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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

The Investigation of Factors Affecting Urban Decays by Using Spatial Analysis Models (Case Study: Pars Abad City)

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Received: 22 Oct 2014 Revised: 21 Nov 2014 Accepted: 31 Jan 2015

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ABSTRACT

In order to model the old texture of Pars Abad city, among the empirical estimation methods, logistic regression modeling approach were used. For this purpose, six groups of independent variables, including variables such as land use, land price, building quality, land area, materials, building antiquity and broker variable (six climatic factors) and the dependent variable (old texture) were selected and the effect of independent parameters on the dependent parameter were analyzed. This operation was performed in IDRISI GIS environment. For modeling the old texture in the study area, the maps produced by the independent parameter and the dependent parameter in the GIS environment were entered to IDRISI environment and the effect of six different variables on the dependent variable (the old texture of Pars Abad city) were determined. According to the results of logistic regression analysis, of the independent parameters, the land quality, building antiquity and the type of materials had the greatest impact on the old texture, and the other parameters did not affect on the old texture. Among the factors of climatic variables used as broker, according to the statistical data of thirty years, the greatest impact were related to the precipitation (rain and snow) and humidity, and the impact of other weather factors on the old texture was not significant.

This map show the areas predisposing to erosion. To verify the modeling and evaluation of the variables in the model, the independent variable sensitivity of ROC methods were used And it was 0.95 for the full data model that represents a good correlation between the independent and dependent variables

Keywords: Old texture modeling , logistic regression, Pars Abad , GIS, ROC

INTRODUCTION

Urban textures of each country are formed in accordance with its development degree in every period of time. In other words, political, economic, social and cultural conditions of the country affected the formation of urban textures in each period of time. According to the statistics and data, regarding 330 selected cities throughout the country, collected by urban development and revitalization organization, the area of urban decays was more than 60000 hectares or 9.2% of the total area of the selected cities (Iran Supreme Council for Planning and Architecture, acts of 2007). Urban problems are plentiful in our country; however considering the extent and type of decay and the time period of relevant activities, urban decays are of high importance. Many cities, especially metropolises, suffer from urban decays problem which intentionally or unintentionally affects urban economy and results in the increased efficiency of space usage. Perhaps a mass of urban decays has severely influenced the optimal exploitation of place. A large number of urban decays are annually evacuated or put out of ecosystem due to the increased extent of decays, a fact which imposes irrecoverable costs on the economy of country. In this regard, revision in organizing old textures, relocation, repair, modification and rebuilding are major concerns of housing and urban development organizations. The revitalizing and renovating process of urban decays in the past and present indicates that the measures taken by the government and municipalities are very limited in this field and without paying attention to the economic, social and environmental dimensions of such textures (Iran Supreme Council for Planning and Architecture). When the urban life is recessed in an area of the city due to any reason, the urban texture of that area starts decaying. The phenomenon of decay in urban textures affects the body of texture and social-economic activities (Shokouhi, 2009: 172). Decay is one the most important factors associated with urban space. It causes lack of organization, imbalance, disproportion, and dysplasia. Decay is a factor which results in destroying public memories and diminishing urban life (Habibi and Maghsoudi, 2002: 15). The elements and spaces of urban textures have limited ages and start changing and decaying as time goes on. In other words, no building and urban space can last long without renovation and revitalization (Sashpour, pp 138: 142). Nowadays applying GIS as a powerful tool for planning and helping optimal urban management is becoming widespread. Malczewski believes that the development of this system is a field for the evolution of planning horizons (Malczewski, 2009). It is thought that these systems help urban planning and management because locational information, taxes position and also descriptive information which describe locational taxes are stored in an environment in these systems, and it is possible to conduct locational and descriptive analyses and combined locational-descriptive analyses in such systems. GIS has many functionalities which give considerable help in urban planning, decision-making and policy-making by considering scientific and practical regulations with respect to a specific method providing fundamentally short-term and long-term requirements along with paying attention to the quality of information (in terms of accuracy and precision). Instances could be determining appropriate locations for providing urban services, helping resolve traffic problem, directing and inhibiting surface waters, widening the streets and calculation their estimation levels, classifying estates in accordance with parameters such as land uses, facades, and building antiquity. There is a certain approach in order to investigate a phenomenon comprehensively. Applying the right approach, we can recognize the phenomenon more precisely and clarify its complexities. This comprehensive phenomenon results from benefiting from different sciences (DoRosnay & Beishon, 1991: 25). One of the sciences which can be applied in the field of recognizing the old textures more comprehensively is the outputs of this system which prevents employee from doing extra work and spending extra time by providing applications and models which can perform repetitive tasks automatically and more rapidly (Gamba *et al*., 2007). Collecting a set of descriptive data and inserting them in the geographical information systems, we can perform the necessary calculations and analyses. The above-

mentioned system begins storing, setting conditions, managing and displaying geographical information. Also, it usually includes models which are used in special operations such as generating the maps, spatial analysis and visual presentation of data (Frigioni & Tarantin, 2003: 207-208). Using spatial analysis methods, GIS can analyze different information; therefore, we can study the general spatial relationship and spatial distribution and analysis of phenomenon and use them in a defined area (Liangfeng *et al.*, 2002: 373).

Various researches have been conducted with different topics pertaining to old texture in Iran. In this regard, some domestic ones can be noted. Ayazi (2006) attempted to recognize old textures by using the geographical information system. The indices of calculating the width and building of each block, areas of streets around the blocks, calculating the width of streets around the block, determining if they are impasse, calculating the penetration rate of each block and allocating it to the desired block are used as identification indices. Kamyab *et al*.(2010). In order to model urban development for the city of Gorgan between 1987 and 2001, logistic regression modeling was used. To do so, three groups of independent variables including social-economic, biophysical, and land-use variables were used. Among them, agricultural and pastureland uses were the most efficient data for the urban development of Gorgan in comparison with other variables. They indicate the current uses of the area, especially the transformation of pasturelands had a very important role in the urban development of Grogan. Zangiabadi *et al*. (2011) conducted a research which investigated and extracted indices of general urban decay in the western area of the city of Jahrom by using the method of weighting the desired indices. It means that the data were obtained through field studies, GIS, and overlapping the relevant layers in land use map system and viewpoints of experts and municipality engineers in the city of Jahrom. After that, the extent of area decay was specified by using GIS based on each index.

Need for Social Research

Home is where family spends the best and most efficient hours of its lifetime. Also, its social impacts require more investigation because families are closely in relation with each other. All researches are meant for human welfare and happiness, so the spatial and skeletal characteristics of buildings are considered to be among the most important factors of individual happiness.

Economic Necessity

Paying attention to the desirable localization of houses, the penetration field and appropriate availability, renovation and revitalization of buildings have important roles in reducing the costs for the officials and families. It means that all of the space is used by optimally renovating and revitalizing old textures, a fact which results in better land use and economic advantage. Above all, heat is not wasted by revitalizing old texture and equipping them with optimal materials in this area (due to having a cold climate); therefore, it is cost-effective.

The Necessity of Planning and Measures

Due to the extent of the problem and its consequences, it is necessary to investigate it in the society by recognizing its dimensions and aspects. On the other hand, given the vastness of country and population distribution in different regions of our country, the urban beauty has been diminished because the level of life has been upgrading and many reconstructions have been done around old textures. Revitalization of old textures has become an important problem for the officials who are involved in the construction of schools. Consequently, planning for revitalization and renovation of old textures emerged as a requirement, given the regulations and criteria of importance. In this research, both short-term and long-term objectives are considered. They include resolving the skeletal problems in the city, managing the future crisis, the optimal use of available old texture space, increasing the availabilities, retrofitting the buildings, and preventing the uncontrolled expansion of buildings.

MATERIALS AND METHODS

Introduction of Pars Abad City Boundaries

With an area of over 1383 square kilometers, Pars Abad City of Moghan is a nearly vast plain which covers 14% of total area of Ardabil Province. It is the northernmost city of Ardabil. This city is located from the latitude of 39 degrees and 12 minutes to the latitude of 39 degrees and 42 minutes from north latitude and from the longitude of 47 degrees and 10 minutes to the longitude of 48 degrees and 21 minutes from east of the prime meridian. This city is limited to the Aras River and the Republic of Azerbaijan from north, while it is limited to the city of Kaleybar in Eastern Azerbaijan Province. Also, it is limited to the Republic of Azerbaijan from east, and it is limited to the cities of Bilesavar and Germi from south and western south. Pars Abad weather station is nearly 72.6 meters above the sea surface, and its distance from the Caspian Sea (Khazar) is 75 kilometers and even 40 kilometers at some spots (Statistical Periodic of Ardabil, 2006: pp. 25). The Aras River with a length of 1072 kilometers which is considered the vital artery of the area and the most important watering resource for the Moghan Plain stems from the mountainsides of Bingöl Dagh Mountain. Its total water bed is 100220 square kilometers. The areas owned by Turkey, Armenia, Azerbaijan, and Iran are 23, 38, and 39 percent, respectively. This city consists of 4 sub-regions and 8 villages (Astronomy Atlas of Iranian Provinces, Tehran; 2004). According to a census conducted in 2011, the population of this city is 88924 people (The State Statistics Organization, 2012).

The data used in this research were provided by the State Statistics Organization, Ardabil Meteorological Organization, Pars Abad Municipality, and by using field operations. The software applications used in this research (GIS) were used to generate maps of independent and dependent parameters. IDRISI was used to specify the impact factors of independent variables on dependent ones. It was also used to model old textures and to generate predictive maps. Six parameters (such as building antiquity, land use, building quality, building area, land price, and materials) were used to model the old texture of Pars Abad City. Therefore, the maps of independent variables (building antiquity, land use, building quality, building are, land price, and materials) and the map of dependent variable (old texture) were provided out of data existing in GIS, and then the predictive map and variables factors were provided out of the maps generated in IDRISI. After providing informational layers and classifying them in this model, the maps of parameters pertaining to the study area was generated in GIS. Then these maps were inserted into the model, and modeling the old textures of Pars Abad City was conducted. The impact factor of each of independent variables on the dependent variable (old texture) was specified in IDRISI. Finally, the output was indicated in the form of map, diagram and table.

DISCUSSION

Two types of database were used in this research. One was the geometrical information database, and the other one was GIS database in the structure of a descriptive information system. To conduct the analyses, there should be a connection between these two databases through a common field of them. Before collecting the descriptive information on the residential units in Pars Abad City, the fields required for descriptive information were first specified. These fields are antiquity, land use, building area, building price, materials, and building quality. Using a map designed in AUTOCAD and specifying the boundaries of Pars Abad City in GIS by blocking the study area, a new was provided for this city. The independent variables were applicable for performing the field works and collecting data. After collecting data, all variables were inserted into GIS, and the maps of variables were provided.

Findings Obtained by Investigating the Old Texture and Logistic Regression Model

The Results of Coefficients Obtained by Logistic Regression Modeling

The results of coefficients obtained by logistic regression modeling are mentioned in the following table for the dependent variable of old texture throughout Pars Abad City. The logistic regression analysis was done by using data in IDRISI.

Using IDRISI, the most important factors were determined. Then these factors (antiquity, materials, building quality, land price, land area, and land use) were considered as independent variables, while the old texture map was considered as the dependent variable, and the best formula was determined as follows:

logit(baft_n)=-6.1351+ 0.040852*build+0.037343*landus_new*quality+0.063112*ghedmat_new+0.413770*price*1.09265

The statistical indices such as mean and standard deviation for the factors of dependent and independent variables are shown in the following table:3

Maps of Modeling

Predicted Probability Map

Considering the dependent variable in the future, this map states the probability of old texture. In this image, each cell has a value whose magnitude indicates its decay probability in the future. The extent of decay will increase in the future from top to down in the predicted map.Using this map, we can recognize the spots which are likely to be decaying a lot in the future, so we can attempt to revitalize them. According to the predicted map, there are places which are currently old, and they will be more decaying in the future, too. However, there are spots which were not decaying in the past, but they will be decaying in the future.

The Final Map of Old Texture

This map indicates the extent of decay. We can observe that the extent of decay increases from top to down in the decay diagram. This map also indicates that the type of old texture is convergent in this area, and it is not clustered.

There are some tests such as ROC, Pseudo R Square, Chi Square, and so forth in order to evaluate the validity of regression model. In this paper, ROC test was used to evaluate the validity of logistic regression model in the study area. In ROC test, this scale is a digit from 0 to 10. It is obtained by ROC curve. The value of 1 for ROC indicates a complete locational agreement between decay map of the predicted amount and the real decay extent in the city. The value of 0.5 for this scale indicates that positions are random (Lo & Hu, 2007). It indicates that the values of cells are generated as random positions in the predicted probability map (Lo & Hu; 2007). The value of 0.9523 obtained in this study indicates the significant correlation between the independent and dependent variables. Pseidp-R^2 test indicates the determinability factor of R^2 and changeability of all variables in the model. However, the acceptable sample size is not clear in the logistic regression because of dealing with data which have locational correlation by nature. Therefore, the word pseudo is used for R. Yet, using this scale in the logistic regression model is confirmed for the satisfaction test of the model by Domenicich & McFadden and Osking & Clark (1986). According to these researchers, the acceptable value of Pseudo-R^2 is between 0.2 and 0.4. The values of ROC and Pseudo-R^2 for this model are 0.9532 and 0.2522, respectively. They confirm the modeling due to being in the acceptable range.

CONCLUSION

Urban textures of each country are formed in accordance with its development level in each era; in other words, political, economic, social, and cultural conditions of each country have been affecting the formation of urban textures throughout time. Old urban textures refer to the fields of legal boundaries of cities which are exposed to damage due to old structures, lack of appropriate public transportations, lack of service facilities and urban

infrastructures. They have low locational, environmental and economic values. These textures are not possible to be renovated because their residents and owners are poor, and the investors are not motivated to invest there. The main criteria to recognize and detect such textures are mentioned in the following. The logistic regression modeling method which is an empirical estimation method was used to model the old textures of Pars Abad City. Six categories of independent variables including land use, land price, building quality, land area, materials, and building antiquity were used in order to perform such an action. Also, the old texture was used as the dependent variable, while climatic factors were used as mediator variables. These variables were mapped in GIS environment, and then the raster maps obtained by variables were inserted into IDRISI in order to perform the modeling and specify the coefficients of variables. The effective factors in the old texture of the study area were modeled through logistic regression model. The results indicated that building quality, antiquity and materials, among all the studied parameters, had the greatest effect on decaying a building. Among the climatic factors, precipitation and humidity were effective in decaying the studied buildings. There are some tests such as ROC, Pseudo R Square, Chi Square, and so forth. We used ROC test to evaluate the validity of logistic regression model in the study area. The values of ROC and Pseudo R^2 for this model were 0.9532 and 0.2522, respectively. They confirmed the modeling due to being in the acceptable range.

REFERENCES

1. Statistical Periodic of Ardabil Province, 2006, pp. 25
2. Astronomy Atlas of Iranian Provinces, 2004, Tehran Press
3. Ayazi, Seyed Muhammad, 2006, Recognition of Old Textures by Using Geographical Information Systems Considering the Capabilities of GIS, Tehran, National Cartographic Center
4. Habibi, Mohsen and Maghsoodi, Maliheh, 2002, Urban Revitalization, Tehran University Press, First Edition
5. Zangiabadi, Ali et al., 2011, Extraction of Indices for Recognizing Urban Old Textures by Using GIS (Case Study: The Western Area of Urban Old Texture in the City of Jahrom), Human Geography Researches, No. 78, pp. 117-136
6. Housing and Urban Development of Ardabil Province, 2012
7. Sashpour, Mahdi, 2009, The Intervention Procedure in Old Textures, The 3rd Regional Conference of Studying Urban Issues of Zanjan
8. Shokouhi, Ali, 2009, Analysis of Urban Old Texture Problems by Using Fuzzy Maps, The 3rd Regional Conference of Studying Urban Issues of Zanjan
9. Iran Supreme Council for Planning and Architecture, acts of 2007
10. Kamyab, Muhammad et al., 2010, Finding an Information-oriented approach with the Function of Logistic Regression Method for Modeling the Urban Development of Gorgan, Ecology Journal, No. 54, pp. 89-96
11. Statistical Center of Iran, 2011, General Census of Population and Housing
12. DoRosnay, J., Beishon, J., 1991, A Systems Thinking Approach, Translated by: Jahanbagloo,
13. Frigioni, D., Tarantino, L., 2003, Multiple Zooming in Geographic Maps, Data & Knowledge Engineering, 47, PP. 207-236.
14. Gamba, P., Dell_Acqua, F., Dasarathy, B., 2005, Urban Remote Sensing Using Multiple Data
15. Hu,Z., Lo,C.P. 2007. Modeling urban growth in Atlanta using logistic regression. Computers,
16. Longley, P.A., M.F. Goodchild, D.J. Maguire, and D.W. Rhind, 2001. Geographic Information Systems and Science. New York: Wiley.
17. Malczewski, J., 2004, GIS-based Land-use Suitability Analysis: A Critical Overview,Advanced e-Planning in Europe, Government Information Quarterly, 24, PP. 763-754.

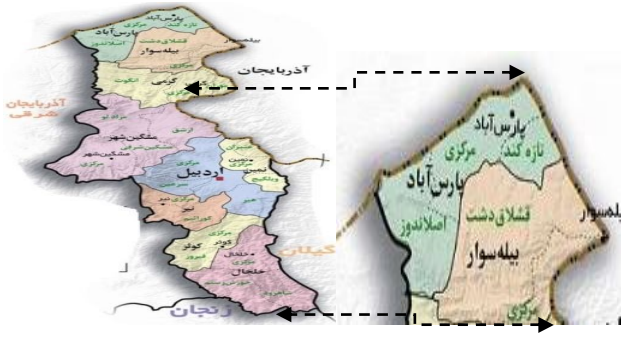

Figure 1: The Geographical Position of the Study Area

Table 1: Variables Used in Logistic Regression Model (Based on Data-Driven Approach)

Row	Variable	Type of Variable
1	Dependent	Old Texture
2	Independent	Antiquity
		Land Use
		Building Area
		Building Price
		Materials
		Building Quality
3	Mediator (Climatic Factors)	Temperature
		Precipitation
		Humidity
		Sunny Hours
		Temperature
		Wind
		Freezing Days

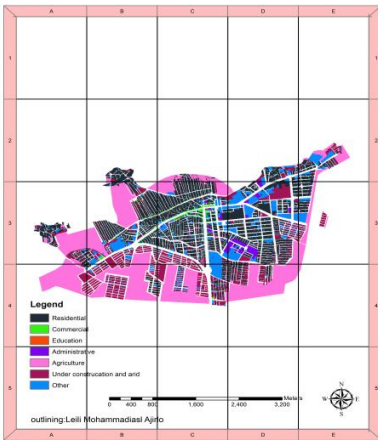

Figure 2: Land Use Map of the Study Area

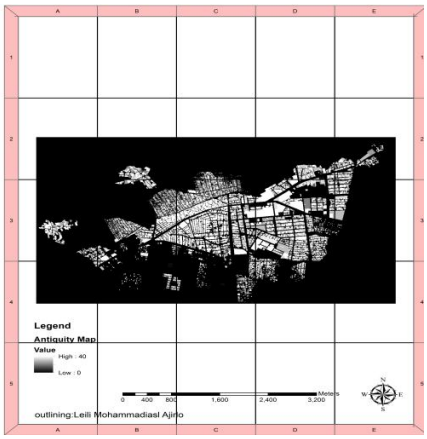

Figure 3: Antiquity Map of the Study Area

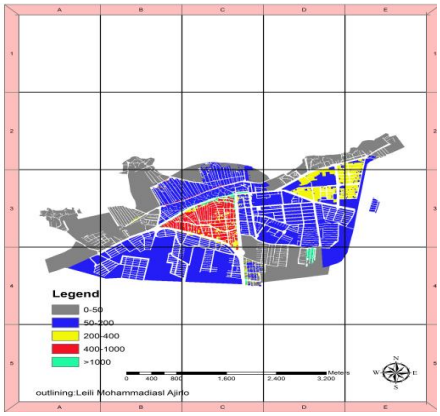

Figure 4: Price Map of the Study Area

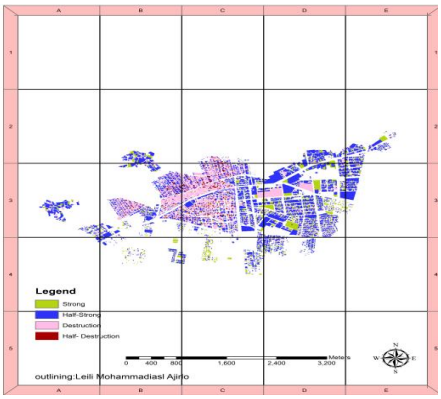

Figure 5: Building Quality Map of the Study Area

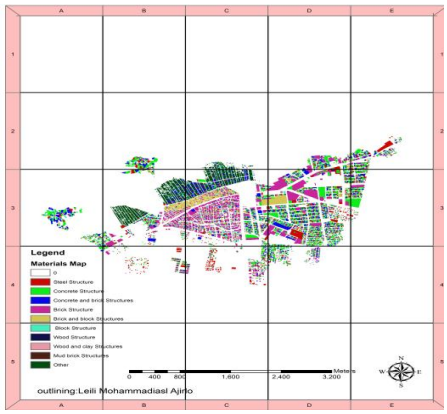

Figure 6: Materials Map of the Study Area

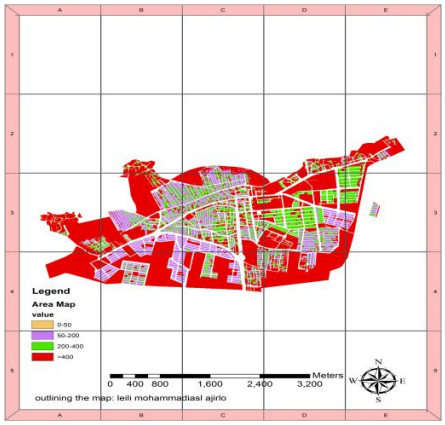

Figure 7: Area Map of the Study Area

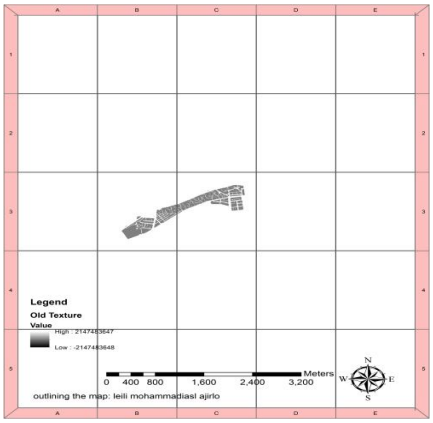

Figure 8: Old Texture Map of the Study Area

Table 2: Coefficients Obtained by Logistic Regression Model

	Dependent Variables	Coefficients
X_0	Constant	-6.1351
X_1	Antiquity	+0.063112
X_2	Materials	+0.040852
X_3	Building Quality	+1.09365
X_4	Land Price	+0.002619
X_5	Building Area	0.0183427
X_6	Land Use	0.037343

Table 3: The Statistical Indices of Mean and Standard Deviation for the Factors of Independent Variables

Variable	Mean	SD
Antiquity	2.843180	6.536516
Materials	0.722263	1.891080
Building Quality	0.409304	0.909002
Land Price	0.763695	1.044146
Land Area	1.441387	1.769128
Land Use	1.696590	2.473040
Old Texture	0.23129	0.150314

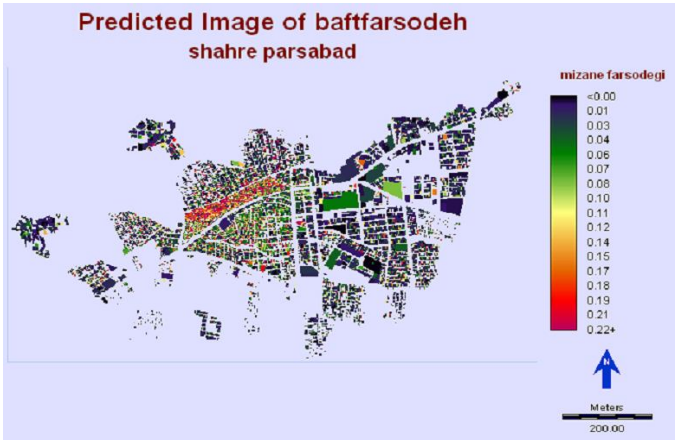

Figure 9: Predicted Map of Pars Abad City Old Texture

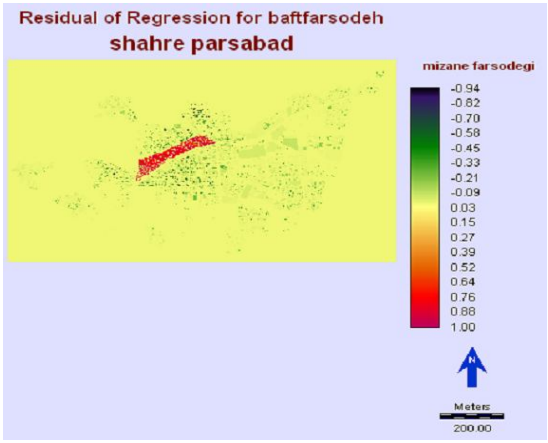

Figure 10: Final Old Texture Map

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

IS Success in M-Banking Systems: A Dynamic Approach

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Received: 20 Nov 2014 Revised: 21 Dec 2014 Accepted:5 Jan 2015

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ABSTRACT

Mobile banking system plays a major role in mobile commerce. As wireless networks are existed, today new generation of electronic commerce applications are emerged and expanded, that are known as mobile commerce. In this field one of services that served in bank industry with cell phones is mobile banking. Although many studies have been conducted to assess users' satisfaction or the other factors with mobile applications, none has focused on applying system dynamic on m-banking. So the goal of this article is to developing all the casual loops in an m-banking system. The research extract alternatives based on all the IS success models and developing Causal loop diagram based on the models factors. Method of this article is based on system dynamics theory and the causal loop diagrams are conducted based on this theory by VENSIM application. This causal loops help the researchers to develop dynamic models of mobile banking systems in future.

Keywords: Dynamic approach, IS Success Models, M-Banking Systems

INTRODUCTION

Mobile banking (m-banking) is a new phenomenon in recent years. As smart phones rob the attention of a wide range for doing bank transactions, m-banking takes a high penetration coefficient. Mobile banking is among the latest

in a series of recent mobile technological wonders. Although automated teller machine (ATM), telephone, and Internet banking offer effective delivery channels for traditional banking products, but as the newest delivery channel established by retail and microfinance banks in many developed and developing countries, m-banking is likely to have significant effects on the market (Safeena et al., 2012).

In particular, the expanded uses of smartphones has increased demand for m-banking services, prompting many more banks, microfinance institutions, software houses, and service providers to offer this innovative service together with new sets of products and applications designed to extend their client reach (including to unbanked populations), improve customer retention, enhance operational efficiency, increase market share, and provide new employment opportunities (Shaikh, 2013).

These amount of demand in m-banking are made banks to design and develop new information systems in order to have a successful information system (IS) to increase the amount of bank customers that is called users in m-banking. Increasing m-banking users have so many positive aspects for banks that is not the aim of this article, but it tries to discuss about IS success with dynamic approach which one of the results could be increase in bank users. As it discussed in this article all the loops of an information system of mobile banking will be introduced. First we will argue about the theoretical background of successful IS and m-banking then the research methodology will be discussed and at last dynamic model of successful IS in mobile banking will be shown based on theoretical background.

Theoretical Backgrounds

Mobile banking is defined as banking transactions using mobile devices such as cell phones, PDAs (Personal Digital Assistants), smart phones and other devices like tablets and lap tops. This study therefore regards m-banking as something of an information system. The study is based on all factors of all IS success models. Following is an explanation of IS success models based on m-banking.

Early attempts to define information system success had difficulty in handling the complex, interdependent, and multi-dimensional nature of IS success. To address this problem, DeLone and McLean (1992) performed a review of the research published during the period 1981 to 1987, and created a taxonomy of IS success based upon this review (Petter et al., 2008). The DeLone and McLean theory of IS success (1992), as illustrated in Figure 1, was an attempt to prescribe a single theory of IS success. It consisted of six constructs: system quality, information quality, use, user satisfaction, individual impact and organizational impact. Constructs are a high level description of the system that is being built; and are used for modeling the structure of business processes (Seila et al., 2003).

After the DeLone and McLean theory, Seddon et al. (1999) modified it. The major difference between the two theories is the definition and placement of IS use. Seddon et al argue that use must precede impacts and benefits, but it does not cause them (Seddon et al, 1997). They consider IS use as behavior that reflects an expectation of net benefits from using an information system and therefore model IS use as resulting behavior of IS success. Seddon's et al. (1999) reformulation of the DeLone and McLean theory into two partial variance models complicates measurement, whereas the original desire for formulating a theory for IS success was simplicity.

After Seddon model, DeLone and McLean revisited the 1992 theory and carried out refinements taking into account the numerous criticisms and suggestions for improvement from other researchers. This modified theory is illustrated in 2 below; where the arrows represent influence (DeLone and McLean, 1999). The key changes were: the introduction of net benefits (replacing individual impact and organizational impact in the original theory), a re-specification of the relationships among constructs and the construct "service quality" was added to the D&M model. After revisited theory of Delone and McLeane, Gable et al. (2008) basing on DeLone and McLean (1992) argue that a holistic measure for evaluating an IS should consist of dimensions that together look backward (impacts), and

forward (quality). Gable et al., (2008) define the IS-Impact of an information system (IS) as a measure at a point in time of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user-groups. The authors acknowledge that the IS-Impact model was developed and validated with data only from the Australian public sector, and wonder whether the citations used are complete and representative of contemporary IS in general. And apart from their study, this model has not been tested anywhere else (Gable et al., 2008).
The result of gathering all variables of each model are shown in table 1.

METHODOLOGY

Methodology of this article is based on system dynamic theory. System dynamics is an approach to understanding the behavior of complex systems over time. It deals with internal feedback loops and time delays that affect the behavior of the entire system.[1] What makes using system dynamics different from other approaches to studying complex systems is the use of feedback loops and stocks and flows. These elements help describe how even seemingly simple systems display baffling nonlinearity.In this research the causal loop of IS success in m-banking is developed. We try to consider all the variables based on different models about IS success to have a comprehensive causal loop model.

Representing Causal Loop Diagram (CLD)

The causal loop of this research is developed with VENSIM software which is one of the most popular soft wares in system dynamic.

The model contain all variables of IS success in m-banking so it became very large, for this reason we introduce causal loop part by part and at last the whole model will be shown in the article. The variables are collected from review of literatures that is in table 1 and also we took the opinion of some experts in m-banking that is added to CLDs.

Based on the table one the first variable is system quality. The model of system quality is in figure 3.
The second variable is information quality. The causal loop of information quality is in figure 4.
As table 1 shows the third variable is information use that the diagram is shown in figure 5.
Figure 6 is the causal loop diagram of user satisfaction.
Figure 7 is causal loop of net benefit.
Figure 8 is causal loop of system quality.
At last the whole causal loop diagrams of IS success in m-banking is in figure 9. Figure 9 shows all the causal loop diagrams together.

CONCLUSION AND RECOMMENDATIONS

This study aimed to extend our understanding regarding the IS success in m-banking through system dynamic theory. System dynamics modeling is one type of management tool. The advantage of system dynamics models is that they can incorporate many of the complexities of the actual environment that other models cannot. These models also incorporate time lags, feedback effects, and causal factors. They present information in an easy to understand, visual context. Thus, system dynamics models offer the potential to enable agribusiness managers to practice decision making.The model developed and employed in this study is a system dynamics model of IS success in m-banking. The model incorporates complex, dynamic causal factors, and feedback effects. As one example of how the model can be used to provide insight to managers, simulations are run over an integrated model with all factors of all

the IS success models. The purpose of this work is to demonstrate the utility of sophisticated management tools, such as system dynamics, in aiding managers' decision making in banks.

Also, the results show that the proposed CLDs has high explanatory power. This could be especially valuable for researchers to include Stock and Flow diagrams. In addition, some possible moderating effects are not presented in the model. Therefore, future studies should extend the models by adding important factors toward actual use such as to increase the model's predictive power in the mobile banking context. In summary, the study proposes a model that helps to conceptualize IS success in mobile banking through the integration of all models. The findings of this study have important implications for researchers and bank managers in today's dynamic environment.

REFERENCES

1. DeLone, W.H., and Mclean E.R., 1992. Information Systems Success: The Quest for the Dependent Variable. Information Systems Research. 3(1):60-95.
2. DeLone, W.H., and Mclean E.R., 2002. Information Systems Success Revisited. Proceedings of the 35th Hawaii International Conference on System Sciences. IEEE Computer Society Press, Los Alamitos, CA: 238-248.
3. DeLone, W. H., and McLean, E. R., 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. Journal of Management Information Systems. 19(4): 9-30.
4. Dong, L., Neufeld, D. and Higgins, C. (2009). Top Management Support of Enterprise Systems Implementations. Journal of Information Technology. 24:55-80.
5. Gable, G.G., Sedera, D. and Chan, T., 2008. Re-conceptualizing Information System Success: the IS Impact Measurement Model. Journal of the Association for Information Systems. 9(7), 377-408.
6. Petter, S.; Delone, W.; and McLean, E., 2008. Measuring Information Systems Success: Models, Dimensions, Measures, and Interrelationships. European Journal of Information Systems. 17:236-263.
7. Safeena, R., Date, H., Kammani, A., Hundewale, N., 2012. Technology adoption and Indian consumers: Study on mobile banking. International Journal of Computer Theory and Engineering 4(6), 1020 – 1024.
8. Seddon, P.B., 1997 A Re-specification and Extension of the Delone and McLean Model of IS Success. Information Systems Research. 8(3):240-253.
9. Seddon, P.B., 1999 Dimensions of Information Systems Success. Communications of the Association for Information Systems. 2(1) Article 20.
10. Seddon, P.B., Staples, D.S., Patnayakuni, R., and Bowtell, M.J., 1998. The IS Effectiveness Matrix: The importance of Stakeholder and System in Measuring IS Success. Proceedings of the International Conference on Information systems, Helsinki, Finland. Hirscheim, R., Newman and DeGross (Eds). Helsinki, Finland: 165-177.
11. Seila, A., Ceric, V. and Tadikamalla, P. 2003. Applied Simulation Modeling. Brooks/Cole. Belmont, CA.
12. Shaikh, A.A., 2013. Mobile banking adoption issues in Pakistan and challenges ahead. Journal of the Institute of Bankers Pakistan 80(3), 12 – 15.
13. Tharkurta, R. and Ahlemann, F. (2010). Understanding Requirements Volatility in Software Projects-An Empirical Investigation of Volatility Awareness, Management Approaches and Their Applicability. Proceedings of the 43rd Hawaii International Conference on System Sciences. IEEE Computer Society. Honolulu, HI: 1-2.
14. Velasquez, N.F.; Durcikova, A. and Sabherwal, R. (2009). Studying Knowledge Management System Success in System Administration. Proceedings of the 42nd Hawaii International Conference on System Sciences. Big Island, HI: 1-7.
15. Williams, B. and Hummelbrunner, R. (2010). Systems Concepts in Action: A Practitioners Toolkit. Business and Economics. Stanford University Press.
16. Wu, J. and Wang, Y. (2006). Measuring KMS success: A re-specification of the DeLone and McLean's model. Information and Management. 43:728-739
17. Yusof, M.M. and Kuljis, J. (2008). An Evaluation Framework for Health Information Systems: Human, Organization and Technology-fit (HOT-fit). International Journal of Medical Informatics. 77:386-398.

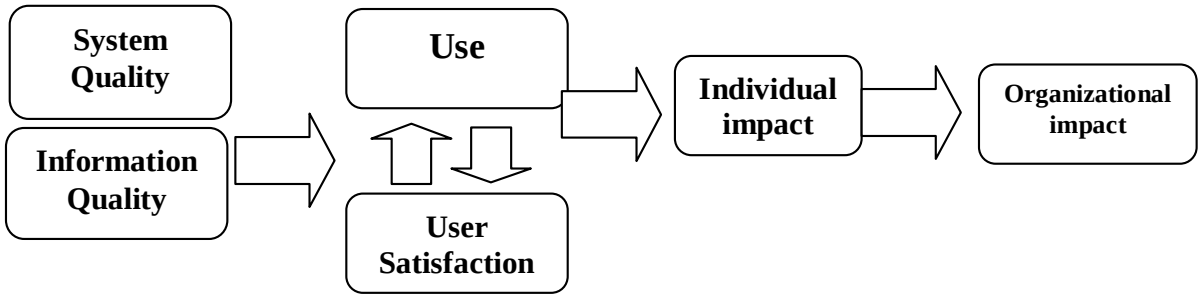

Fig.1 DeLone and McLean Model (1992)

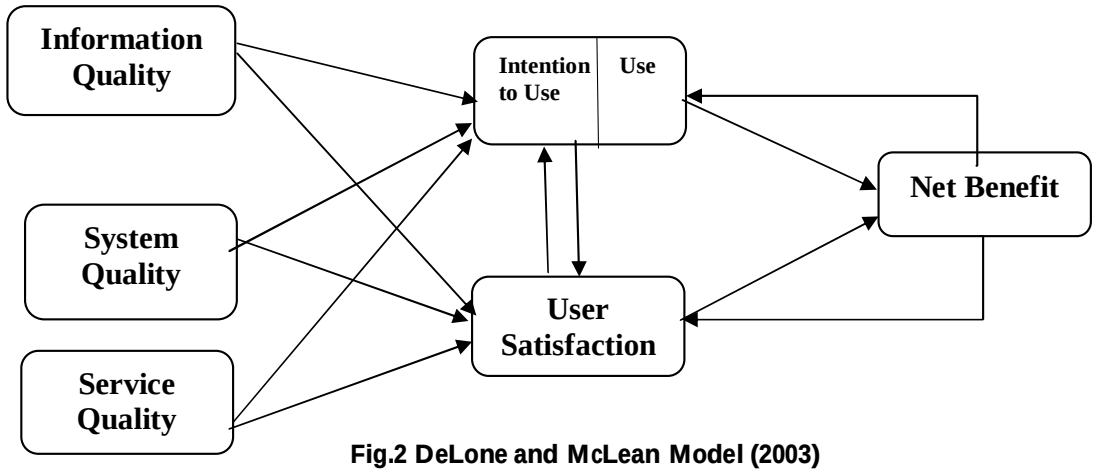

Fig.2 DeLone and McLean Model (2003)

Table1. All the factors gathered from IS success models

Easy Learning (DeLone and McLean, 2003) Easy Using (Velasquez et al., 2009) Availability (Dong et al., 2009) Knowing User Needs (DeLone and McLean, 2003) System Benefits (Wu and Wang, 2006) Output Accuracy (Seddon et al, 1999)	System Quality
Security (DeLone and McLean, 2003) Connection (Yusof and Kuljis, 2008) Usefulness (Velasquez et al., 2009) On Time (Petter et al., 2008) Clarity (DeLone and McLean, 2003) Content (Seddon et al, 1999)	Information Quality

Length of using (Seddon et al, 1997) Real Use opposite to Reported Use (Seddon et al, 1999) Kind of Using (Tharkurta and Ahlemann, 2010) Motivation of Using (DeLone and McLean, 2003)	Information Use
Personal Satisfaction (Tharkurta and Ahlemann, 2010) Whole Satisfaction (Wu and Wang, 2006) Information Satisfaction (DeLone and McLean, 2003) User Happiness (Petter et al., 2008)	User Satisfaction
Personal Impact (DeLone and McLean, 2003) Learning (Tharkurta and Ahlemann, 2010) Impact on Decision Making (Velasquez et al., 2009) Personal Effectiveness (Tharkurta and Ahlemann, 2010) Personal Efficiency (Tharkurta and Ahlemann, 2010) Problem Identification (Seddon et al, 1999) Spending Money for Information (Petter et al., 2008) Organizational Impact (Wu and Wang, 2006) Save Money for Personnel Costs (Olawale et al., 2010) Decrease Personnel (Tharkurta and Ahlemann, 2010) Increase Productivity (Dong et al., 2009) Increase Income (Dong et al., 2009) Decrease Work (Dong et al., 2009) Service Efficiency (DeLone and McLean, 2003)	Net Benefit
Staffs' Uniform and Appearance in Technical Support (DeLone and McLean, 2003) Doing What Is promised by Technical Support Staffs (DeLone and McLean, 2003) Interests of Technical Support Staffs for solving the problems (Williams and Hammel, 2010) Giving Urgent Services by Technical Support Staffs (Seddon et al, 1999) Not Being Too much Busy to Answer Users Requests (Williams and Hammel, 2010) Make Sense of Confidence in Users by Technical Support (Velasquez et al., 2009) Staffs (DeLone and McLean, 2003) Politeness of Technical Support Staffs (Velasquez et al., 2009) Knowledge of Doing Work in Technical Support Staffs (Williams and Hammel, 2010) Personal Attention to the Users by Technical Support Staffs (Williams and Hammel, 2010) Right Perception of Users' needs by Technical Support Staffs(Williams and Hammel, 2010)	Service Quality

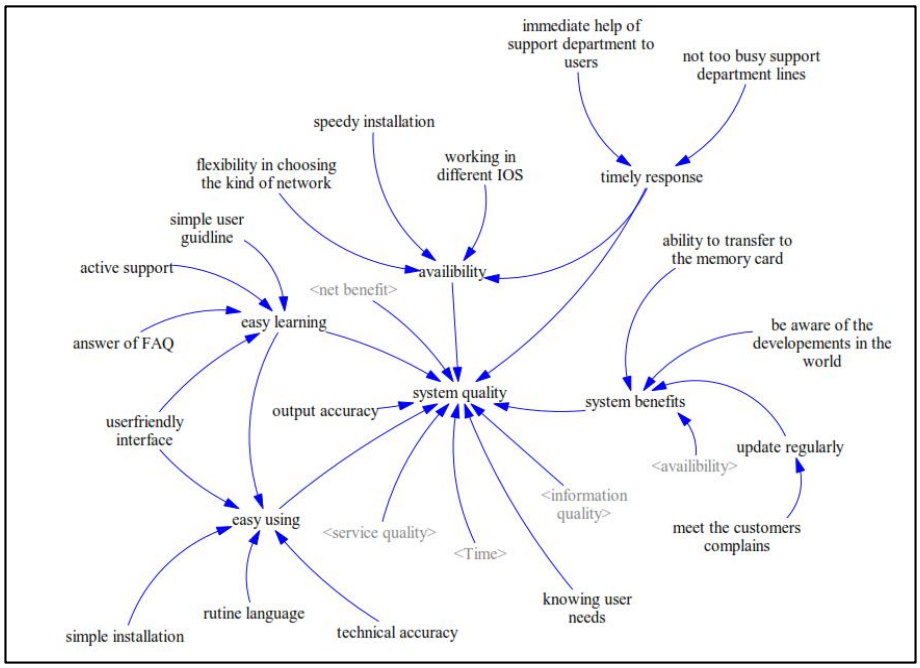

Fig.3. System quality CLD

The second variable is information quality. The causal loop of information quality is in figure 4.

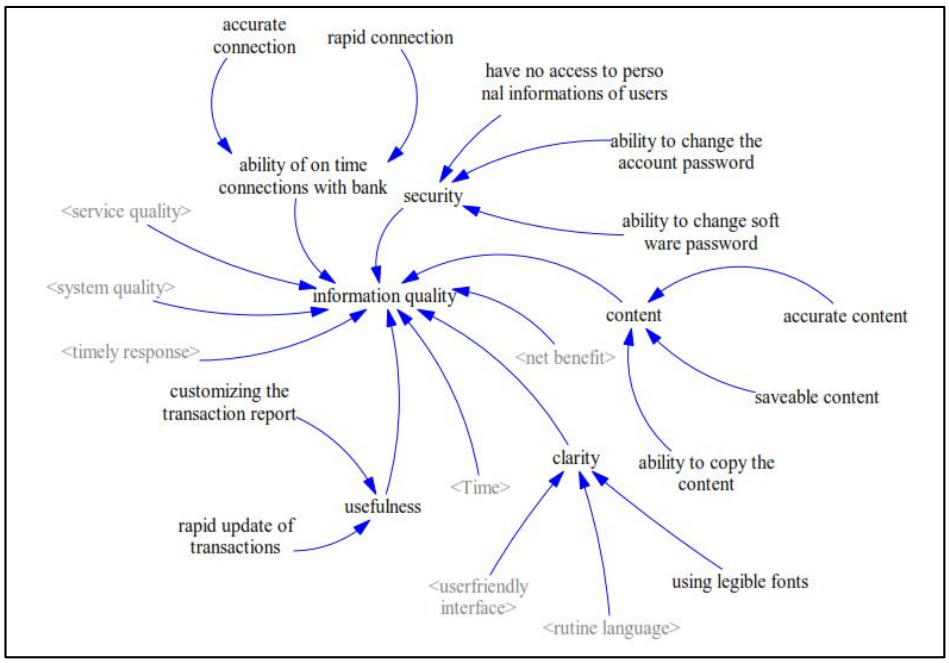

Fig.4. Information quality CLD

As table 1 shows the third variable is information use that the diagram is shown in figure 5.

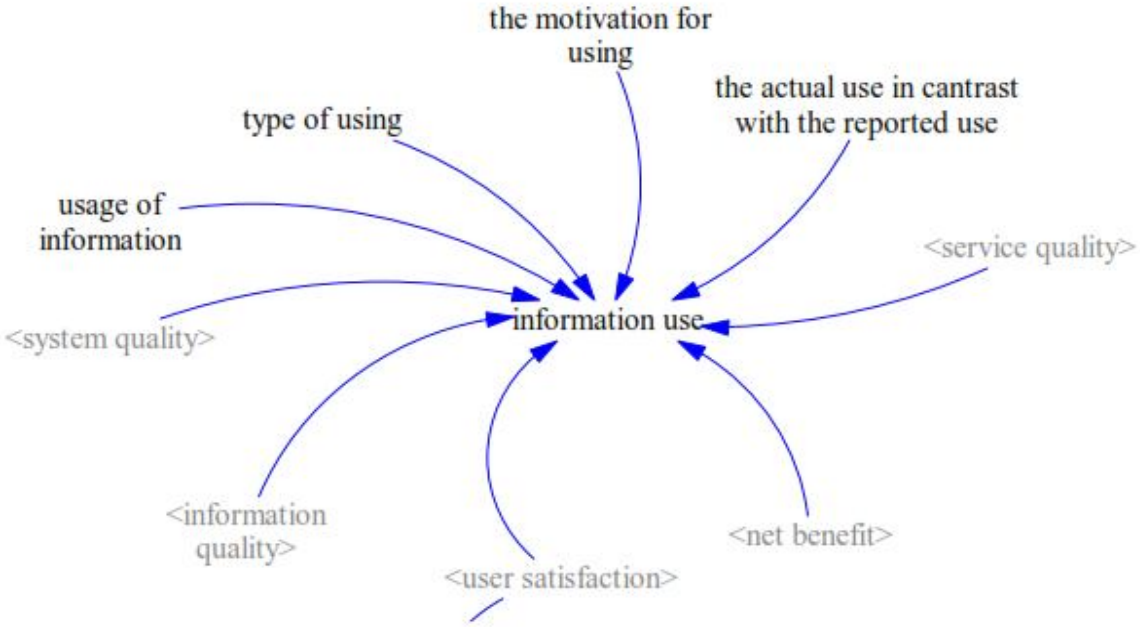

Fig.5. Information use CLD

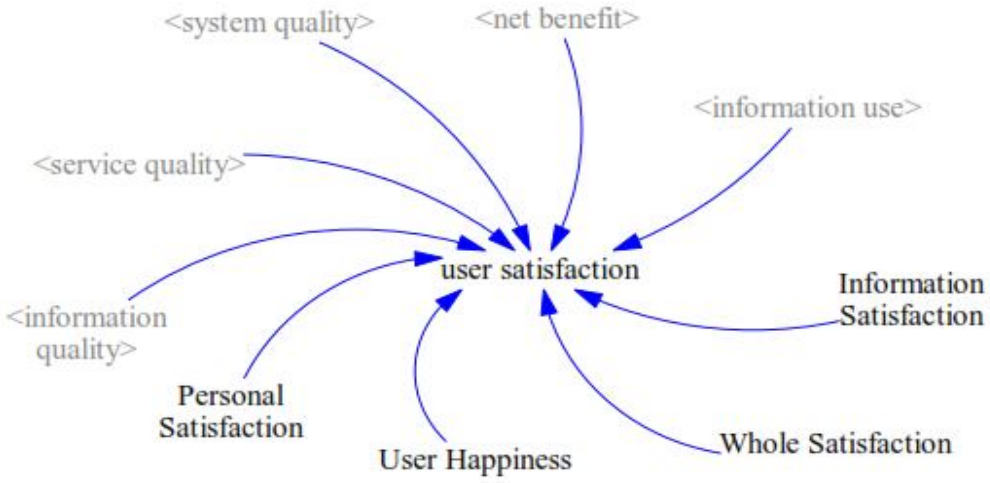

Fig.6. User satisfaction CLD

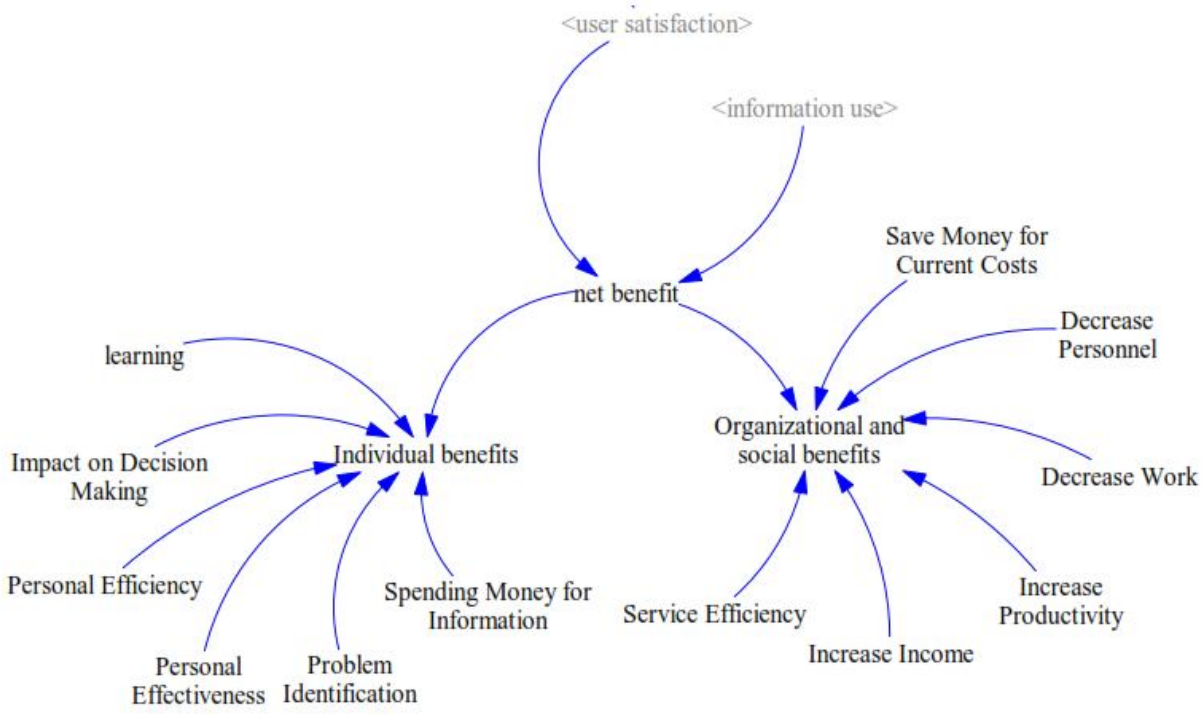

Fig.7. Net benefit CLD

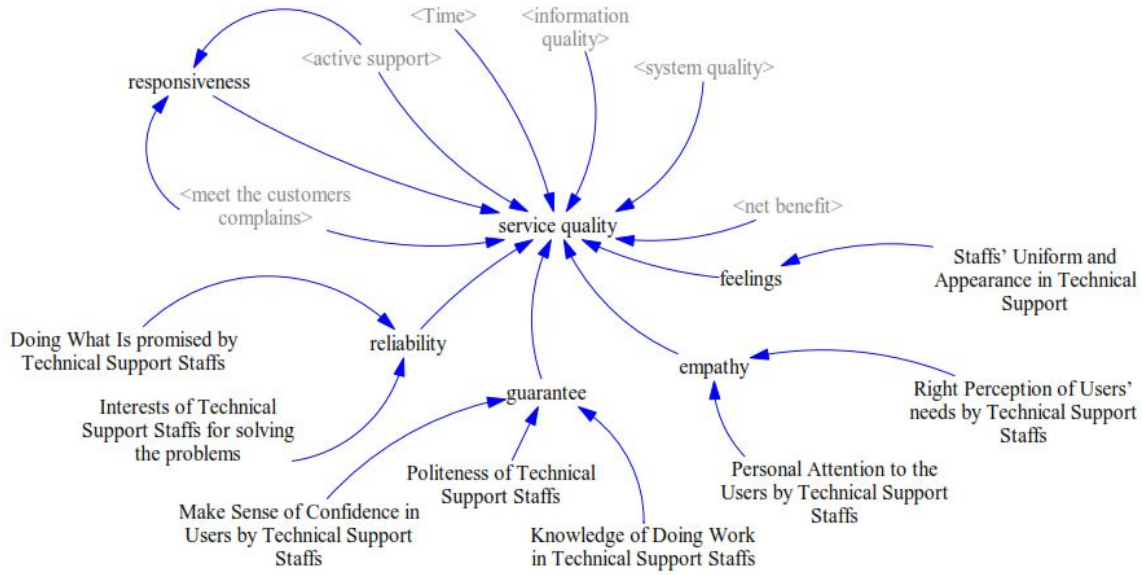

Fig.8. Service quality CLD

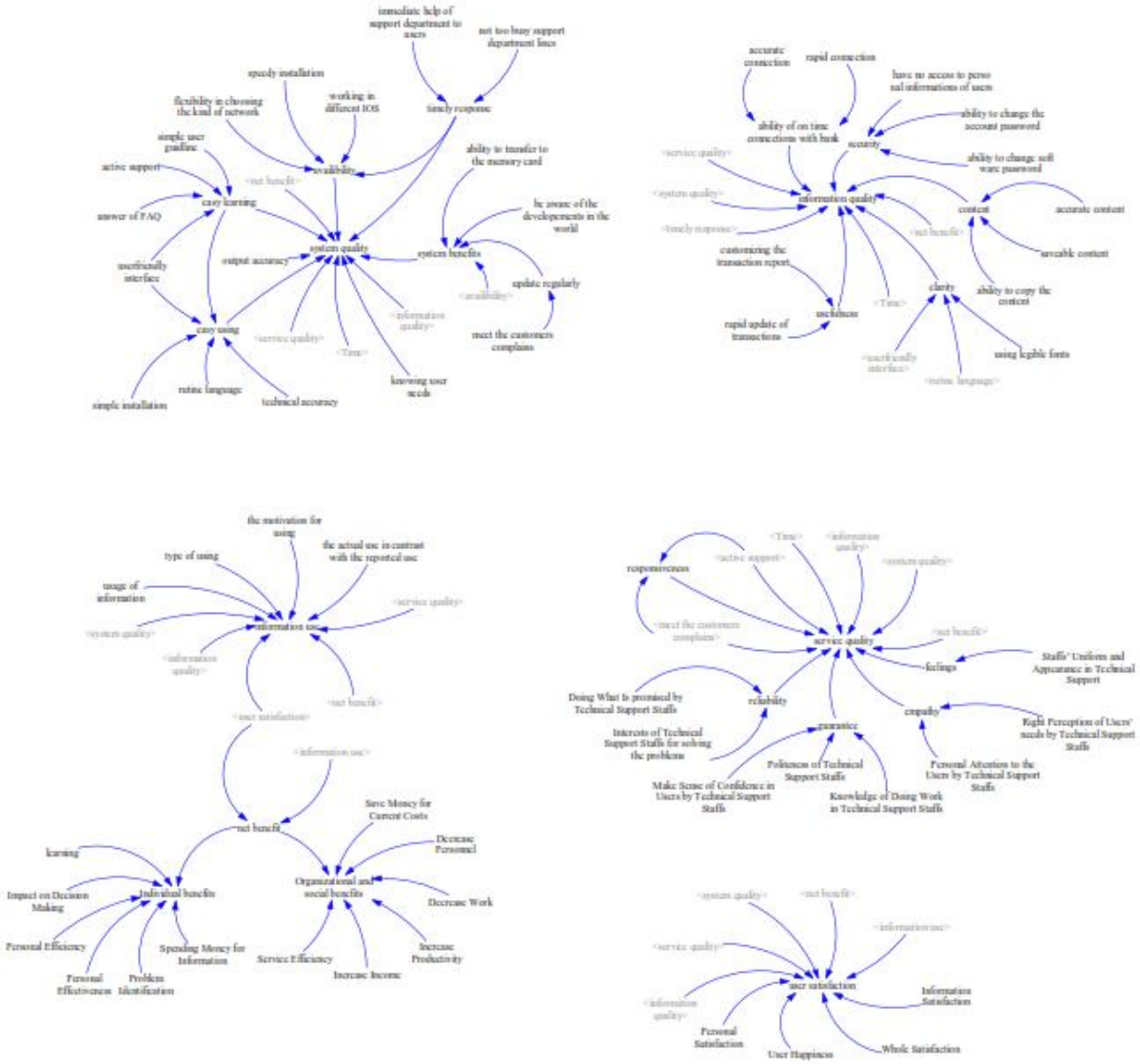

Fig. 9. IS Success in M-Banking Systems

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Constraints Perceived by Beneficiaries in MGNREGA Participation

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Received: 12 Dec2014 Revised: 5 Jan 2015 Accepted: 17 Jan 2015

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ABSTRACT

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is an Indian job guarantee scheme, enacted by legislation on 25 August, 2005. The act has become operative in the notified districts from 2nd February 2006 with an objective of enhancing livelihood security of rural households by providing at least 100 days of guaranteed wage employment in every financial year to every household whose adult members volunteer to do unskilled manual work. The present paper analyzes the various constraints faced by beneficiaries after their participation in MGNREGA in the four districts of eastern Vidarbha region of Maharashtra namely, Bhandara, Gondia, Gadchiroli and Chandrapur. For the study eight tahsils and a sample size of 320 beneficiaries were selected. The results indicated that the major financial constraints of MGNREGA beneficiaries were delay in payment of wages. Among other constraints faced were lack of technical guidance and non availability of assured 100 days employment to every household. Beneficiaries suggested that wages are paid to beneficiaries within a period as per rule of MGNREGA

Keywords: Beneficiaries, Constraints, MGNREGA.

INTRODUCTION

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is an Indian job guarantee scheme, enacted by legislation on 25 August, 2005. The act has become operative in the notified districts from 2nd February 2006 with an objective of enhancing livelihood security of rural households by providing a minimum of 100 days of guaranteed wage employment in every financial year to every household whose adult members volunteer to do untrained manual work. "This employment Guarantee Act is the most vital legislation of our times in some ways. For the first time, rural communities are given not simply a development programme, however a regime of rights. This act, will also unlock the potential of the rural poor to contribute to the reconstruction of their setting. The NREGA offers hope to people who had all, but lost their hope. It has a clear focus on the poorest of the poor. It seeks to reach out to those in need of livelihood security. The NREGA offers employment, offers financial gain, offers a living and it offers an opportunity to measure a lifetime of self-esteem and dignity. Considering the importance of act, it felt essential to check the major constraints faced by the Beneficiaries participated in MGNREGA.

MATERIALS AND METHODS

Locale of the study: The study was carried out in eastern Vidarbha region, which comprises the districts namely Bhandara, Gondia, Gadchiroli and Chandrapur. These four districts are well known for paddy growing belt of Vidarbha region.

Selection of tahasil's: The higher number of registered persons since beginning of the scheme was the criterion for selection of the tahsils for the study. The talukas namely 1) Deori, 2) Sadak Arjuni, 3) Lakhandur, 4) Sakoli 5) Nagbhir 6) Brahmapuri 7) Kurkheda 8) Wadsa were observed having more number of registered persons on the job. Hence, these tahasil's were selected for the study.

Selection of villages: From each selected tahasil's, four villages were selected for the study based on higher number of beneficiaries under MGNREGA working in a selected village. Thus, total thirty two villages were selected.

Selection of beneficiaries: The list of beneficiaries who worked under MGNREGA since five years was obtained from Gram Panchayat of the selected villages and from each selected village ten beneficiaries were selected randomly to constitute a sample size of 320 beneficiaries.

Research Design & data collection: An exploratory research design was used for the present study. Interview schedule was prepared and pre-tested. Data were collected in face to face situation. The interview with the beneficiaries was conducted at their resident or place with comfort situation.

RESULTS AND DISCUSSION

Constraints in participation of MGNREGA: Based on various type of difficulties faced by beneficiaries working in MGNREGA and were collected from the beneficiaries, the constraints were categorized into five groups viz. financial, situational, technical, administrative and communicational constraints represented in Table 2. A critical look at Table 2 reveals that variety of difficulties was face by the beneficiaries. The data presented in Table 2 observed that the major financial constraints of MGNREGA beneficiaries was that, delay in payment of wages, as per the provision of MGNREGA enhancing the livelihood security by making payment of wages within 7 days from the date of work and not more than 15 days in any case, but beneficiaries reported that, wages are paid with delays from 15 days to 90 days by implementing agencies. This discourages the labourers to come for work in future. Nearly fifty percent

(41.25) beneficiaries expressed that they were difficult to withdrawal f payment from bank due to they did not know about bank transaction or proper guide. 15.63 per cent of beneficiaries reported that they had not clear idea how to given wage to labour.As regards the situational constraints, beneficiaries stated that, they had conflicts among them during working in MGNREGA work, favoritisms in distribution of work at work site (27.50%), non co-operative attitude of local leaders and irregularity in attending gram sabha by beneficiaries (17.50%).

In respect of technical constraints findings presented in Table 52 reported that, majority of beneficiaries stated the problem they had lack of technical guidance (86.25%), lack of proper knowledge about procedure of apply for MGNREGA work (68.75%) and difficulty in opening of bank account(66.25%).In the set of administrative constraints, non-availability of assured 100 days employment to every household was major difficulty expressed by 80.31 per cent beneficiaries. Another major administrative constraint was improper management for provision of work by extension workers expressed by 54.69 per cent beneficiaries. Non availability of supporting staff to beneficiaries (29.69%), non co-operative attitude of gram sevak (20.00%), ignorance of unemployment payment facility face by the 12.50 per cent beneficiaries and non availability of work site facilities. The findings presented in Table 2 revealed that, non availability of literature on MGNREGA was communicational constraint expressed by 22.19 per cent beneficiaries in study area. In summing up, the constraints analysis revealed that, delay in payment of wages and difficulties in withdrawal of payment from bank were major financial constraints encountered by beneficiaries. Conflicts amongst beneficiaries while working, favoritisms in distribution of work at work site , non co-operative attitude of local leaders , lack of technical guidance, lack of proper knowledge about procedure of apply for MGNREGA work, non availability of assured 100 days employment to every household and improper management for provision of work by extension workers were the important situational, technical and administrative constraints to beneficiaries that cannot be over looked. In order to improve rural livelihood by working in MGNREGA, the financial, situational, technical and administrative constraints experienced by the beneficiaries are of vital importance and need attention from the administration to improve the livelihood and better implementation of MGNREGA scheme. The above findings emphasize a need for concerted efforts from administrators of MGNREGA scheme to look into these problems in order to improve rural livelihood and achievement of MGNREGA objective. [2] Observed that the scale of the NREGS works was inadequate, delay in the payment of wages, lack of basic facilities like water, shade, first-aid and child care that had been promised under the Act. Behind these failures were deep structural problems, including poor flow of funds, staff shortage, flawed record-keeping and lack of a grievance redressed mechanism. Corruption was found to be widely prevalent in all the states with only exception of Rajasthan.Officials and middlemen often created muster rolls with fictitious names and misappropriated the funds. [1] pointed out some problems under NREGA in Andaman and Nicobar Islands were delay in issuance of job cards, less people participation in the scheme (20.00%), absence of NGOs and civil society in the scheme, social audit system was in-effective, no provision to give unemployment allowance, delay in starting work by Panchayats, performance of MVC was very poor, involvement of contractors in NREGA works, etc.

Suggestions of beneficiaries for better implementation of the scheme

As per the major constraint face by beneficiaries was delay in wage payment .Beneficiaries suggested that wages are paid to beneficiaries within a period as per rule of MGNREGA. Two week delay may be considerable for maintenance of daily needs. To pay wages in time, efforts should be taken to take early care in measurement, check measurement, payment by the implementing agency within the stipulated period for each activity to avoid delay payment.

As per the technical and administrative constraints awareness about the scheme entitlements among primary stakeholders is the key for success of programme. The findings of this study indicated that majority of labourers are unaware of the basic entitlements of the scheme which deprives them from claiming their shares. People are unaware of the fact that dated receipt be issued against each demand received. Because of this, they are not in a position to

claim for unemployment allowance and implementing agencies are not bothered of meeting their demand by providing work within 15 days of receipt of demand.

The study has reported that MGNREGA programme often poses the problem of labour scarcity for some of the agricultural operations. As a consequence, farmers had to do operations by machine and old age labour due to which the cost of summer paddy cultivation is increased. Hence farmers suggested that 100 days of employment guarantee under MGNREGA be confined strictly to months when there is no transplanting, harvesting and threshing of paddy crop. Make some paddy crop operation by MGNREGA beneficiaries for decrease the cost of cultivation and solve the farmer's problem in study area.

CONCLUSION

It might be concluded that the major financial constraints of MGNREGA beneficiaries were delay in payment of wages. Among other constraints faced were lack of technical guidance and non availability of assured 100 days employment to every household. Beneficiaries suggested that wages are paid to beneficiaries within a period as per rule of MGNREGA. Efforts should be taken by implementing agency to resolve the constraints of beneficiaries and employment in MGNREGA should be linked with farm level activities to minimise the problem of labour scarcity of farming community.

REFERENCES

1. Bannerjee, H. 2009. NREGA: A study in Andaman and Nicobar Islands. Kurukshetra 58(2): 23-26.
2. Gladson, D. 2008. Plougher Cut - Impact of NREGA. Tehelka Magazine 5(37): 12-13.

Table 1: District wise MGNREGA beneficiaries and selected beneficiaries

Sr. No.	Districts	Total MGNREGA beneficiaries	No. of beneficiaries selected
1	Bhandara	31029	80
2	Chandrapur	42490	80
3	Gondia	46237	80
4	Gadchiroli	36018	80
	Total	155774	320

Table2: Distribution of beneficiaries according to constraints in participation of MGNREGA

Sr. No.	Constraints	Beneficiaries (n=320)	
		frequency	Percentage
A.	**Financial constraints**		
1	Delay in payment of wages	300	93.75
2	Difficulty in withdrawal of payment from bank	132	41.25
3	Misunderstanding about wages	50	15.63
B.	**Situational constraints**		
1	Conflicts amongst beneficiaries while working	107	33.44
2	Favoritisms in distribution of work at work site	88	27.50

3	Non co-operative attitude of local leaders	95	29.68
4	Irregularity in attending gram sabha by beneficiaries	56	17.50
C	**Technical constraints**		
1	Lack of technical guidance	276	86.25
2	Lack of proper knowledge about procedure of apply for MGNREGA work	220	68.75
3	Difficulty in opening of bank account	212	66.25
D	**Administrative constraints**		
1	Non availability of assured 100 days employment to every household	257	80.31
2	Improper management for provision of work by extension workers	175	54.69
3	Non availability of supporting staff to beneficiaries	95	29.69
4	Non co-operative attitude of Gram sevak	64	20.00
5	Ignorance of unemployment payment facility	40	12.50
6	Non availability of work site facilities	32	10.00
E	**Communication constraints**		
1	Non availability of literature on MGNREGA	71	22.19

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

REVIEW ARTICLE

A Review Paper on Performed Studies of Green Spaces and Urban Open to Urban Sustainable Development

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Received: 23 Dec 2014 Revised: 10 Jan 2015 Accepted: 21 Jan 2015

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ABSTRACT

The development of civil society is affected by the growth of Population and migration trends, and the unplanned construction. Planning and urban development have resulted in uncontrollable changes in the manufacturing environment. Use of plants in urban areas is partly a response to the needs of citizens in urban areas. Nowadays applying green space is an important value in cities that is because of the function of environmental, social, cultural, and economical issues in the urban green space. Therefore, planning and development of green areas and open green spaces in the city is in accordance with the needs and capabilities. Each area is in the urgent management requirements of the program. Urban planning is considered in the metropolis. The aim of this paper is review of the importance of urban space, the development of concepts and various methods for evaluation of urban development.

Keywords: green space, urban open, development.

INTRODUCTION

Growth and the rapid development of the city and the need to create new user in order to accountability to increasing need and accommodation of population and housing lead to a decrease in the proportion of green space and gardens and environmental pollution and have many problems (Ahmadi et al, 2011). So cities are considered as the main factorcausinginstabilityin the world.The use of plants in urban areas expanded in the twentieth century as a response to the needs of thecitizensdue to thepluralityof urbanization (Saeednya, 2000). Nowadays the use of green space is an important and valuablecriterion in cities that it is because of variousfunctions of environmental, social, cultural, economic and urban green space (Meshkini et al, 2010).

Themost importantimpact of green space in cites is theadjustmentof temperature,relative humidityincreases, andthe airof eleganceand attractdust(Pourahmad, 2009). So the creationanddevelopment ofgreen space isa partof the fabricofcitiesand is a part of urban servicesand cannotbeisolatedfrom otherurbanneeds. For this reason, thequantity and qualityof green spaceshould bemade proportional tothe physicalsizeof the city andthe communityneedsto be able to have a goodenvironmentalperformance as an active greenspace (Majnounian, 1995).

Greenspacesshouldbe developedin such a waythatcan be usedordevelopedtomeetthe needs offuture generationsin the context ofsustainable development. Sustainable development is a planning processin whichthere is economic growth, social justiceandenvironmentalsustainability ofthe resources. In thisprocessallthe differentaspectsof the development based on thequality of lifeandenvironmental protectionis considered (Khatoonabadi, 2005). Land degradation of farming and gardening,lack ofgreen spacesandurbandevelopment, include issues that endanger stabilityof moderncities, especially indeveloping countries thatisfacedwith aserious threat.

Importance of Green Space:

Greenspaceis important and impressive on factors such as its importance to the quality of life, health and environmental sustainability.

The quality of life

In terms of quality of life, over 95% per cent of people believe it is very or fairly important to have green spaces near to where theylive. Parks and green spaces are the most frequently used service of all the public services tracked. Well designed green and open spaces can benefit communities in a variety of ways including increasing levels of social contact andsocial integration, particularly in underprivileged neighborhoods (Sullivan et al., 2004).In one study, green space in a housing complex encouraged more social activity and more visitors. Residents also knew more of their neighbours and said that their neighbours were more concerned with helping and supporting each other(Sullivan et al., 2004).A natural play environment at school also helps reduce bullying, increases creative play, improves concentration and a feeling of self worth in children(Ridgers et al., 2007).

Health benefits

A Swiss study in a forest park in Zurich found that visitors reported decreases in headaches and in their levels of stress – the positive effects increased with the length of stay and with the level of physical activity undertaken(Hansmann et al., 2007).

Environmental sustainability

Green space can improve air quality, coniferous trees can capture particulates and toxic gases a such as nitrogen dioxide and ozone (Bolund, and Hunhammar, 1999).A study in Stockholm, Sweden found that urban and suburban forestsact as a refuge for threatened species of bird whose numbers had been decreasing in rural areas. Crucial to achieving this was the establishment of green corridors that included large areas of natural vegetation, a network of important habitats and a range of both mature and decaying trees (Mortberg and Wallentinus, 2000).Therefore planning and development of green areas and open green spaces in order to organize, Therefore planning and development of green areas and open green spaces in order to organize, Deficiencies and determine the feasibility of converting open spaces sustainable urban green space, Commensurate with needs and capabilities of each region consider as the most urgent needs of management and urban planning in cities.

Definitions and Concepts

Sustainable Development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Sustainable urban development

Today sustainable urban development is a form of development that can be followed in sustainable development of cities and urban communities which guarantee the future generations (Hall, 1993). In terms of physical forms, urban sustainable development means changes in land use and density levels in addition to meeting the needs of city residents in the fields of housing, transportation, food and leisure over time in terms of environmental and life livable, economically viable and kept associated socially. Sustainable urban development has become a powerful framework for developing solutions that improve the quality of life on a local level and can also be an important component of responding to the broader global environmental crises.

G**reen space**

- Green space is an area of grass, trees, or other vegetation set apart for recreational or aesthetic purposes in an otherwise urban environment. Green space or Open space reserve, protected areas of undeveloped landscape.
- Urban open space, open space areas for parks, green spaces, and other open areas
- Green space, the Natural environment. Greenbelt, a policy or land use designation used in land use planning. Greenway (landscape), a linear green space running through an urban area. Green infrastructure, a concept in land use planning
- Green space Information for Greater London (GiGL), the environmental record centre for London.

Green spaces are multi-functional; they are used in many different ways. They include not only areas in which the public have physical access and visual access, but also green spaces provide settings for buildings, communities and everyday activities. The quantity, quality, character, distribution and accessibility of green spaces vary across Scotland, reflecting local circumstances.

Urbangreen spacecan also beused asthe recreationsitesandareas ofsemi-naturalwoodlands thatare definedbya significant amount(Kong and Nakagoshi, 2006). Urbangreen spaceispart ofan urbanopen spacearea, natural or underthetrees, shrubs,flowers,grasses andotherplants that are based on themonitoring andmanagementof peoplewith regard tothe rules, regulations andexpertiserelatedtobuildingmaintenanceorare selected toimproveliving conditions, habitat and welfareof citizens andnon-rural population centers, (Majnounian, 1995).

History

Studies inthe field ofsustainable urban developmentarenumerous. Recentworkin the interiorare mentioned inTable 1:

Methods of evaluation of sustainable development:

Review best practices in urban development follows:

SWOT

A SWOT analysis is a structured planning method used to evaluate the strengths, weaknesses, opportunities, and threats involved in a project or in a business venture. A SWOT analysis can be carried out for a product, place, industry, green space and open space. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective. Some authors credit SWOT to Albert Humphrey, who led a convention at the Stanford Research Institute (now SRI International) in the 1960s and 1970s using data from Fortune 500 companies (Humphrey, 2005; Humphrey 2012; Westhues et al., 2001).

A SWOT analysis focuses on the four elements of the acronym (Table 2). The purpose of performing a SWOT is to reveal positive forces that work together and potential problems that need to be addressed or at least recognized (Westhues et al., 2001). Also for SWOT can group positives and negatives to think broadly about organization and its external environment (Westhues et al., 2001).

Positives	Negatives
• Strengths • Assets • Resources • Opportunities • Prospects	• Weaknesses • Limitations • Restrictions • Threats • Challenges

Analytic hierarchy process (AHP)

Analytic hierarchy process (AHP) was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since. AHP is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology. AHP has application in group decision making (Saaty 2008) and is used around the world in a wide variety of decision situations, in fields such as government, environment, geography and etc.

The AHP helps decision makers find one that best suits their goal. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

Decision situations to which the AHP can be applied include (Forman et al., 2001).

- Choice – The selection of one alternative from a given set of alternatives, usually where there are multiple decision criteria involved.
- Ranking – Putting a set of alternatives in order from most to least desirable
- Prioritization – Determining the relative merit of members of a set of alternatives, as opposed to selecting a single one or merely ranking them
- Resource allocation – Apportioning resources among a set of alternatives
- Benchmarking – Comparing the processes in one's own organization with those of other best-of-breed organizations
- Quality management – Dealing with the multidimensional aspects of quality and quality improvement

- Conflict resolution – Settling disputes between parties with apparently incompatible goals or positions (Saaty 2008).
- Lee and Chan in 2008 used The Analytic Hierarchy Process (AHP) Approach for Assessment of Urban Renewal Proposals. This paper adopts the analytic hierarchy process(AHP)to work out the most sustainable design proposal for an area undergoing urban renewal. AHP is a robust multi-criteria decision making (MCDM)method for solving social, governmental and corporate decision problems.
- Also Xu Yannan et al., in 2008 used AHP for The Study of Green Space System Planning in Changzhou City, China.

REFERENCES

1. Ahmadi, A. Monotheists, A and Shojaeian, A. (2011); Optimal location model Issue of urban green space using GIS And AHP(Case study: Ahwaz), Environmental Journal, No.15.Pp.162-147.
2. Ambrey, C and fleming, C. (2012). Public green space and life satisfaction in urban Australia. 56th AAREAannual conference, Fremantle. Western AustraliA. February 7-10.
3. Bolund, P. and S. Hunhammar (1999). Ecosystem services in urban areas. Ecological Economics 29(2): 293-301
4. Forman, E H.; Saul I. G (2001). The analytical hierarchy process—an exposition. Operations Research 49 (4): 469–487. doi:10.1287/opre.49.4.469.11231.
5. Hansmann, R., Hug, S. M. and Seeland, K. (2007) Restoration and stress relief through physical activities in forests and parks. Urban Forestry and Urban Greening, 6, 213-225.
6. Hashemi, A. Kafi, M., Hashemi, M., Sefid M. (2009);Trend analysis of urban green space: A case study of Tehran, Environmental Science, Pp.86-73.
7. Humphrey A. (2012). The Father of TAM. TAM UK. Retrieved 2012-06-03.
8. Humphrey, A (2005). SWOT Analysis for Management Consulting. SRI Alumni Newsletter (SRI International).
9. Irani Behbahani, H., Razi, N.,(2005);Sustainable Development of Forest Park Sheikh fromhillUrmia, ecology, No.37.Pp.104-89.
10. Kazmi,M, AliAkbari, S. (2010). Analysisof environmental sustainability, with emphasis on thedistribution ofgreen space of Ilam. Geography, New Era, Vol VIII, Issue 26,pp137149
11. Kong, F and Nobukazu N (2006), Spatial-temporal gradient analysis of urban green spaces in Jinan, China, Landscape and Urban Planning 78, PP: 147-164
12. Lee, G. K. L. E. chan, H. W. (2008). The Analytic Hierarchy Process (AHP) Approachfor Assessment of Urban Renewal Proposals. Soc Indic Res (2008) 89:155–168DOI 10.1007/s11205-007-9228-x.
13. Majnounian, H,(1995); Debates of Park News, green space and resorts News. Tehran Parks and Green Space , No.44.
14. Masnavi, MR. (2002). Sustainable Development andNewParadigmof UrbanDevelopment: compact city and wide city . Environmental Studies,31,pp104-89.
15. Meshkini, A., Rahimi, M., Sabir M, and Akbarpoor M,(2010); Assessmentand analysisof urbanlandusewith an emphasis onurban green spaceinGolestan, Geography and Regional Development¬A, No. XV, Fall and Winter, pp.115 -91.
16. Mortberg, U. and. Wallentinus H. G (2000). Red-listed forest bird species in an urban environment - assessment of green space corridors. Landscape and Urban Planning 50(4): 215-226.
17. PakFtrt, AR. (2004). ExecutiveSolutions In order to maintainurbangardensCase Study: Planning and ExecutiveSolutions of Ghasredashtgardensof Shiraz. Tehran University, MS Thesis.
18. Parivar, P, Yavari, AR and Setoodeh A. (2008) Analysis of temporal changes and spatial distribution of urban green spaces in Tehran landscape scale, ecology, age thirty-four, No.45.Pp.84-73.
19. Pourahmad, A.,(2009);Urban green space management of Tehran, Research of Human Geography, No.69.Pp.50-29.

20. Ridgers ND, Stratton G, Fairclough SJ and Twisk J W (2007) Children's physical activity levels during school recess: A quasi-experimental intervention study. International Journal of Behavioral Nutrition and Physical Activity 4: 19; see also 'Playtime initiatives could reduce childhood obesity' (2009) University of
21. Saaty, Thomas L., Peniwati, Kirti (2008). Group Decision Making: Drawing out and Reconciling Differences. Pittsburgh, Pennsylvania: RWS Publications. ISBN 978-1-888603-08-8.
22. Saeedinya, A.,(2000); urban green space. Organization of Municipality, Tehran.
23. Shah Md. Atiqul H. (2011). Urban Green Spaces and an Integrative Approach to Sustainable Environment. Journal of Environmental Protection, 2011, 2, 601-608.
24. Westhues, A; Lafrance J; Schmidt G (2001). A SWOT analysis of social work education in Canada. Social Work Education: The International Journal 20 (1): 35–56.
25. Xu Y ., Jia D ; Wang X. (2009). The Study of Green Space System Planning Based on AHP and GIS in Changzhou City, China. Conference Location: Manchester. DOI:10.1109/ICIC.2009.308. Publisher: IEEE.

Table 1.Studies inthe area ofgreen space

Results	Name of Researcher
The value ofgreen space increaseswithpopulation density and therelationshipbetweengreen spaceand publicsatisfaction levelisanonlinear relationship	et al (2012) Ambrey
Citycompressedhasshortcomingssuch asgreen spacesandurban	Masnavi (2002)
The results confirms Lackof properrulesforpublic participationinurbanmanagement	Pakfetrat (2004)
Emphasizing the importance ofsustainable design of green spaceforsustainable development	Irani Behbehani and Razieh moftakhar (2005)
In order to restoregreen spaceit is essential toidentifyandanalyze thechangesof time and place of green space	Parivar et al.
To confirm the multiple roles played by green spaces, certain level of qualitative improvements and distribution of green spaces within the urban area should be considered and incorporated effectively into the environmental sustainability agenda.	Atiqul Haq (2001)
Green space has leading roleinimprovingthe lives ofcitizens	Hashemi et al. (2010)
In most cases with the improvement of green spaces and parks the tendency to use the parks increases.	Atiqul Haq (2001)
In Ilam city, there isashortage ofgreenandunequal distribution.	Kazemi and Ali Akbari (2010)

Table 2.SWOT

Internal		External	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
-	-	-	-

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Factors Influencing Socio- Economic Impact of Sericulturists in Cluster Promotion Programme

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Received: 22 Oct 2014 Revised: 21 Nov 2014 Accepted: 10 Jan 2015

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ABSTRACT

Central Sericulture Board together with Directorate of Sericulture, Maharashtra implemented Cluster Promotion Programme (CPP) throughout the year 2007-10. The present paper analyzes the factors influencing the socio-economic impact of sericulturists participated in CPP in Osmanabad district. In all total, a hundred and fifty sericulturists were selected by "probability proportionate sampling size technique" from eight talukas covering twenty five villages. Information was collected by personal interviews with sericulturists. The findings discovered that out of 16 variables regression coefficient for five variables namely family size (2.3632), innovativeness (2.5059), land holding (2.1388), annual income (1.9721) and socioeconomic status (2.4822) are significant at 5% level of significance, whereas economic impact is significant with 1% level of significance.

Key words: Cluster Promotion Programme, Sericulture, innovativeness, socioeconomic.

INTRODUCTION

Under Catalytic Development Project(CDP) implemented by Central Silk Board (CSB)Ministry of Textiles, Govt. of India, Sericulture Production cluster were identified and Cluster Promotion Programme (CPP) were implemented by CSB in collaboration with Directorate of sericulture, M.S in Osmanabad district during the year 2007-10.Success of any new technology depends on its acceptance /adoption by Sericulturists and the user acceptance is much dependent on carefully drawn and implemented extension programme [1]. Considering the above mentioned facts,

the present investigation was conducted in Osmanabad district of Maharashtra State wherein hundred and one villages are below mulberry plantation with an area of 274 ha (685 acres) and having a Cocoon production of 76380.2 kgs [2]. The aim of study was to assess the factors influencing the socio-economic impact of sericulturists participated in CPP in Osmanabad district for identifying the key variables to be put emphasis by extension agencies in future sericulture development programmes.

MATERIALS AND METHODS

location of study

The present investigation was undertaken in Osmanabad district. It is situated in the southern part of the State abutting Andhra Pradesh in south and lies between north latitudes 17°37' and 18°42' and east longitude 75°1 6' and 76°47'.

Sampling plan and data collection

Three stages sampling technique was adopted for this investigation. Cluster wise mulberry planted eight talukas were selected wherever Cluster Promotion Programme was implemented throughout 2007-08. On the basis of this, list of mulberry growing villages were prepared, arranged in descending order of area and in all 25 villages were selected on number proportionate basis. The percentages of area under mulberry plantation in each block was calculated and converted into proportion for selection of 150 respondents. The respondents those have taken the advantage of CPP between 2007-2010 were selected from the selected villages; the list of sericulturist under CPP was drawn. Thus, in all 150 respondents were selected for study from the list by adopting "proportionate Probability sampling to the size technique. Information on pre-structured interview schedule was collected by conducting personal interviews with sericulturists.

Assessment of factors influencing socio-economic impact of sericulturists

In order to find out the factors influencing socio-economic impact of, *Karl Pearson's Co-efficient of Correlation* 'r' was worked out. The correlation analysis helps the researcher in determining the relationship of selected personal, situational, socio-economic communication and psychological characteristics of the respondents with their socio-economic impact of sericulturists under cluster promotion programme. To ascertain the contribution of selected independent variables towards socio-economic impact, multiple regression analysis was carried out.

RESULTS AND DISCUSSION

Multiple Regression Analysis of Independent Variables with Socio- Economic Impact

Simple correlation merely depicts the co-existence between two variables. This statistical tool does not consider the interaction effect. In order to ascertain the contribution of selected independent variables towards socio-economic impact, multiple regression analysis was carried out and the results of this analysis are furnished in Table 1. The results from Table 1 showed that a set of 16 independent variables under study had explained 34.10 percent variation in composite socio-economic impact under CPP whereas, remaining 65.90 percent might be due to factors namely excess to credit, market orientation, debtness, labour at proper time, infrastructure facilities, mass media exposure

which are not included in the study, if they were included in the study the result might be different.It was further revealed that out of 16 variables regression coefficient for five variables namely family size (2.3632), innovativeness (2.5059), land holding (2.1388), annual income (1.9721) and socioeconomic status (2.4822) are significant at 5% level of significance, whereas economic impact is significant with 1% level of significance. Regression coefficient for 11 independent variables namely age (0.9647), education (0.2546), caste (1.1431), social participation (-0.7527), cosmopoliteness (-0.6287), risk orientation (-1.0544), economic motivation (-1.4120) attitude towards sericulture (-0.2237), extension contacts (0.0936) and area under mulberry (-0.8549) has no effect on socio-economic impact of sericulturist under cluster development programme on sericulture and were non- significant.

Multiple Regression Analysis of Independent Variables with Economic Impact

To know the important variables with their predictive abilities in explaining variations in dependent variable i.e. economic impact / economic gain due to CPP on sericulture, multiple regression analysis was carried out and presented in Table 2.The results from the Table 36 showed that a set of 15 independent variables under study had explained 35.50 percent variation in economic impact / economic gain to the sericulturist under CPP whereas remaining 64.50 percent variation might be due to factors namely excess to credit, achievement motivation, market orientation, irrigation source facilities, mass media exposure, infrastructure facilities which is not included in the study, if they were included in the study the result might be different. It was further revealed that out of 15 independent variables regression coefficient for 6 variables namely education (2.3915), cosmopoliteness (1.9946), attitude towards sericulture (2.3268), innovativeness (2.5219), size of land holding (2.4500) and area under mulberry (2.4683) were statistically significant at 5% level of significance. While the variables such as economic motivation (2.9205), annual income (3.1027) and socio-economic status (3.1452) were significant at 1% level of significance.Regression coefficient for remaining 6 independent variables viz. age (0.4597), caste (-1.1794), family size (0.0881) social participation (-0.1320), risk orientation (-0.4513) and extension contacts (0.2220) has no effect on economic gain / impact under cluster development programme on sericulture and were non- significant.

CONCLUSION

It might be concluded that out of 16 variables regression coefficient for five variables namely family size (2.3632), innovativeness (2.5059), land holding (2.1388), annual income (1.9721) and socioeconomic status (2.4822) are significant at 5% level of significance, whereas economic impact is significant with 1% level of significance. These variables should be considered by the extension agencies to laid emphasis in future sericulture development programmes.

REFERENCES

1.Rama Mohana Rao, P and Kamble, C.K. (2009) “Impact of demonstration of technology package in Sericulture extension and future extension strategies “Indian Journal of Sericulture 48 (2) PP: 178-181.

2.Anonymous (2010) “Area and production of mulberry and silk cocoon” Annual report of Department of Sericulture, Osmanabad, M.S. PP: 1-2.

Table 1. Multiple Regression Analysis of Independent Variables with Socio-Economic Impact

Sr. No.	Independent variables	Partial b	T value for partial b	Standard partial b value	P value	Rank
1.	Age	0.2233	0.9647	0.2314	0.3363	
2.	Education	0.2966	0.2546	1.1647	0.7993	
3.	Caste	2.2449	1.1431	1.9639	0.2550	
4.	Family Size	3.8827	**2.3632 ***	1.6429	0.0195	**III**
5.	Social Participation	-2.4642	-0.7527	3.2735	0.4529	
6.	Cosmopoliteness	-3.3265	-0.6287	5.2905	0.5305	
7.	Risk orientation	-3.1123	-1.0544	2.9515	0.2935	
8.	Economic motivation	-1.4671	-1.4120	1.0390	0.1602	
9.	Attitude towards sericulture	-0.3788	-0.2237	1.6932	0.8232	
10.	Innovativeness	2.6918	**2.5059 ***	1.0741	0.0134	**IV**
11	Extension Contacts	0.3742	0.0936	3.9962	0.9255	
12	Size of Land holding	7.5899	**2.1388 ***	3.5486	0.0342	**I**
13	Area under Mulberry	-27.1875	-0.8549	31.7996	0.3941	
14	Annual Income	0.0927	**1.9721 ***	0.0047	0.0506	**VI**
15	Socioeconomic status	6.5681	**2.4822 ***	2.6461	0.0143	**II**
16	Economic Impact	0.0038	**3.3246 ****	0.0839	0.9630	**V**

R^2 = 0.341 (with 16 independent variables)F = 4.31 ** *Significant at 0.05 level of probability **Significant at 0.01 level of probability

Table 2. Multiple regression analysis of independent variables with Economic Impact

Sr. No.	Independent variables	Partial b	T value for partial b	Standard partial b value	P value	Rank
1.	Age	0.1094	0.4597	0.2380	0.6464	
2.	Education	1.8402	**2.3915 ***	1.1882	0.1238	**VI**
3.	Caste	-2.3716	-1.1794	2.0108	0.2403	
4.	Family Size	0.1490	0.0881	1.6908	0.9298	
5.	Social Participation	-0.4447	-0.1320	3.3690	0.8951	
6.	Cosmopoliteness	7.9332	**1.9946 ***	5.4018	0.1442	**II**
7.	Risk orientation	-1.3701	-0.4513	3.0354	0.6524	
8.	Economic motivation	1.2966	**2.9205 ****	1.0635	0.2249	**VIII**
9.	Attitude towards sericulture	2.1969	**2.3268 ***	1.7323	0.2069	**V**
10.	Innovativeness	2.7243	**2.5219 ***	1.0802	0.0128	**VII**
11	Extension Contacts	0.9130	0.2220	4.1122	0.8246	
12	Size of Land holding	8.7545	**2.4500 ***	3.5731	0.0155	**III**
13	Area under Mulberry	27.2609	**2.4683 ***	32.6441	0.4051	**I**
14	Annual Income	0.0089	**3.1027 ****	0.4806	0.1867	**IX**
15	Socioeconomic status	0.6757	**3.1452 ****	2.7228	0.8043	**IV**

R^2 = 0.355 (with 15 independent variables) F = 4.93** *Significant at 0.05 level of probability**Significant at 0.01 level of probability

RESEARCH ARTICLE

Quantification of the Hand Tremor Severity in Digital Spirography Signals of Multiple Sclerosis Patients by Analysis of the Signals in Chaotic Domain

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Received: 20 Dec 2014 Revised: 15 Jan 2015 Accepted:31Jan 2015

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ABSTRACT

Recently investigating chaos in biomedical signals has attained great attention due to the nonlinear dynamical behavior observed in some of these signals. Analysis of the digital spiral drawing signals as a non-invasive method of quantifying upper limb motor function based on kinematic and physiologic features derived from handwritten spirals requires an efficient post-processing effort to be clinically applicable. Several works have proposed extraction of the statistical features and frequency analysis of these signals. However, nonlinear dynamical behavior of the spirography signals as the time series shows a potential existence of chaos in their dynamics. In this paper Lyapunov exponents of spirography signals along with the approximate entropy are calculated to invest this hypothesis. Some Lyapunov based features with the approximate entropy proposed by Pincus are extracted features of complex domain and they are compared with statistical features in classifying the signals of two groups of subjects, controls and patients. Simulations verify the chaotic behavior of these signals while sensitivity, specificity and accuracy of the classification process have been used as the criteria.

Keywords: Digital spiral drawing; hand tremor; complex features; chaos; Lyapunov exponents; approximate entropy.

INTRODUCTION

Essential tremor is the most common cause of pathological tremor and one of the most common neurological diseases [1–3]. Its diagnosis is based on clinical grounds, and usually misdiagnosis occurs in up to 50% of cases. Parkinson's disease (particularly in elderly patients) and dystonia (tremulous cervical dystonia) are the most common disorders mistaken for essential tremor [1, 2].The frequency of the kinetic tremor typically ranges from 8Hz to 12Hz, and is related to age inversely [1–3, 5, 6]. Tremor may occur also in the legs, feet, trunk, jaw (chin), tongue, and voice [1–3,5–8]. In general,essential tremor affects the upper limbs in most cases (95% of patients), and according to Deuschl and Elble, less commonly affects the head (30%), voice (20%), jaw (10%), tongue (20%), trunk (5%) and lower limbs (10%) [8].

Tremor is estimated to be clinically present in at least one quarter of the MS population and is strongly related to impairment, disability and handicap [9, 10]. The evaluation of intention tremor in the clinical setting is commonly performed using ordinal scales rating tremor amplitude during the finger-to-nose test and performance tasks such as pouring water and spiral drawing. Typically, individual items are rated on a 0–4 (Fahn's tremor rating scale) or 0–10 rating scale [11, 12]. Ratings of abnormal Archimedean spiral drawing correlate significantly with the severity of clinically rated tremor severity and related disability [9, 12]. It is commonly applied in studies to document tremor severity in MS, but also in other pathologies such as patients with essential tremor or Parkinson's disease [9, 14-16].
Spiral Analysis is a non-invasive system of quantifying upper limb motor function based on kinematic and physiologic features derived from handwritten spirals. Spiral Analysis uses a digitizing tablet and writing pen connected to a computer to record position, force and time measurements. No wires are attached and no needles are used. Spiral Analysis is patented under US #6,454,706 entitled "System and Method for Clinically Assessing Motor Function" [17].Spirograph is the recording of the drawing of an Archimedean spiral, in this studyfollowing the trace of a standard model spiral on the plan of drawing, with or withoutinvoluntary element.All information of each drawing recordings are saved in a text file with .spr as fileextension. Each recording file includes in the first several lines information of patientname, gender, age, date of recording and a brief description concerning individualconditions. All those information are optional at the time of recording thereforeavailability of those information depends on whether the operator has put it in since therecording or not [17].

Spirography has been a commonly used test in tremor diagnosis. However there is nostandard post processing method, resulting in individual standalone studies but no crossresearch data analysis. This is mainly because of the lack of a standard recordingprocedure and compatible device. In the recording of spirographies, different recordingdevices and recording principle would lead to differences in data source, data type, dataformat and data organization. Meanwhile different subject instructions during recordingsuch as whether a time limit is given for each drawing also bring about dynamics into therecordings. Post recording process procedure is highly depended on the recorded data(including type, format, organization, information indicated) and the intended parametersfor spirography analysis. In spite of the differences among each study, almost all studiesare interested in the frequency of tremor oscillation and dominant frequency reading infrequency spectrum or power spectrum.

In most of digital spirography studies, the position of pen on the tablet will be recorded. Then, the velocity of moving pen tip in horizontal, vertical, radial, and tangential directions will calculated. Finally, the averages and standard deviations of these four variables will be compared with the control groups. In these studies, most of the patients have definite, clinical documented tremor and the digital spirography signal used for scoring the depth of motor degradations [18]. Unfortunately, the statistical approach mentioned above, will not reveal the hidden destructions of biomechanical strategies in upper extremity when the patient falls within the first stages of motor control degradations and usually receives the lowest score in clinical tests as normal controls [18]. It is believed that spectral analysis will emerge the fine oscillations originated from motor control disruption caused by disease [19]. Therefore, a few studies utilized spectral analysis as an indicator which only shows the presence of tremor within specific frequency bands [19, 20]. Again, it is seen that such approach is not sufficient to discriminate patients without tremor

(ataxia) signs. Even though the complex movement of human arm needs sophisticated methods for analysis, a few studies utilized complex system analysis in hand drawing. For instance, Longstaff and Heath [21] studied the dimensionality (a measure of the number of control variables) and Lyapunov exponents (a measure of predictability) of the pen tip velocity profiles in fulfilling hand writing task. They invest the complex system analysis in patient with tremor and controls.

To neglect the time duration variation of signal drawing in different tests and situations, the signal is treated as the free scale time-series. This consideration ignores the time scale and therefore an unknown mapping in Fourier transform of the signal occurs. Now the signal is free of the time constrains applied during the test. The dynamical behaviors of digital spirography signals are analyzed in chaotic domain to model the non-observable kinetics. In this paper a multiphase hybrid algorithm is developed to invest the nonlinear dynamical behavior of the signals with and without tremor. The goal is to quantify the severity of tremor and therefore a quantized severity measure of the neurological disease is attained.

In recent years, there has been an increasing interest in applying techniques from the domains of nonlinear analysis and chaos theory in studying the behavior of a dynamical system from an experimental time series such as biological signals [22-25]. The purpose of these studies is to determine whether dynamical measures especially Lyapunov exponents and correlation dimension can serve as clinically useful parameters. Digital spirography test signals in time domain show nonlinear behaviors for both healthy and patients with tremor. Therefore we study these signal in the domain of chaos and nonlinear dynamics to assess the extracted chaotic characteristics in subject classification.
To study comprehensively the dynamics of a chaotic system, several important chaotic invariants are proposed to be estimated such as Lyapunov exponents, correlation dimension, Kolmogorov entropy [25]. Significant attention has been dedicated to calculate these global features of systems in many applicable fields, e.g., hydroelectric power system, biology, economics and as well as in nonlinear dynamics.

Lyapunov exponents show sensitivity to initial conditions, while dimension and entropy show complexity and the chaotic level system, respectively [26]. One of the most vital proofs for chaos is the existence of at least one positive Lyapunov exponent [26]. Lyapunov Exponent (LE) characterizes the rate of separation and unification of close trajectories in a dynamical system.

While chaotic invariant have been widely used in characterization of the biomedical signals, there is not a comprehensive studypublished in the literature that uses chaotic features for analysis of the digital spirography signals. Mean, standard deviation and maximum of the Lyapunov spectrum for the spirography time series are estimated by a Jacobian-based method.Approximate entropy is also calculated as a complex feature to show the dynamical behavior of such the signals.

MATERIALS AND THE METHODS

Patients and signal recording

Twenty two MS patients were selected randomly among the registered patients in the MS Centre of Sina Hospital affiliated to the Tehran University of Medical Sciences. The patients who had definite MS according to the McDonald Criteria [30] and their Expanded Disability Status Scores (EDSS) [31] besides the MSFC score noted well were included in the study [32]. The protocol of the study was approved by the Ethics Committee of Tehran University of Medical Sciences and all the participants signed the informed consent form before the start of study. Eligible subjects were patients who had clinically definite MS according to Mc Donald's criteria 2010 and who had no relapse during the last 30 days. Exclusion criteria were: Treatment with corticosteorids (IV) during the past 30 days, history of drug or alcohol abuse, psychiatric disorders, thyroid disorders and Patients with a treatment of tremor. All data were collected during a single four-hour visit. Baseline demographics (age, sex, race, self-reported height and weight and

tobacco use), current medications and medical and neurologic history were reviewed. Then, Subjects underwent MSFC [33, 34], EDSS tests, 0-4 ataxia clinical scale for dysmetria, and Barthelactivities of daily living (ADL) [35, 36].

Thirteen normal controls are age and gender match where included in the study from the staffs and student of Sina Hospital MS centre.The template of circular spirals (Archimedean Spirals) has been introduced by [27, 28] and summarized as follow. The Archimedean spirals has maximal outside diameter of 10 cm and it involves $3\,{}^{3}/_{4}$ cycles. It can be summarized in formula (1):

$$R = \Omega.\theta \qquad (1)$$

where R is the radius on the polar coordination system (maximum 10 cm), controls the distance between successive turnings of the spiral ($\Omega = 1.0cm/\left(3\frac{3}{4}\pi\right)$) and θ is angle on the polar coordinate system (maximum 3 and third quarters). The template (see figure 1) is printed and placed on tablet. The subjects were asked to use the digital pen to trace the spirals on the graphic tablet.

During the tests, patients are allowed to place their hand wherever it is more comfortable. Patients are instructed to perform the test for four times from inward to outward and vise verse and they were asked to draw the spiral at a comfortable speed. It is also asked from the patients to perform the test in a mode that they are performing a graphical drawing by stating the following sentence: “Please, perform the test as if you are making a drawing”. This indication originated from a study which is reported that high pressure of pen on the surface of digitizer may suppress the lack of control over the pen [29].

In order to choose the best sampling time for the graphic tablet, we consider the Nyquist theorem [37]. Based on research articles on upper extremity, the highest frequency ranges of are resultant from orthopedic disorders which are 18 Hz [39].Then the least sampling rate based on Nyquist theorem is 36 Hz. By choosing 100Hz sampling rate we will avoid the aliasing effects [39]. A specific program was implemented to extract and save graphic tablet information and display drawing on-line on the PC screen. This program has simple graphic user interface (GUI) which extract the position of pen tip on its surface along with its pressure [40]. The software is available on request.

1.1. Chaotic analysis of digital spirography signals

Approximate Entropy (ApEn) is a statistic that can be used as a measure to quantify the complexity (or irregularity) of a signal. It was first proposed by Pincus [41]. For more details on calculation of the ApEn value of a time series, the readers are referred to reference “Approximate entropy as a measure of system complexity” written by Pincus [41]. Approximate entropy is a statistical measure on the signal which indicates the complexity of signal dynamical behavior. Larger values of ApEn for a signal indicate higher complexities in the signal dynamics. To invest the chaotic behavior of the signals one can estimate the Lyapunov exponents of the signal. Estimating the Lyapunov exponents can be performed either by Jacobian based methods or trajectory based methods. It has been shown that Jacobian based methods are more complicated than the trajectory methods but they yield more accurate Lyapunov spectrum. A description of the Jacobian methods for estimating the Lyapunov spectrum of a dynamical system is given as follows

Step 1) Input the set of observations as

$$X = \{x(i)\} = \{x_i\}_{i=1,2,\dots,N}$$

which are taken from the trajectory of

$$f: \mathbb{R}^n \to \mathbb{R}^n, \qquad x_{t+1} = f(x_t), \quad t = 0,1,2,\dots$$

Step 2) Calculate the Embedding dimension D_m according to Takens Theorem [42].

Step 3) Calculate the set of time delays $\tau_i, (i = 1, 2, \ldots, D_m - 1)$ *for the calculated* D_m *and select the optimal value of* τ_{opt} *according to: earliest time* τ *at which the autocorrelation drops to a fraction of its initial value [29] or has a point of inflection [30].*

Step 4) Construct the approximator model $\Gamma(D_m > 1)$ *as* D_m*-input single-output.*

Step 5) Perform the mapping from the input of D_m*-dimension to the 1-dimension output:*

$$Model - Mapping: \begin{pmatrix} x_{t+D_m-1} \\ x_{t+D_m-2} \\ \vdots \\ x_t \end{pmatrix} \rightarrow \Gamma(x_{t+D_m-1}, x_{t+D_m-2}, \ldots, x_t), \quad (9)$$

Step 6) According to Eqs. 13-27 and making the model trained by Eqs. 28-32 according to the set of observations, calculate the partial derivatives:

$$J(t)_{x_t^{D_m}} = \begin{pmatrix} \Gamma_{D_m} & \Gamma_{D_m-1} & \Gamma_{D_m-2} & \cdots & \Gamma_2 & \Gamma_1 \\ 1 & 0 & 0 & \cdots & 0 & 0 \\ 0 & 1 & 0 & \cdots & 0 & 0 \\ \vdots & \vdots & \ddots & & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 1 & 0 \end{pmatrix}, \quad (10)$$

in which

$$\Gamma_j = \frac{\partial \Gamma}{\partial x_{t+j-2}}, \quad (11)$$

and Γ *is the approximated function of the* D_m*-inputs-1-output.*

Meanwhile, in [31] it was shown that the N largest Lyapunov exponents of Γ *have the same values as the Lyapunov exponents of f(t), therefore, the Lyapunov exponents of* Γ *should be calculated.*

Step 7) Build the Jacobian Matrix of Γ*.*

Step 8) Use QR-decomposition to extract the eigenvalues, and then yield the Lyapunov Exponents.

Each signal will have D_m values in its Lyapunov spectrum while the largest value corresponds to the largest Lyapunov exponent. Positive largest Lyapunov exponent indicates the chaos in dynamics of the system and a complete Lyapunov spectrum gives plentiful physical information about the dynamical system. One should note that majority of these information are not obtained from the statistical and frequency analyses.

SIMULATION RESULTS

In this paper, 4 types of artificial neural networksare employed to characterize and model the spirography signals according to the extracted complex features. Therefore, the inputs to the network are the extracted features and they all together construct the feature space in which the signals are located as a point. The more appropriate the features, the more reliable spirography signal characterization. Since the Lyapunov exponents contain a significant amount of information about the signal, the largest and mean value of Lyapunov exponents of the signals are used as the first two inputs along with the embedding dimension, time lag, correlation dimension and Approximate Entropy for the signal. In the present study, the Jacobian-based technique of Razjouyan et al. [43] was used for the estimation of Lyapunov exponents. A rectangular window formed by 250 discrete data is cut as a pattern. Positive Lyapunov exponents are observed for spirography signals, which confirm the chaotic nature of the studied signals. All implementations have been performed by MATLAB 7.0 software on an AMD FX™-6100 Six-Core 1.39 GHz Processor with 3.25 GB of RAM (e.g. see figure 2).

To report the performance of the classifier, the three common criteria sensitivity, specificity and accuracy are reported and calculated as follow:

$$Sensitivity(\%) = \frac{TP}{TP+FN} \times 100 \quad (12)$$

$$Specificity(\%) = \frac{TN}{TN+FP} \times 100 \quad (13)$$

$$Accuracy(\%) = \frac{TP+TN}{TP+FP+TN+TP} \times 100 \quad (14)$$

where the abbreviation and their meaning are summarized in Table 1. The sensitivity results describe the percentage of MS patients that the classifier correctly considers them as MS patients. Specificity result demonstrates the percentage of incorrect classifications that is done by the classifier. The accuracy shows the validity. The higher accuracy percentage reveals the higher veracity of results.

Figure 3 shows the confusion matrix of classifier which shows the performance of classifier has been shown. Here, MLP is fed with the features obtained from PSD after the PCA had been applied along the four directions (x, y, r, and θ). Again, we run the MLP for 10 times and the average results of sensitivity, specificity and accuracy are shown in figure 4. MLP is fed with the features obtained from complex system analysis along the four directions (x, y, r, and θ). Again, we run the MLP for 10 times and the average results of sensitivity, specificity and accuracy are shown in figure 5.

Figure 6 displays the performance of the MLP classifier for each group of features (statistical, spectral, and complex variables). Results show that complex features have higher performance than the other two groups in healthy patient signal discrimination. features and the blue bars represent the performance of ANN for statistical features.Figure 7 shows the result of the MLP when it is fed by all the three groups of features. The performance of classifier is reported for at least 10 times repetitions of the simulation and the average valuesare reported. It is seen that the classifier with all of the features (statistical & PSD) falsely entrapped in local minimums.

In order to distinguish the Lyapunov-based features and the approximate entropy another experiment is performed. In Table 2 the results of signal classification based on some sets of features are given. According to the results given in Table 2, Lyapunov based performs better than the approximate entropy while using all these features together is preferred.

As it can be seen from the results given in Table 2,considering chaotic features (Lyapunov-based features) solely outperforms using approximate entropy. However, this can be justified first by the number of features used for classification. Second, this issue implies the chaos in the dynamics of the signals while different behaviors show the signals corresponding to control and patientsubjects. Moreover, it can be inferred from the results that multilayer perceptron better classifies the nonlinear spiral drawing signals that conventional methods such as K-means. Fuzzy neural network is also implemented in the experiment while Gaussian membership functions are applied as the fuzzy sets and three membership functions for each input feature is initiated. Slight improvements are seen in the classification results of the FNN compared to the MLP. Because of the high complexity of the training process and also the computation time of the training, using MLP as the classifier is preferred.

CONCLUSION

In this paper feasibility for discriminating between the MS patients without tremor and healthy controls has been invested in digital spiral drawing task. The main hypothesis of this paper was that Lyapunov exponents and approximate entropy as the complex features have the capability to reveal the process of motor control destruction in MS patients. The approach in this paper design as follow: 1) Preprocessing: prepare the data. 2) Features extraction: three groups of features (statistical, spectral, and complex features) had been extracted from the signal. 3) Classification: a multilayer perceptron artificial neural network with back propagation learning algorithmwith four

neurons in the hidden layer and one output neuron was used. 4) Performance: the performance of classifier investigated for each group of features and also for using all features together. For the sake of statistical analysis, it is seen that its features are not separable by statistical discriminator (fig. 2) nor the two groups are disguisable by high order classifier like ANN. Besides, the spectral features showed the same promises as the statistical features. Although the performance of classifier reaches to higher level by these features, the overall performance is not satisfactory. It is clearly observed that complex features obtained the highest sensitivity, specificity and accuracy in comparison with the other feature groups. Such results has been hypothesized and confirmed by the confusion matrix of MLP which demonstrates the performance. Furthermore, the capabilities of Lyapunov based features and approximate entropy were compared. It is suggested for the future works looking for other complex features like other types of entropy, correlation and fractal dimensions and phase space features. The remarkable increase in the performance of classifier is the sensitivity. Such increase gives the promises that complex features are such appropriate features that do not misclassify the control subjects into patient group.

ACKNOWLEDGEMENTS

This project has been supported financially by Department of Engineering, Birjand branch, Islamic Azad University, Birjand, Iran.

REFERENCES

[1] Louis ED. Essential tremor. Lancet Neurol 2005;4:100–10.
[2] Quinn NP, Schneider SA, Schwingenschuh P, Bathia KP. Tremor – Some controversial aspects. MovDisord 2011;26:18–23.
[3] Elble R, Deuschl G. Milestones in tremor research. MovDisord 2011;26:1096–105.
[4] Koller WC, Hubble JP, Busenbark KL. Essential tremor. In: Calne D. Neurodegenerative Diseases. Philadelphia: W.B. Saunders; 1994, pp. 717–42.
[5] Deuschl G, Bain P, Brin M. Consensus statement of the movement disorder society on tremor. MovDisord 1998;13:2–23.
[6] Louis ED, Wendt KJ, Pullman SL, Ford B. Is essential tremor symmetric? Observational data from a community-based study of essential tremor. Arch Neurol 1998;55:1553–9.
[7] Louis ED, Ferreira JJ. How common is the most common adult movement disorder? Update on the worldwide prevalence of essential tremor. MovDisord 2010;25:534–41.
[8] Deuschl G, Elble R. Essential tremor – Neurodegenerative or nondegenerative disease towards a working definition of ET. MovDisord 2009;24:2033–41.
[9] Xu, Keying, "An Improved Approach for Essential Tremor Spirography Processing by Integrating Frequency Domain Information and Spatial Domain Information" (2013). Open Access Theses. Paper 411.
[10] Alusi SH, Worthington J, Glickman S, Bain PG. A study of tremor in multiple sclerosis. Brain 2001;124(Pt. 4):720–30.
[11] Pittock SJ, McClelland RL, Mayr WT, Rodriguez M, Matsumoto JY. Prevalence of tremor in multiple sclerosis and associated disability in the Olmsted County population. MovDisord 2004;19(12):1482–5.
[12] Hooper J, Taylor R, Pentland B, Whittle IR. Rater reliability of Fahn's tremor rating scale in patients with multiple sclerosis. Arch Phys Med Rehabil 1998;79(9):1076–9.
[13] AlusiSH,Worthington J, Glickman S, Findley LJ, Bain PG. Evaluation of three different ways of assessing tremor in multiple sclerosis. J NeurolNeurosurg Psychiatry 2000;68(6):756–60.
[14] Bain PG, Findley LJ, Atchison P, et al. Assessing tremor severity. J NeurolNeurosurg Psychiatry 1993;56(8):868–73.
[15] Fox P, Bain PG, Glickman S, Carroll C, Zajicek J. The effect of cannabis on tremor in patients with multiple sclerosis. Neurology 2004;62(7):1105–9.

[16] Ondo WG, Wang A, Thomas M, Vuong KD. Evaluating factors that can influence spirography ratings in patients with essential tremor. Parkinsonism RelatDisord 2005;11(1):45–8.

[17] Pullman SL, System and method for clinically assessing motor function, United States Patent No. US6,454,706 B1, September 2002.

[18] Feys P, Helsen W, Prinsmel A, Ilsbroukx S, Wang S, LiuX, Digitisedspirography as an evaluation tool for intentiontremor in multiple sclerosis, J Neurosci Methods160:309, 2007.

[19] Miralles F, Tarongí S, Espino A, Quanti¯cation of thedrawing of an Archimedes spiral through the analysis ofits digitized picture, J Neurosci Methods 152:18, 2006.

[20] Westin J, Ghiamati S, Memedi M, Nyholm D, JohanssonA, Dougherty M, Groth T, A new computer method for assessing drawing impairment in Parkinson's disease,J Neurosci Methods 190:143, 2010.

[21] Longsta MG, Heath RA, Spiral drawing performance asan indicator of ¯ne motor function in people with multiplesclerosis, Hum MovSci 25:474, 2006.

[22] Casseleggio A. and A. Carana, ‘‘Correlation dimension estimation from electrocardiograms’’, Chaos Solitons Fractals 5, 713–726 (1995).

[23] Casaleggio, A., S. Braiotta, and A. Corana. "Study of the Lyapunov exponents of ECG signals from MIT-BIH database." In Computers in Cardiology 1995, pp. 697-700. IEEE, (1995).

[24] Fell, J., Mann, K., Roschke, J., &Gopinathan, M. S. (2000). Nonlinear analysis of continuous ECG during sleep II. Dynamical measures. Biological Cybernetics, 82, 485–491.

[25] Govindan, R. B., K. Narayanan, and M. S. Gopinathan. "On the evidence of deterministic chaos in ECG: Surrogate and predictability analysis." Chaos 8.2 (1998): 495-502.

[26] Bremen, H. F. V. [2001] "Implementation of approach to compute the Lyapunov characteristic exponents for continuous dynamical systems to higher dimensions", Applied Mathematics and Computation, Volume 121, Issues 2-3, 219-259.

[27] Liu X, Carroll CB, Wang SY, Zajicek J, Bain PG, Quantifying drug-induced dyskinesias in the arms using digitised spiral-drawing tasks, J Neurosci Methods, 144:47-52, 2005.

[28] Feys P, Helsen W, Prinsmel A, Ilsbroukx S, Wang S, Liu X, Digitisedspirography as an evaluation tool for intention tremor in multiple sclerosis, J Neurosci Methods, 160:309-16, 2007.

[29] Perlman SL. Ataxias. Clinics in Geriatric Medicine. 2006. 22 (4).

[30] Polman CH, Reingold SC, Edan G, Filippi M, Hartung HP, Kappos L, Lublin FD, Metz LM, McFarland HF, O'Connor PW, Sandberg-Wollheim M, Thompson AJ, Weinshenker BG, Wolinsky JS, Diagnostic criteria for multiple sclerosis: 2005 revisions to the "McDonald Criteria", Ann Neurol, 58:840-6, 2005.

[31] Hughes S, Spelman T, Trojano M, Lugaresi A, Izquierdo G, Grand'maison F, Duquette P, Girard M, Grammond P, Oreja-Guevara C, Hupperts R, Boz C, Bergamaschi R, Giuliani G, Rio ME, Lechner-Scott J, van Pesch V, Iuliano G, Fiol M, Verheul F, Barnett M, Slee M, Herbert J, Kister I, Vella N, Moore F, Petkovska-Boskova T, Shaygannejad V, Jokubaitis V, McDonnell G, Hawkins S, Kee F, Gray O, Butzkueven H; MSBase Study Group. The Kurtzke EDSS rank stability increases 4 years after the onset of multiple sclerosis: results from the MS Base Registry, J NeurolNeurosurg Psychiatry. 83:305-10, 2012.

[32] Kurtzke JF, Historical and clinical perspectives of the expanded disability status scale, Neuroepidemiology, 31:1-9, 2008.

[33] Cohen JA, Reingold SC, Polman CH, Wolinsky JS, Disability outcome measures in multiple sclerosis clinical trials: current status and future prospects, Lancet Neurol, 11:467-76, 2012.

[34] Bosma LV, Kragt JJ, Brieva L, Khaleeli Z, Montalban X, Polman CH, Thompson AJ, Tintoré M, Uitdehaag BM, Progression on the Multiple Sclerosis Functional Composite in multiple sclerosis: what is the optimal cut-off for the three components?, MultScler, 16:862-7, 2010.

[35] Sainsbury A, Seebass G, Bansal A, Young JB, Reliability of the Barthel Index when used with older people, Age Ageing, 34:228-32, 2005.

[36] Alusi SH, Worthington J, Glickman S, Bain PG, A study of tremor in multiple sclerosis, Brain, 124: 720-30, 2001.

[37] Cho S, Grazioso R, Zhang N, Aykac M, Schmand M, Digital timing: sampling frequency, anti-aliasing filter and signal interpolation filter dependence on timing resolution, Phys Med Biol, 56:7569-83, 2011.

[38] Wyne KT, A comprehensive review of tremor, JAAPA, 18:43-50; quiz 57-8, 2005.

[39] Jennifer L. Durkin, Jack P. Callaghan, Effects of minimum sampling rate and signal reconstruction on surface electromyographic signals. J ElectromyogrKinesiol, 15: 474-481, 2005.

[40] Loni B, Shiri ME, Razjouyan J. Designing a neurological disorders with the tablet hardware. Bachler of Science thesis, Amirkabir university of Technology, Tehran, Iran. 2009.

[41] Pincus, S. M. [1991] "Approximate entropy as a measure of system complexity," Proc. Natl. Acad. Sci. USA 88:2297-2301.

[42] Takens F. Detecting strange attractors in turbulence. In D. A. Rand and L.-S. Young. Dynamical Systems and Turbulence, Lecture Notes in Mathematics. 1981. vol. 898. Springer-Verlag. pp. 366–381.

[43] Razjouyan, J., Gharibzadeh, S., Fallah, A., Khayat, O., Ghergherehchi, M., Afarideh, H., &Moghaddasi, M. (2012). a Neuro-Fuzzy Based Model for Accurate Estimation of the Lyapunov Exponents of AN Unknown Dynamical System. International Journal of Bifurcation and Chaos, 22(03).

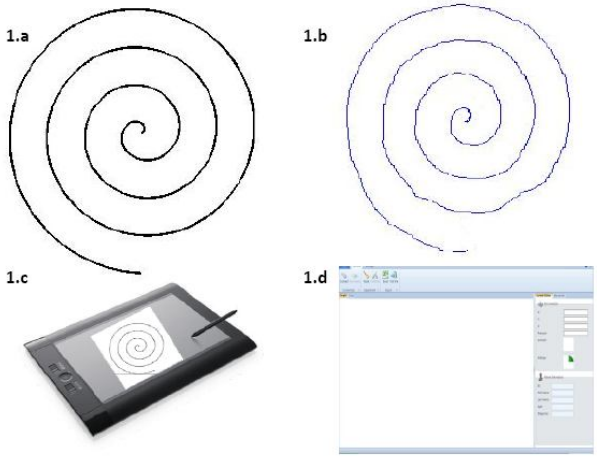

Figure 1. a) the template which is used for tracing. b) the position of pen on the tablet extracted by the software. c) the A3 size tablet and the template placed on. d) the software implemented to record the pen position.

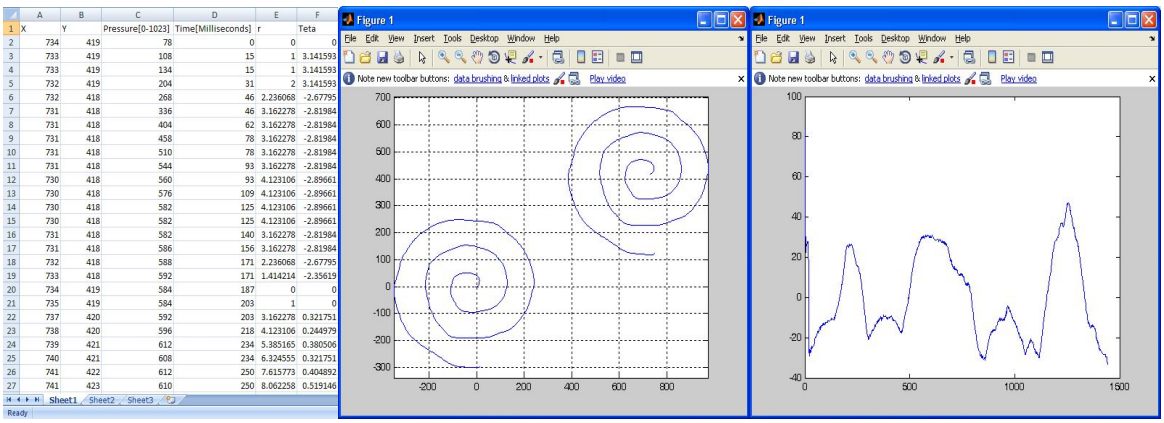

Figure 2. Sample data of signal recording, numerical data in excel (left figure), graphical plot of spiral drawing (mid figure) and sample deviation curve (right figure).

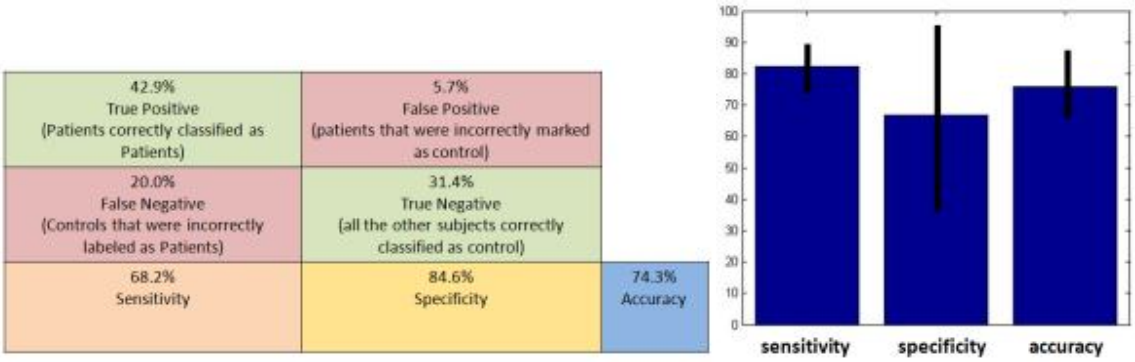

Figure 3. The confusion table and performance bar plot for the ANN classifier with spectral features solely.

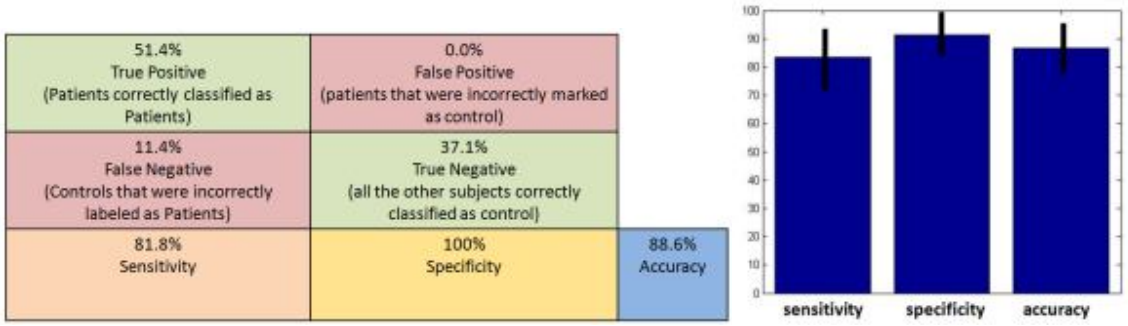

Figure 4. The confusion table and performance bar plot for the ANN classifier with complex system features solely.

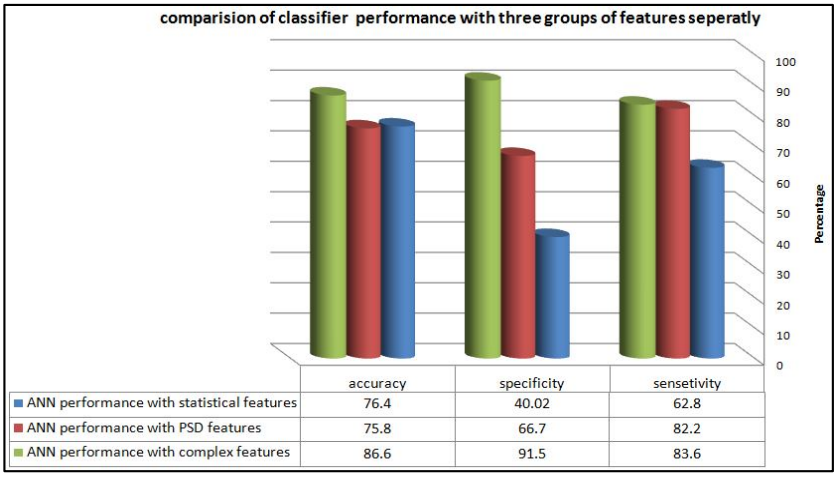

Figure 5.Comparing the performance (sensitivity, specificity and accuracy) of the classifier for three groups of features for MS patients without tremor and healthy controls. The green bars represent the performance of ANN for complex features, the red bars represent the performance of ANN for PSD features and the blue bars represent the performance of ANN for statistical features.

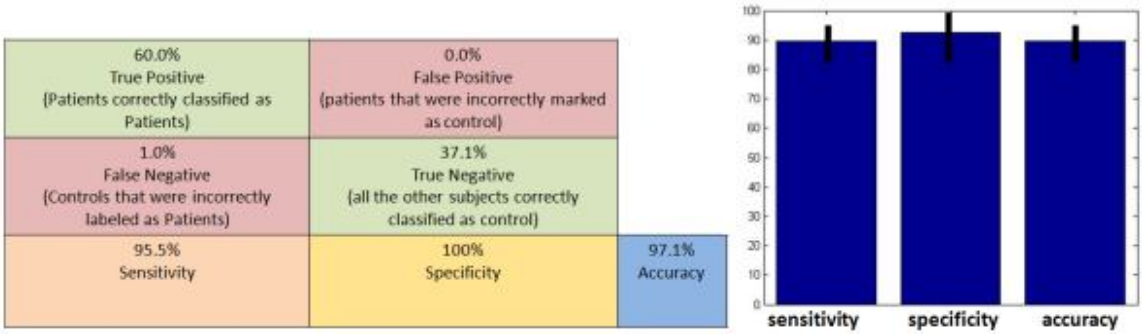

Figure 6. The confusion table and performance bar plot for the ANN classifier with statistical and PSD features.

Table 1: the abbreviations which are used in formula (12), (13) and (14).		
Abbreviation	**Stands for**	**Description**
TP	True positive	Patients correctly classified as Patients
FP	False positive	patients that were incorrectly marked as control
TN	True negative	All the other subjects correctly classified as control
FN	False negative	Controls that were incorrectly labeled as Patients

Table 2.Classification of the signals corresponding to two groups of patients and controls. (Lmax: maximum Lyapunov, Lmean: mean Lyapunov spectrum, Lsd: standard deviation of Lyapunov spectrum, ApEn: approximate entropy)

Features	**Classifier**	**Features #**	**Class**	**Accuracy**	**Specificity**	**Sensitivity**
Lmax, Lmean, Lsd	MLP	3	Chaoticity	71.8	68.5	61.8
Lmax, Lmean, Lsd, ApEn	MLP	4	Complex	90.3	87.2	84.4
ApEn	MLP	1	Complexity	44.9	41.5	32.7
Lmax, Lmean, Lsd	K-means	3	Chaoticity	64.2	61.5	62.6
Lmax, Lmean, Lsd, ApEn	K-means	4	Complex	67.1	64.8	62.9
ApEn	K-means	1	Complexity	41.2	38.4	39.3
Lmax, Lmean, Lsd	FNN	3	Chaoticity	72.8	71.5	70.4
Lmax, Lmean, Lsd, ApEn	FNN	4	Complex	92.6	89.4	87.5
ApEn	FNN	1	Complexity	45.5	43.6	37.9

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Investigating of the Effects of Relative Price Changes Variability and Skewness and Monetary Shocks on Inflation in Iran

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Received: 10 Oct 2014 Revised: 21 Jan 2015 Accepted: 31Jan 2015

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ABSTRACT

This paper analyses the effects of relative price variability and skewness as aggregate supply shocks and liquidity as aggregate demand shocks on inflation in iran's economy. For this purpose, we used total and state urban price index and M2 for period 2004-2012 and arellano and bover (1995) and Blundell and Bond (1998) method. The results show that relative price variability and Skewness and M2 have positive and meaningful effect on inflation. So, it is needed to consider supply and demand shocks simultaneously in disinflation policies.

Key Words: Inflation, relative price changes dispersion and skewness, dynamic panel data approach

INTRODUCTION

Inflation has always been one of the most controversial issues in Iranian economy and various studies have been conducted based on inflation theories. However, one of the theories that has not been tested and analyzed is Ball and Mankiw's supply-side theory of inflation proposed in 1995. The opinion of most macro-economists about inflation rate and its effective factors is that in the long run, growth in money supply is the initial factor of inflation rate. However, there are more to be discussed on its short-term behavior. Certainly, monetary policy and other determinants of the aggregate demand have significant roles in this phenomenon. However, since 1970s and with the emergence of the stagflation phenomenon, some economists have emphasized the role of supply shocks or price shocks. Fundamentally, supply shocks are changes in some relative prices. For instance, the famous supply shock in the 1970s was increased relative price of food and energy. As a Theoretical matter, it is not quite clear why such changes in relative prices cause inflation.

There is a reliable piece of literature that well explains the relationship between inflation and distribution of relative price changes and includes many pieces of evidence showing the positive relationship between inflation and dispersion of relative price changes. However, the positive relationship between inflation and skewness in relative price changes has relatively been give less attention. The theoretical explanations about the causal mechanism accounting for the observed relationships are not definite. The existing theories explaining these relationships are divided into three categories; the first one indicates the direction of causality from inflation to the variability of relative prices, which in most empirical studies, the variability of relative prices means the dispersion of price changes among product groups. The second category assumes the variability of relative prices or skewness of relative price changes as the exogenous variable and shows that the inflation is caused by the distribution of relative price changes. The third category expresses that both variables of inflation and relative price variability are created by some exogenous factors.

Various empirical studies were carried out to test the theories of this literature. One of these theories serving as the basis for the present research is the study by Ball and Mankiw (1995) that assumes the dispersion/skewness of relative price changes as the supply-side shock, based on which proposes the supply-side theory of inflation.
Considering the above discussion and the stagflation dominating the Iranian economy, the following questions are raised and it is endeavored to answer them and propose appropriate political suggestions based on the existing literature.

1) Can we explain the inflation in Iranian economy using dispersion (second moment) of relative price changes?
2) Can we explain the inflation in Iranian economy using skewness (third moment) of relative price changes?
3) Can we explain the inflation in Iranian economy using the interaction (crossover) effects of dispersion and skewness of relative price changes?
4)

In the second and third sections, the status of inflation in Iran and the theoretical principles of the research are expressed and the theory proposed by Ball and Mankiw is explained, and in the fourth section, empirical studies are reviewed. In the fifth section, we will examine the data and variables used in the research. In the sixth section, the panel data approach will be examined and in the seventh section, the results of model estimation and its analysis will be presented. The eighth section includes conclusion and policy implications.

The Status of Inflation in Iran

Since 1936 (the year Bank Melli Iran prepared the first index of Iranian economy), the total price level and cost of living index has always been increasing except for 1945, 1946 and 1950. The important point to be remembered, however, is that this increase has gone through many ups and downs. The trend of inflation rate for the period 1936-2013 is shown in diagram 1.Investigating the time series of inflation before and after the 1979 Revolution indicates the two characteristics of inflation in Iran. One of the characteristics is the high variation of inflation rate in Iran, one of the consequences of which is the decrease in the efficiency of price mechanism for the allocation of economic resources, which makes it difficult for economic agents to predict the future, increases the financial risk and disrupts the allocation of resources. The second characteristic is the chronic persistence of inflation. Studies on the reasons for inflation in Iran show that the most important causes of inflation are structural problems, dominance of public sector in economic activities and their competition with those working in the private sector, lack of state financial discipline and continuous budget deficit, liquidity growth and implementation of monetary policies inappropriate for the economic conditions of the time. Thus, considering these factors, this study aimed at examining another aspect of the determinants of inflation proposed by Ball and Mankiw in 1995.

A Supply-Side Theory of Inflation

The classical theory of inflation rules out any implication of relative price changes—, which are believed to be driven by real factors—for aggregate inflation. According to this view, for a given stock of money, increases in some prices are offset by decreases in some other prices. Thus, the aggregate price level is unaltered. The aggregate price level changes only when money supply changes. In other words, according to the classical view, inflation is driven by aggregate demand factors only. During the 1970s high inflation was accompanied by a low level of output, a phenomenon called stagflation. The classical framework did not explain this phenomenon well. On the other hand, this could consistently be explained by changes in aggregate supply conditions. Also, a closer look at the anatomy of inflation during that period reveals that this inflation was mainly driven by changes in relative prices of a few commodities such as oil and food. Thus, the relative price changes had the essential traits of an aggregate supply shock. Economists, however, came up with various different stories to interpret relative price changes as supply shocks.

Ball and Mankiw (1995) exploit the positive relationship between inflation and relative price dispersion/skewness to propose a theory of aggregate inflation in which relative price changes are considered as aggregate supply shocks. They argue that the existence of such relationships is "a novel empirical prediction" of a menu costs model. Because of "menu costs" (the costs of adjusting prices) firms' responses to shocks are asymmetric: they adjust prices only in response to large shocks. Thus, large shocks have disproportionate effects on the price level and the resultant changes in relative prices have implications for aggregate inflation. If the distribution of desired price changes is skewed to the right, a shock will lead to more increases in relative prices than decreases, and inflation will be higher. On the other hand, when the distribution is skewed to the left, decreases occur more quickly than increases, and inflation is lower. This supply-side theory predicts that the skewness of relative price changes will be correlated with aggregate inflation. This theory further suggests that high variability of price changes magnifies the effect of skewness on inflation because a larger variance of shocks leads to more weight in the tails of the distribution. A given skewness shock then leads to an even greater disparity between the number of price increases and decreases.

In order to provide empirical evidence for their theory in the U.S., Ball and Mankiw estimate several regressions with the aggregate inflation as the dependent variable. These regressions include lagged inflation, standard deviation of relative price changes, skewness of price changes, and the interaction of standard deviation and skewness—one at a time, or all of them together—as repressors. They find that standard deviation and skewness of relative price changes have statistically significant positive effects on aggregate inflation.

Quantity theory of money

In monetary economics, the quantity theory of money states that money supply has a direct, proportional relationship with the price level. For example, if the currency in circulation increased, there would be a proportional increase in the price of goods. The theory was challenged by Keynesian economics,[2] but updated and reinvigorated by the monetarist school of economics. While mainstream economists agree that the quantity theory holds true in the long run, there is still disagreement about its applicability in the short run. Critics of the theory argue that money velocity is not stable and, in the short-run, prices are sticky, so the direct relationship between money supply and price level does not hold.

Overview of Empirical Studies

Muhammad Akmal (2012)

In an article named "*The Relationship between Inflation and Relative Price Variability in Pakistan*", Muhammad Akmal explored the relationship between inflation and relative price variability (RPV) by using disaggregated Consumer Price Index (CPI) data for Pakistan. He used three methods to assess the functional form and stability of the

relationship between inflation and RPV; (a) visual assessment through scatter plots; (b) rolling regression analysis, and (c) Bai-Perron multiple structural break tests.

The results show that the methods (a) and (c) confirm that the relationship between inflation and RPV is approximately U-shaped and it is unstable over time. Whereas the rolling regression approach shows that the relationship is not significant across all rolling samples; however, coefficients signs are in right direction. The findings also suggest that the optimal inflation level for RPV is positive in Pakistan. Moreover, it may not always be good to follow an anti-inflationary policy if the relationship between inflation and RPV is non-linear, as below the threshold level of inflation, such policy may actually increase volatility in relative prices and carry more social cost than benefit.

Davis *et al.* (2011)

Davis et al. examined the cost of inflation due to the misallocation of economic resources due to relative price variability. For this purpose, they used the data of nine economic sectors in seven OECD countries from 1970 to 2005 and applied dynamic panel data methods. The results showed that inflation changes the real shares of some sectors even when inflation is treated as endogenous.

Choi and Kim (2010)

Choi and Kim's study aimed at examining asymmetry in the effect of inflation on relative price variability. They showed that the existing asymmetry resulted from the misspecification of the true model. The specified model was a piecewise linear regression model, while the existing relationship was a U-shaped one. For this purpose, the disaggregated monthly consumer price indices for three countries, Canada, Japan, and the US were used as research data, including 36 categories for Canada (1984M1-2005M5), 47 for Japan (1984M1-2006M7) and 38 for the United States (1984M1-2007M9).

Pou and Dabus (2008)

The work of Pou and Dabus aimed at testing Ball and Mankiw's supply-side theory of inflation in order to predict that inflation in Spain (1975-2002) and Argentina (1960-1989) was positively related to the skewness of price changes distribution. They concluded that there was a positive inflation–skewness relationship in both countries at low inflation, even though the mean annual inflation rates were very different – 2.2% for Spain and 23% for Argentina. In gher inflation periods, skewness was not significant. Finally, their results suggested that the menu-costs model was not suitable beyond certain threshold of inflation.

Data and Basic Variables

In order to answer the questions raised in the first section, the overall consumer price index (CPI) for urban households and the CPI for urban households in terms of main product groups in all provinces of the country from 2004 to 2012 are used as research data. The main product groups include:

1) Foods and drinks,
2) Tobacco,
3) Clothing and footwear,
4) Housing, water, electricity, gas and other fuels,
5) Furniture, supplies and services,
6) Health and hygiene,
7) Transportation,
8) Communications,
9) Recreation and cultural affairs,
10) Education
11) Restaurant and hotel,
12) Miscellaneous products and services.

The overall and provincial CPI data were collected from the price index database of the Central Bank of Islamic Republic of Iran. The variables used in this research and obtained using the above data are as follows:

Inflation Rate: Inflation is the increasing and irregular trend of increase in prices in the economy. This variable is estimated by using the CPI and includes the growth rate of consumer product and service price levels for urban households.

We define $P_{j,t}$ as the CPI for all products in the province j in the year t, and use it to estimate the inflation rate. Therefore, the inflation rate in the province j in the year t is as follows:

$$DP_{j,t} = LnP_{j,t} - LnP_{j,t-1} \quad (1)$$

Relative Price Variability (RPV): This variable is the dispersion or standard deviation (second moment) of relative price changes, which is estimated for the province j in the year t as follows:

$$VP_{j,t} = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(DP_{i,j,t} - \overline{DP}_{j,t})^2} \quad \text{And} \quad (2)$$

Where $\overline{DP}_{j,t}$ is the average price changes (average among products) in province j during period t. i shows the product group and n indicates the number of product groups.

Skewness of Relative Price Changes: Skewness is defined as the asymmetry in relative price changes and is calculated as follows:

$$SP_{j,t} = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{DP_{i,j,t} - \overline{DP}_{j,t}}{VP_{j,t}}\right)^3 \quad (3)$$

Dynamic Panel Data Approach

In dynamic panel data, when the dependent variable appears on the right side as a lagged variable, OLS estimators are not consistent. The econometric method used in many economic studies to solve this problem is the two-stage least squares (2SLS) econometric method. A prerequisite to using 2SLS method is finding a suitable instrumental variable to solve the endogeneity problem of explanatory variables. However, application of this method has certain limitations such as difficulty in finding suitable instrumental variable and the limitation of such variables. Moreover, this method cannot solve the problem of correlation between explanatory variables and reduce or remove the linearity of model. A suitable econometric method for removing or reducing the endogeneity problem of explanatory variables is the estimation of model using Generalized Method of Moments (GMM) dynamic panel data.

Using GMM dynamic panel data approach has other advantages such as considering the asymmetry of individual variance, more information and removal of the biases in sectional regressions, which results in more accurate estimations with higher efficiency and less linearity in GMM. GMM dynamic panel data method is used when the number of sectional variables (N) is more than the number of years (T) (i.e. N□T), which is the same in this research. It means that the number of provinces as the sectional units is more than the number of years as the sample time-series.

In order to estimate the model using this method, it is necessary to first specify the instrumental variables used in the model. The consistency of GMM estimator depends upon the validity of the assumption of no serial correlation in the disturbance terms and instruments which can be tested by using the three specification tests of Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The first test is Sargan test of over-identifying restrictions and tests the validity of instruments. The second test is a statistic that tests the existence of second-order serial correlation in first-order subtractive disturbance terms. Non-rejection of null hypothesis for both tests provides

evidence for the assumption of no serial correlation and validity of instruments. GMM estimator is consistent if there is no second-order serial correlation in disturbance terms of first-order subtractive equation.

The estimated model is based on dynamic estimators using the GMM method. Its empirical framework is derived from the model used by Baltagi (2007), which can be defined as follows:

$$y_{it} = \alpha y_{it-1} + \beta' x_{it} + \eta_i + \phi_t + \varepsilon_{it} \quad (4)$$

where α_{it} is the intercept, y_{it} the dependent variable, and y_{it-1} the dependent variable with a time lag. x_{it} also includes the independent variables used under instrumental variables and η_i is the individual or constant effects of countries, ϕ_t the constant effects of time, and ε_{it} the disturbance term.

In the specification of model (4), it is assumed that the disturbance terms have no correlation with individual or constant effects and with some explanatory variables and lagged values of variable. If η is correlated with some explanatory variables, then using first-order subtraction would be a suitable method to remove the constant or individual effects of units. Because in this way, using constant effects method leads to biased estimators of coefficients and it is necessary to use first-order subtraction for equation (4). Under such conditions, therefore, equation (4) turns to this equation:

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta' \Delta x_{it} + \Delta \phi_t + \Delta \varepsilon_{it} \quad (5)$$

In equation (5), the first-order subtraction of the lagged dependent variable (Δy_{it-1}) is correlated with the first-order subtraction of disturbance terms ($\Delta \varepsilon_{it}$). Moreover, there is the endogeneity problem for some explanatory variables, which is not considered in the model. Thus, it is necessary to use instrumental variables in the model to solve this problem.

Considering this literature, the empirical research model is specified as follows to estimate the coefficients:

$$DP_{j,t} = \alpha + \beta_1 DP_{j,t-1} + \beta_2 VP_{j,t} + \beta_3 SP_{j,t} + \beta_4 \left(VP_{j,t} \times SP_{j,t} \right) + u_{j,t} \quad (6)$$

where $DP_{j,t}$ is the inflation rate, $DP_{j,t-1}$ the inflation rate with a time lag, $VP_{j,t}$ the relative price variability (RPV), $SP_{j,t}$ the skewness of relative price changes, and $VP_{j,t} \times SP_{j,t}$ the mutual interaction of relative prices and skewness of relative price changes. If needed, virtual variables of time and sections will also be used.

RESULTS AND DISCUSSION

In this section, considering the limitation of the period and high number of sections, the methods of Arellano and Bover (1995), Blundell, and Bond (1998) were used because they are suitable for this type of data. The results are presented in Table 1:The results of Table 1 show that the coefficients of all variables effective in the inflation rate are statistically significant. What is to be discussed, however, is the consistency or inconsistency of the impact direction of these variables on the inflation rate with that of relevant theories. A lagged inflation rate with a coefficient of 0.4026 leads to an increase in the inflation rate in current period. Dispersion of relative price changes with a coefficient of 0.431 has a positive effect on the inflation rate, which is in line with Ball and Mankiw's theory; in a way that with the increased relative price variability, the inflation rate is positively influenced by this increase. The coefficient of the term for skewness of relative price changes with a coefficient of 0.0215 causes the increase of inflation rate and this, too, is in line with the theory. This means that as the skewness of relative price changes in Iran increases, inflation rate grows.

The coefficient of the mutual interaction of dispersion and skewness of relative price changes, though significant, is against the theory of Ball and Mankiw in terms of impact direction and this implies that inflation is negatively influenced by the mutual interaction of these two variables. However, the theory expresses that when there is skewness in relative price changes, relative price variability can lead to increased or decreased price levels, depending on whether it is skewed to right or left.The coefficient of the monetary term with a coefficient of 0.0715 causes the increase of inflation rate and this, too, is in line with the quantity theory of money.

Arellano and Bond's test was used to ensure the accurate specification of equation and lack of autocorrelation between disturbance terms. Its null hypothesis is the lack of first-order autocorrelation between subtractive disturbance terms. This test is used when the two-stage methods of Arellano and Bover (1995), Blundell, and Bond (1998) are used to estimate the equation coefficients. Momentary conditions and the results obtained from this test are only valid on the condition that there is no autocorrelation in individual disturbance terms. Since the rejection of null hypothesis (i.e. lack of first-order autocorrelation in subtractive disturbance terms) is not an indicator of wrong specification, we will examine the null hypothesis of no autocorrelation with higher order (for example second-order) in subtractive disturbance terms of first-order. The results indicate the rejection of null hypothesis of no first-order autocorrelation; however, the null hypothesis of no second-order autocorrelation cannot be rejected and this shows that there is no second-order autocorrelation in subtractive disturbance terms of first-order. Therefore, there is no evidence proving the estimated model does not have an accurate specification. The result of Arellano and Bond's test is depicted in Table 2:The above output does not present evidence that the model is misspecified.

CONCLUSION AND POLICY IMPLICATIONS

In this paper, we tested the supply-side theory of inflation proposed by Ball and Mankiw and examined the effects of dispersion and skewness of relative price changes and monetary shocks on inflation in Iranian economy. For this purpose, the overall CPI and provincial CPI data for 12 main product groups in urban areas from 2004 to 2012 were used. Dynamic panel data approach and the methods by Arellano and Bover (1995) and Blundell and Bond (1998) were utilized to estimate the coefficients of effective variables in the inflation due to the existence of a lagged dependent variable in the right side of the model as an effective variable in inflation. The results obtained from the estimation of this model indicate that the coefficients of dispersion and skewness of relative price changes and inflation rate with a time lag are in line with the theory; in a way that the dispersion and skewness of relative price changes and inflation rate of the previous period have a positive significant effect on inflation.

The positive effect of dispersion and skewness of relative price changes on the general level of prices shows that the increase in the dispersion of relative price changes leads to an increase in the general level of prices, which is due to the asymmetry in price shocks and lack of proper signaling by the market to economic agents in order for resources to be optimally allocated in different economic sectors. In other words, a kind of instability is created in economic agents' decision-making due to the high amount of changes in relative prices of different economic sectors. As a result, implementing certain activities to predict shocks and thus business behaviors as well as implementing policies to prevent high RPV can contribute to the establishment of stability and confidence in economic agents' decision-making and prevent the decrease in people's power of purchase and creation of constant welfare costs.Increase in monetary liquidity as an important variable, can be associated with other variables, inflation factor to be considered. It is observed that the demand and supply side shocks factor in the increase in the general level of prices and therefore inflation and therefore should be regarded seriously.

Moreover, considering the fact that in this research the current period's inflation rate is influenced by the inflation rate with a time lag (the previous period's inflation rate) and a kind of retrospective expected inflation is dominant, it is necessary for the government and especially the central bank to take practical measures to create stability in the general level of prices in a low rate. In order to provide a transparent and reliable anchor for economic agents in

order to shape their inflationary expectations and change them from retrospective to prospective expectations, the central bank should declare its quantitative goals for inflation in the form of official prediction and explain its programs and the way it is going to realize these goals to the public.

REFERENCES

1- Asgharpour, H, Salmani, B, Feshari, M and Dehghani, A. (2011). The impact of corruption on gross national saving rate in MENA Countries. Journal of Economic Modeling Research, 3, 99-121.
2- Akmal, Muhammad. (2012). the Relationship between Inflation and Relative Price Variability in Pakistan. SBP Working Paper Series, 44, 3-15.
3- Ball, Laurence and Mankiw, B. Gregory. (1995). Relative Price-Changes as Aggregate Supply Shocks. The Quarterly Journal of Economics, 110, 161-193.
4- Caraballo, Ma Angeles and Dabus, Carlos. (2013). Price Dispersion and Optimal Inflation: The Spanish Case. Journal of Applied Economics, 16, 49-70.
5- Caraballo, Maria Angeles and Usabiaga, Carlos. (2004). Inflation and Relative Prices: Empirical Evidence for the Spanish Economy. Problems and Perspectives in Management, 4, 59-71.
6- Choi, Chi-Young and Kim, Young Se. (2010). Is there any asymmetry in the effect of inflation on relative price variability? Economics Letters, 108, 233-236.
7- Davis, George K, Hineline, David and Kanago, Bryce E. (2011). Inflation and Real Sectoral Output Shares: Dynamic Panel Model Evidence from Seven OECD Countries. Journal of Macroeconomics, 33, 607-619.
8- Nath, Hiranya. (2002). Relative Price Changes as Supply Shocks: Evidence from U.S. Cities. Quarterly Journal of Business & Economics, 41, 3-20.
9- Ukoha, Obasi. O. (2007). Relative Price Variability and Inflation: Evidence from the Agricultural Sector in Nigeria. AERC Research Paper, 171, 1-30.
10- Pau, M. Angeles Caraballo and Dabus, Carlos (2008), Nominal rigidities, skewness and inflation regimes, Research in Economics, 62, 16-33.
11- Rahmani, T. (2002). Macroeconomic: Volume II. Tehran: Baradaran Publication.

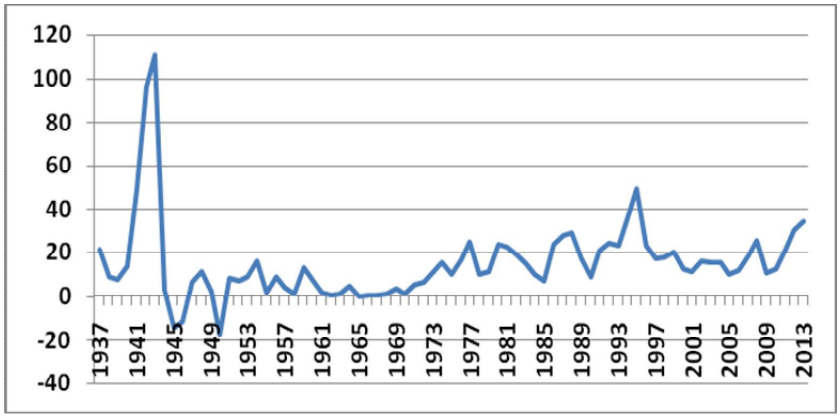

Diagram 1: The Inflation Rate in Iran (1937-2013)

Table 1: Estimation Results
Dependent Variable: Inflation Rate

Variable	Coefficient	Z-Statistic	P-Value
$DP_{j,t-1}$	0.4026	3.5	0.000
$VP_{j,t}$	0.431	2.27	0.023
$SP_{j,t}$	0.0215	2.09	0.036
$VP_{j,t}*SP_{j,t}$	-0.4263	-3.55	0.000
$M_{j,t}$	0.0715	5.07	0.000
Constant	-0.2945	-5.22	0.000

Table 2: Arellano and Bond's test

Autoregressive Order	Z-Statistic	P-Value
1	-2.9962	0.0027
2	0.999	0.3178

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Appraisal of Knowledge and Adoption Level of Sericulturists in Cluster Promotion Programme

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Received: 20 Dec 2014 Revised: 2 Jan 2015 Accepted: 10 Jan 2015

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ABSTRACT

Cluster Promotion Programme (CPP) was implemented by Central Sericulture Board together with Directorate of Sericulture, Maharashtra throughout the year 2007-10. The present paper analyzes the knowledge and adoption level of sericulturists participated in CPP in Osmanabad district. In all total, a hundred and fifty sericulturists were selected by "probability proportionate sampling size technique" from eight talukas and twenty five villages. Information was collected by made interviews with sericulturists. The findings discovered that Majority of the sericulturists (46.00 percent) possessed high level of knowledge and as much as 42.67 per cent had medium level of knowledge remaining solely 11.33 per cent of the respondent had low level of knowledge about recommended practices related to sericulture under CPP.As regards adoption level, over three forth of the respondent (88.67%) had medium level of adoption about cultivation practices of mulberry and cocoon production of sericulture under CPP. The findings of the present investigation will be helpful to the Central Silk Board, Department of Sericulture in Maharashtra, scientists and sericulture extension agencies in Osmanabad district as well as other districts of Maharashtra in organizing applicable training programmes supported current knowledge level of sericulturists and motivate them to adopt scientific package of practices in sericulture.

Key words: Adoption; Cluster promotion programme; Knowledge; Sericulturist.

INTRODUCTION

Sericulture is a labour-intensive industry in all its phases. It involves different activities like garden establishment, leaf production, silkworm rearing, and marketing of cocoons. More so, mulberry cultivation and silkworm rearing are conducted around the year. It is estimated that five to six crops can be harvested from one acre of mulberry garden during one year. On the other hand many agricultural crops like sugarcane, pulses, oilseeds, *rabi* sorghum etc are planted once in a year, hence limited employment opportunities as compared to sericulture. China leads the globe with silk production of 104000 MT or 81.95% of the manufacture. India ranks second in respect of world raw silk production. It's this position, jointly of solely 2 major silk producers within the world, and from its employment potential, that sericulture and silk derive their importance within the Indian textile map. Under Catalytic Development Project(CDP) implemented by Central Silk Board (CSB)Ministry of Textiles, Govt. of India, Sericulture Production cluster were identified and Cluster Promotion Programme (CPP) were implemented by CSB in collaboration with Directorate of sericulture, M.S in Osmanabad district during the year 2007-10.Success of any new technology depends on its acceptance /adoption by Sericulturists and the user acceptance is much dependent on carefully drawn and implemented extension programme [1]. Considering the above mentioned facts, the present investigation was conducted in Osmanabad district of Maharashtra State wherein hundred and one villages are below mulberry plantation with an area of 274 ha (685acres) and having a Cocoon production of 76380.2 kgs [2]. The aim of study was to assess the current status of sericulturists concerning their knowledge and adoption about scientific mulberry cultivation and cocoon production practices under CPP for creating valuable information for extension agencies to organize appropriate training programmes supported study findings.

MATERIALS AND METHODS

location of study: The present investigation was undertaken in Osmanabad district. It is situated in the southern part of the State abutting Andhra Pradesh in south and lies between north latitudes 17°37' and 18°42' and east longitude 75°1 6' and 76°47'.

Sampling plan and data collection: Three stages sampling technique was adopted for this investigation. Cluster wise mulberry planted eight talukas were selected wherever Cluster Promotion Programme was implemented throughout 2007-08. On the basis of this, list of mulberry growing villages were prepared, arranged in descending order of area and in all 25 villages were selected on number proportionate basis. The percentages of area under mulberry plantation in each block was calculated and converted into proportion for selection of 150 respondents. The respondents those have taken the advantage of CPP between 2007-2010 were selected from the selected villages; the list of sericulturist under CPP was drawn. Thus, in all 150 respondents were selected for study from the list by adopting "proportionate Probability sampling to the size technique. Information on pre-structured interview schedule was collected by conducting personal interviews with sericulturists.

Appraisal of knowledge level of sericulturist: A Teacher made tests was developed to measure the knowledge of the respondents on selected technology for sericulture. Responses were collected on two paint continuum i.e. complete knowledge and no knowledge. For each correct answer given by respondent a numerical score of one and for incorrect answer or if respondent does not respond, a zero score was assigned and on the basis of total score obtained on the knowledge test the raw score was converted into knowledge index as under.

$$\text{Knowledge Index} = \frac{\text{Obtained Knowledge Score}}{\text{Maximum Obtainable Knowledge Score}} \times 100$$

Finally on the basis of knowledge index respondents has been categorized into 3 classes i.e. Low, Medium and High as below.

Sl.No	Category	Index range
1	Low	Up to 53.69
2	Medium	53.70 to 67.21
3	High	Above 67.22

X = 65.45 ±SD = 11.76

Appraisal of adoption level of sericulturist

It is operational defined as decision making process where individual respondents through a number of mental stages over a period of time before making a final decision to adopt the improved cultivation technology of sericulture. The extent of adoption of recommended technology for sericulture was measure by developing an adoption test. The score obtained on adoption test was converted into adoption index as below.

$$\text{Adoption Index} = \frac{\text{Obtained Adoption Score}}{\text{Maximum Obtainable Adoption Score}} \times 100$$

On the basis of adoption index, respondents were categorized into 3 classes i.e. Low, Medium and High as below.

Sl.No	Category	Index range
1	Low	Up to 61.23
2	Medium	61.24 to 85.35
3	High	Above 86.36

X = 73.29 ±SD = 12.06

RESULTS AND DISCUSSION

Distribution of respondents according to their level of knowledge

The knowledge of the respondents about mulberry cultivation practices and cocoon production technology recommended by State Sericulture Department, under Cluster Promotion Programme ascertained on the basis of knowledge score. The respondents were classified into three levels on the basis of their score and distribution is shown in Table 1.The data presented in Table 1 discovered that majority of the respondent (46.00 percent) possessed high level of knowledge and as much as 42.67 per cent had medium and remaining only 11.33 per cent of the respondent had low level of knowledge about recommended practices related to sericulture. The above findings are in consonance with the findings of [3]., [4]., [5]. these researcher reported that the knowledge and adoption levels of extension staff and farmers was increased after trainings at farmers level.

A critical look of practice wise knowledge in Table 2 revealed that in case of Mulberry cultivation, nearly about 98.00 percent of the respondent had knowledge about 2-3 harrowing to be done at the time of land preparation followed by great proportion of respondents 90.00, 88.00, 86.00 and 80.00 per cent possessed knowledge about collection /burning of stubbles, leaf eaters on mulberry, soil type, spacing required for mulberry cultivation and leaf preservation respectively. It was followed by knowledge about varieties (79.33%), chemical fertilizers (68.00%), diseases of

mulberry (65.33%), mulberry leaf production per year (61.33%), management of disease (58.67%), management measures for leaf eaters and sucking pest, pruning method/ frequency (48.00%) and sett treatment with chemicals (45.33%) respectively.In case of knowledge about disinfection 94.00 percent respondents follow maintenance of general hygiene i.e. Cleanliness, stepwise disinfection (sun dry and soak in solution) (93.33%),knowledge about disinfection (before and after rearing) (80.66%), pest and diseases on silkworm (uzi fly, virus and bacterial diseases etc.) (60.00%) and disinfectants and concentration 48.66 per cent respondent

The knowledge about egg transportation and incubation ,it is interesting to note that cent percent of the respondent had knowledge about method of egg transportation/incubation (100%) while majority (96.00%) have knowledge about black boxing followed by incubation method (53.33%) and time of black boxing (42%) respectively.
In case of knowledge about Chawki rearing higher percentage of respondents (93.33% and 84.67%) were known to have knowledge about method of Chawki rearing and frequency of feeding. The knowledge regarding selection of Chawki leaf were (67.33%), method of brushing and use of bed disinfectant 66.00% and temperature and humidity (40.67%) respectively.The knowledge about late age rearing, majority (72.67%) of the respondent have knowledge about bed cleaning followed by frequency of feeding (72.00%), method of cleaning (47.33), ventilation (44.00%) uzi control (43.33%) and management of temperature/humidity (36.00%) for late age silkworm respectively.

It is pleasant to know that about mounting and spinning ,93.33 percent of the respondent have knowledge about disinfection of mountages, while majority (91.33%) have knowledge dusting of lime powder, mode of cocoon transportation whereas 58.67% have knowledge about 5th instar larvae fully developed for spinning, method of cocoon grading and 52% respondent have knowledge about method of cocoon harvesting.

In last, it may be summarized that most of the respondent had knowledge regarding method of egg transportation/incubation, 2-3 harrowing to be done at the time of land preparation, black boxing, collection /burning of stubbles, method of chawki rearing, frequency of feeding, maintenance of general hygiene i.e. Cleanliness, stepwise disinfection (sun dry and soak in Vijeta powder/ Bleaching powder, Formalin solution), leaf eaters on mulberry, soil type, spacing required for mulberry cultivation and leaf preservation respectively. This was followed by higher per cent of the respondents who had knowledge about bed cleaning, chawki leaf varieties, chemical fertilizers diseases of mulberry, frequency of feeding mulberry leaf, production per year, method of brushing and use of bed disinfectant, 5th instars larvae fully developed for spinning and method of cocoon grading was also possessed by most of the sericulturist under cluster promotion programme.

Likewise the respondents have average knowledge about temperature and humidity, pest and diseases on silkworm, cocoon transportation, method of cocoon harvesting management of disease, management measures for leaf eaters and sucking pest, pruning method/ frequency, sett treatment with chemicals, incubation method, time of black boxing, temperature and humidity, method of cleaning, ventilation, uzi control and temperature/humidity management for late age silkworm under cluster promotion programme on sericulture.

Distribution of respondents according to their level of adoption

The Table 3 revealed that majority of the respondent (88.67%) were found in medium category of adoption followed by 10.00 per cent of the respondent who had low category of adoption and meager 1.33 per cent of the respondent had high category of adoption about cultivation practices of mulberry and cocoon production under sericulture cluster promotion programme.

Thus, it could be inferred from these findings that over three forth of the respondent (88.67%) had medium level of adoption about cultivation practices of mulberry and cocoon production under sericulture under CPP. [6]. suggested that intensified extension efforts would be fruitful in popularizing improved rainfed sericulture practices.

From Table 4 , it is revealed that majority (94.00%) of the respondents have adopted the intercultural operations and collection/ burning stubbles, soil type (92.66%), land preparation viz 2-3 harrowing (85.33%), varieties (84.00%),spacing (68.00%),chemical fertilizer, leaf eaters on mulberry, leaf preservation (65.33%) respectively. It was followed by the adoption of diseases on mulberry (64.66%) and mulberry leaf production per year (54.00%). Similarly, average number of the respondents adopted the technologies namely management of diseases (49.34%), pruning method/frequency (46.66%), management measures for leaf eaters and sucking pest (45.33%) and sett treatments with chemicals (38.66%).

In case of disinfection majority of the respondent had adopted the practice of maintenance of general hygiene (88.66%), stepwise wise disinfection (82.67%), and disinfection before and after rearing (65.33%). The adoption level about diseases of silkworm and disinfectants and concentration was 56.00% and 44.66% respectively.There is 92.00 percent adoption level pertaining to method of egg transportation / incubation and 84.67% had adoption regarding black boxing. About 44% respondents follow incubation method and adoption regarding time of black boxing was found to be only 38.00%.

Pertaining to chawki rearing majority of the respondents adopted method of chawki rearing (83.33%), frequency of feeding (74.66%) and use of disinfectants (64.00%).whereas the level of adoption regarding selection of chawki leaf (58.66%), method of brushing (54%) was recorded. Likewise the adoption regarding temperature /Humidity is recorded to be about 41.33%.With respect to adoption level during late rearing it was found to be medium i.e frequency of feeding (54.00%), bed cleaning (48.66%), method of cleaning (45.33%), uzi control (41.33%), maintenance of late age temperature/ humidity (34.66%), and providing ventilation about 26% respectively.

There is 92.66 percent adoption pertaining to mode of cocoon transportation, dusting of lime powder (83.33%), disinfection of mountages (66.00%), method of cocoon grading, followed 5th instar larvae of silkworm fully developed for spinning (60.00%) and method of cocoon harvesting (50.67%) respectively.

In nut shell, it may be summarized that most of the sericulturist had adopted various technologies namely intercultural operations and collection/ burning stubbles, soil type, mode of cocoon transportation, method of egg transportation/ incubation, maintenance of general hygienic, land preparation viz 2-3 harrowing, varieties, black boxing, method of chawki rearing, dusting of lime powder, stepwise disinfection, frequency of feeding, spacing, disinfection of mountages, disinfection before and after rearing, chemical fertilizer, leaf eaters on mulberry, leaf preservation, use of disinfectants, diseases on mulberry, method of cocoon grading, follows 5th instar of silkworm fully developed for spinning and selection of chawki leaf respectively under cluster promotion programme. The findings are in line with the findings of [7].

Where as the respondent have average adoption level pertaining to diseases of silkworm, method of brushing, frequency of feeding, method of cocoon harvesting, capacity of mulberry leaf production per year, management of diseases, bed cleaning, disinfectants and concentration, incubation method, pruning method/ frequency, management measures for leaf eaters and sucking pest, management of temperature and humidity respectively under cluster promotion programme on sericulture.

CONCLUSIONS

It might be concluded that majority of the respondents (46.00 percent) possessed high level of knowledge and as much as 42.67 per cent had medium level of knowledge remaining only 11.33 per cent of the respondent had low level of knowledge concerning recommended practices associated with sericulture under CPP. Over three forth of the

respondent (88.67%) had medium level of adoption about cultivation practices of mulberry and cocoon production of sericulture under CPP. The appraisal of current level of knowledge and adoption of sericulturists about scientific mulberry cultivation and cocoon rearing practices under CPP have created valuable information for extension agencies to arrange appropriate training programmes supported study findings.

REFERENCES

1. Rama Mohana Rao, P and Kambale, C.K. (2009): *"Impact of demonstration of technology package in Sericulture extension and future extension strategies"* Indian Journal of Sericulture 48 (2) PP: 178-181.
2. Anonymous (2010):*"Area and production of mulberry and silk cocoon"* Annual report of *Department* of Sericulture, Osmanabad, M.S. PP:1-2.
3. Srinivasa, G., Rahmathulla, V.K., Vindhya,G.S and Rajan, R.K (2007) "*Training programmes in sericulture: their evaluation and impact on extension personnel and sericulturists"* Indian Journal of Sericulture 46 (1) PP:26-31.
4. Bagchi, S.N., Saha,A.K., Gosh, A., Gosh,S., Sengupta,D., Das,S.K and Sarkar,A. (2008) *"Development of Sericulture in West Bengal through IVLP"* Indian Silk 47 (6) PP: 12-15.
5. Dayananda and Kamble, C.K. (2008): *"Studies on the knowledge and adoption of integrated technology package and its impact on mulberry cultivation among sericulturists in Anekal Division of Karnataka"* Indian Journal of Sericulture 47 (2) PP: 188-193.
6. Kumaresan, P., Srinivasa, G and Prakash, N.B.V (2005) *" Productivity and profitability in rainfed sericulture- a study in the district of Chamaraja Nagar in Karnataka"* Agricultural Economics Research Review XVIII (1) PP:91-102.
7. Haque Rufaie, S.Z., Singh, T.P., Baqual, M.F., Malik, G.N. and Dar H.U (2006) *"Technology Transfer – An effective measure for cocoon crop improvement"* Indian Silk 45 (7) PP: 18-21.

Table 1:Distribution of the respondents according to their level of knowledge

Sr. No	Knowledge	Respondents (n=150)	
		Number	Percentage
1.	Low	17	11.33
2.	Medium	64	42.67
3.	High	69	46.00
	Total	150	100.00

Table 2:Practice wise knowledge about mulberry cultivation and cocoon production

Sr. No	Technology/ Practice	Knowledge of Respondents	
		Knowledge	No Knowledge
A	**Mulberry Cultivation**		
1	Select Medium to heavy type of soil	129 (86.00)	21 (14.00)
2	2-3 harrowing to be done	147 (98.00)	03 (2.00)
3	Collection /burning stubbles and intercultural operations	135 (90.00)	15 (10.00)
4	Recommended dose of manure (FYM i.e 20MT/ha)	102 (68.00)	48 (32.00)
5	Varieties (V-1, S-1635,S-36 etc)	119 (79.33)	31 (20.67)
6	Spacing (3'X3', 2'X2' pair row)	120 (80.00)	30 (20.00)
7	Sett treatment with chemicals	68 (45.33)	82 (54.67)
8	Chemical Fertilizers (120:48:48)/ha/yr.	102 (68.00)	48 (32.00)
9	Leaf eaters on mulberry (jassids, aphids, thrips ,hairy	132 (88.00)	18 (12.00)

	caterpillars, caterpillars etc)		
10	Management measures for leaf eaters and sucking pest (Rogor, Malathion, 5% NSKE)	83 (55.37)	67 (44.63)
11	Diseases on mulberry (leaf spot, Powdery mildew etc)	98 (65.33)	52 (34.67)
12	Management of diseases (Bavistin, Captan, COC)	88 (58.66)	62 (41.37)
13	Pruning Method/ frequency (30-45cmTwice/year)	72 (48.00)	78 (52.00)
14	Mulberry leaf production per year (14000kg /ha)	92 (61.33)	58 (38.67)
15	Leaf Preservation (Leaf chamber/ gunny)	120 (80.00)	30 (20.00)
B	**Disinfection**		
1	Pest and diseases on Silk worm (Uzi fly, virus and bacterial diseases etc.)	90 (60.00)	60 (40.00)
2	Disinfection (Before & after rearing) by using Vijeta powder/ Bleaching powder, Formalin etc.)	121 (80.67)	29 (19.33)
3	Disinfectants & concentration (2% of Formalin/bleaching powder)	73 (48.67)	77 (51.33)
4	Stepwise disinfection (Sun dry & soak in solution)	140 (93.33)	10 (6.67)
5	Maintenance of general hygiene (Cleanliness)	141 (94.00)	09 (6.00)
C	**Egg Transportation & Incubation**		
1	Method of egg transportation / incubation (Care & cool hrs)	150 (100.00)	0 (0.00)
2	Incubation Method (Pot/brick wall/foam)	80 (53.33)	70 (46.67)
3	Black Boxing (Black cloth/Paper)	144 (96.00)	06 (4.00)
4	Time of black boxing (Pin head stage)	63 (42.00)	87 (58.00)
D	**Chawki Rearing**		
1	Select Chawki leaf (below glossy leaf)	101 (67.33)	49 (32.67)
2	Method of brushing (feather)	99 (66.00)	51 (34.00)
3	Temperature / Humidity (27-28^{0}C ,80-90%)	61 (40.67)	89 (59.33)
4	Method of chawki rearing (Box/Paraffin paper)	140 (93.33)	10 (6.67)
5	Use of bed disinfectant (once after every moult)	99 (66.00)	51 (34.00)
6	Frequency of feeding (3 times in winter 4 times in summer)	127 (84.67)	23 (15.33)
E	**Late age rearing**		
1	Late age temperature/ humidity (24-25^{0}C, 60-70%)	54 (36.00)	96 (64.00)
2	Bed cleaning (daily once)	109 (72.67)	41 (27.33)
3	Method of cleaning (net)	71 (47.33)	79 (52.67)
4	Frequency of feeding (3/4feeds/day)	108 (72.00)	42 (28.00)
5	Uzi control (wire mesh/net/trap etc)	65 (43.33)	85 (56.67)
6	Ventilation (Cross ventilation b/w trays)	66 (44.00)	84 (56.00)
F	**Mounting, Spinning, Cocoon harvesting and marketing**		
1	V instar larvae of Silkworm fully developed for spinning after 6-7 days	88 (58.67)	62 (41.33)
2	Dusting of Lime powder	137 (91.33)	13 (8.67)
3	Disinfection of mountages (25% formalin)	140 (93.33)	10 (6.67)
4	Method of cocoon harvesting	78 (52.00)	72 (48.00)
5	Method of cocoon Grading	88 (58.67)	62 (41.33)
6	Mode of cocoon transportation (Gunny cloth/ bamboo)	137 (91.33)	13 (8.67)

Table 3:Distribution of the respondents according to level of adoption

Sr. No.	Category	Respondents (n=150)	
		Number	Percentage
1.	Low	15	10.00
2.	Medium	133	88.67
3.	High	02	1.33
		150	**100.00**

Table 4:Practice wise adoption about mulberry cultivation and cocoon production

Sr. No	Technology/ Practice	Adoption of Respondents		
		Complete	Partial	No adoption
A	**Mulberry Cultivation**			
1	Select Medium to heavy type of soil	139 (92.66)	11 (7.34)	00 (0.00)
2	2-3 harrowings to be done	128 (85.33)	11 (7.34)	11 (7.33)
3	Collection /burning stubbles and intercultural operations	141 (94.00)	09 (6.00)	00 (0.00)
4	Application of recommended dose of manure (FYM i.e 20MT/ha)	98 (65.33)	45 (30.00)	07 (4.67)
5	Varieties (V-1, S-1635,S-36 etc)	126 (84.00)	10 (6.67)	14 (9.33)
6	Spacing (3'X3', 2'X2' pair row)	102 (68.00)	34 (22.66)	14 (9.34)
7	Sett treatment with chemicals	58 (38.67)	62 (41.33)	30 (20.00)
8	Chemical Fertilizers (120:48:48)/ha/yr.	98 (65.33)	38 (25.33)	14 (9.34)
9	Leaf eaters on mulberry (jassids, aphids, thrips ,hairy caterpillars, caterpillars etc)	98 (65.33)	22 (14.67)	30 (20.00)
10	Management measures for leaf eaters and sucking pest (Rogor, Malathion, 5% NSKE)	68 (45.33)	58 (38.67)	30 (20.00)
11	Diseases on mulberry (leaf spot, Powdery mildew etc)	97 (64.67)	28 (18.67)	25 (16.67)
12	Management of diseases (Bavistin, Captan, COC)	74 (49.34)	58 (38.66)	18 (12.00)
13	Pruning Method/ frequency (30-45cmTwice/year)	70 (46.66)	56 (37.34)	24 (16.00)
14	Mulberry leaf production per year (14000kg /ha)	81 (54.00)	42 (28.00)	27 (18.00)
15	Leaf Preservation (Leaf chamber/ gunny)	98 (65.33)	38 (25.33)	14 (9.34)
B	**Disinfection**			
1	Pest and diseases on Silk worm (Uzi fly, virus and bacterial diseases etc.)	84 (56.00)	28 (18.66)	38 (25.33)
2	Disinfection (Before & after rearing) by using Vijeta powder/ Bleaching powder, Formalin etc.)	98 (65.33)	19 (12.67)	33 (22.00)

3	Disinfectants & concentration (2% of Formalin/bleaching powder)	67 (44.67)	53 (35.33)	30 (20.00)
4	Stepwise disinfection (Sun dry & soak in solution)	124 (82.67)	09 (6.00)	17 (11.33)
5	Maintenance of general hygiene (Cleanliness)	133 (88.67)	10 (6.66)	07 (4.67)
C	**Egg Transportation & Incubation**			
1	Method of egg transportation / incubation (Care & cool hrs)	138 (92.00)	05 (3.33)	07 (4.67)
2	Incubation Method (Pot/brick wall/foam)	66 (44.00)	51 (34.00)	33 (22.00)
3	Black Boxing (Black cloth/Paper)	127 (84.67)	12 (8.00)	11 (7.33)
4	Time of black boxing (Pin head stage)	57 (38.00)	63 (42.00)	30 (20.00)
D	**Chawki Rearing**			
1	Select Chawki leaf (below glossy leaf)	88 (58.66)	45 (30.00)	17 (11.34)
2	Method of brushing (feather)	81 (54.00)	52 (34.66)	17 (11.34)
3	Temperature / Humidity (27-28^{0}C ,80-90%)	62 (41.33)	60 (40.00)	28 (18.67)
4	Method of chawki rearing (Box/Paraffin paper)	125 (83.33)	12 (8.00)	13 (8.67)
5	Use of bed disinfectant (once after every moult)	96 (64.00)	27 (18.00)	27 (18.00)
6	Frequency of feeding (3 times in winter 4 times in summer)	112 (74.66)	21 (14.00)	17 (11.34)
E	**Late age rearing**			
1	Late age temperature/ humidity (24-25^{0}C, 60-70%)	52 (34.66)	44 (29.34)	54 (36.00)
2	Bed cleaning (daily once)	73 (48.66)	35 (23.34)	42 (28.00)
3	Method of cleaning by use of nets	68 (45.33)	49 (32.67)	33 (22.00)
4	Frequency of feeding (3/4feeds/day)	81 (54.00)	31 (20.67)	38 (25.33)
5	Uzi control (wire mesh/net/trap etc)	62 (41.33)	46 (30.67)	42 (28.00)
6	Ventilation (Cross ventilation b/w trays)	39 (26.00)	42 (28.00)	69 (46.00)
F	**Mounting, Spinning, Cocoon harvesting and marketing**			
1	V instar larvae of Silkworm fully developed for spinning after 6-7 days	90 (60.00)	31 (20.66)	29 (19.34)
2	Dusting of Lime powder	125 (83.33)	18 (12.00)	07 (4.67)
3	Disinfection of mountages (25% formalin)	99 (66.00)	17 (11.33)	34 (22.67)
4	Method of cocoon harvesting	76 (50.67)	32 (21.33)	42 (28.00)
5	Method of cocoon Grading	92 (61.33)	31 (20.67)	27 (18.00)
6	Mode of cocoon transportation (Gunny cloth/ bamboo)	139 (92.66)	04 (2.67)	07 (4.67)

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Muscle Force Classification for Upper Limb Muscles in Three States of Contractions using Statistical and Complex Features

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Received: 22 Dec 2014 Revised: 12 Jan 2015 Accepted:31 Jan 2015

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ABSTRACT

The slump of muscle power and performance, interpreted as a musculoskeletal or neuro-muscular disorder, can be quantified based on the recorded electromyogram signals. In this paper, the EMG signals of biceps, deltoid, triceps, tibialis anterior and quadriceps muscles are recorded in three states of isometric contraction (ISO), maximum voluntary contraction (MVC) and dynamic contractions from 22 normal subjects aged between 20 and 30 half of them are male. Then, seven features are extracted from the window cut signals to attain a quantitative measure of muscle force and performance. To find which of the extracted features are discriminative and selective for muscle force classification a multilayer perceptron is employed to analyze the features. The network is trained with 70 percent of the signal length and then it is employed for classification and modeling purposes. For each muscle the most effective extracted features are found for males and females separately by a reference classifier. Mean Squared Errors of training and testing procedures with the classification rate are calculated for each muscle in the three states of contraction. Finally two complex features are extracted from the signals and they are used for classification purposes since it is proposed that dynamical behavior of EMG signals can be represented by complex features well.

Keywords: Muscle Force Quantization; Contraction; Classification; Statistical features; Complex features.

INTRODUCTION

Electromyography (EMG) is the study of the electrical activity of the muscle and is a valuable tool in the assessment of neuromuscular disorders. Computer-aided EMG has become an indispensable tool in the daily activities of neurophysiology laboratories in facilitating quantitative analysis and decision making in clinical neurophysiology, rehabilitation, sport medicine and human physiology. EMG findings are used to detect and describe different disease processes affecting the Motor Unit (MU), which is the smallest functional unit of the muscle [1].

Feature extraction is a method to extract the useful information that is hidden in surface EMG signal and remove the unwanted EMG parts and interferences [2, 3]. Some features are robust across different kinds of noises; consequently, intensive data pre-processing methods shall be avoided to be implemented [4]. In addition, appropriate features will directly approach high classification accuracy [5]. Three properties have been suggested to be used in quantitative comparison of their capabilities that include maximum class separability, robustness, and complexity [2, 3].Although many research works have mainly tried to explore and examine an appropriate feature vector for numerous specific EMG signal classification applications (e.g. [2-6]), there have a few works which make deeply quantitative comparisons of their qualities, particularly in redundancy point of view [7].

Hudgins et al. [8] were pioneers in developing a real-time pattern-recognition-based MCS. Using time-domain (TD) features and a multilayer perceptron (MLP) neural network, they succeeded in classifying four types of upper limb motion, with an accuracy of approximately 90%. This work was continued over the last 15 years, by employing various classifiers, such as linear discriminant analysis (LDA) [9, 10], MLP/radial basis function (RBF) neural networks [11], time-delayed artificial neural network (ANN) [12], fuzzy [13, 14], Neuro-Fuzzy [15], fuzzy ARTMAP networks [16], fuzzy-MINMAX networks [17], Gaussian mixture models (GMMs) [18-20], and hidden Markov models (HMMs) [21]. Vuskovic and Du [16] introduced a modified version of a fuzzy ARTMAP network to classify prehensile MESs. Englehart et al. [9] showed that LDA, outperforms MLP on time-scale features that are dimensionally reduced by PCA. In addition, significant results were achieved using probabilistic approaches. Chan and Englehart [21] applied an HMM to discriminate six classes of limb movement based on a four-channel MES. It resulted in an average accuracy of 94.63%, which exceeded an MLP-based classifier used in [10] (93.27%). Furthermore, Huang et al. [18] and Fukuda et al. [19] developed a GMM as a classifier in their MCS; the former showed an accuracy of approximately 97%. Englehart et al. [10] introduced a continuous classification scheme that provided more robust results for a shortened segment length of signal, and high-speed controllers. Oskoei and Hu [5] employed SVM for classification of upper limb motions suing myoelectric signals. They used another method to adjust SVM parameters before classification, and examined overlapped segmentation and majority voting to improve controller performance. They also used a TD multi-feature set (i.e., MAV + WL + ZC + SSC) as the signal features for classification.

In this paper, we follow a high quality EMG feature space which has the following properties [3]:
Maximum class separability. A high quality feature space which results in clusters that have maximum separability or minimum overlap. This ensures the lowest possible misclassification rate.

Robustness. Lowest possible sensitivity of the feature space cluster separability to the noise samples.
Complexity. Lowest possible computational complexity of the features (and clusters) so that the procedure can be implemented with reasonable hardware and in a real-time manner.

Subjects and Methods

A. EMG Dataset

In our experiments, the data acquisition system include PowerLab, 16sp and Dual BioAmp manufactured by ADInstruments Ltd. and software Chart V5.0 with sampling rate adjusted at 2kHz, recording signal amplitude 2mV,

primary low-pass filter 1 with cut-off frequency 500Hz and primary high-pass filter 2 with cut-off frequency 0.3Hz. Data are outputted in txt or excel format which are readable in MATLAB for data processing. MATLAB 7.0 software installed on a Laptop with 2.2GHz Core2Dual CPU is used for signal processing.

Our samples are 22 normal and healthy subjects aged between 20 and 30 with almost similar physical power randomly selected from the students of Biomedical Engineering Department, Amirkabir University of Technology satisfying the conditions of having enough asleep and appropriate nutrition, having no considerable physical activity before the test, no sedative drug use for at least 24 hours before the test, with no bone fracture and musculoskeletal disorder close to the test and no pain should be sensed during the tests by the subjects. Each individual fills out a form requesting the following items

- Personal information as name, gender, age, height, weight
- Types of the recording signals
- Recording degrees of freedom
- Stimulations and motions
- Processing items requested
- Notes

EMG signals of biceps, deltoid, triceps, tibialis anterior and quadriceps muscles are recorded in three states of isometric contraction (ISO), maximum voluntary contraction (MVC) and dynamic contractions. A preprocessing filtering process is then applied to the recorded signals. A window consisting of 20,000 samples (10 seconds) is made cut off for each signal to be processed and analyzed.

Feature Extraction

Feature extraction, which is the step to measure features or properties from the input data, is essential in the pattern recognition system design. The goal of the feature extraction is to characterize an object to be recognized by measurements whose values are very similar for objects in the same category, and very different for objects in different categories. Computational complexity and class discrimination are two main factors for determining the best feature set.A set of features are listed in Table 1 along with their descriptions. The primary purpose of this work is to use these features to find an optimum set best describing and characterizing the EMG signals. The non-linear classifier used in this work is a Feed Forward Neural Network with 1 hidden layer which its inputs are the selected features among the feature list given in Table 1. In our experiments it has been found that there is a tradeoff between the classification accuracy and computational complexity. Therefore, for offline signal processing high classification accuracy is followed through assigning more effective features and for online processing in which the computation time is concerned minimum possible number of features should be chosen. It is noted that the features #8 and #9 are computed by the method of reference [22].

Simulation

After the data acquisition phase, all recorded signals underwent noise filtering as the preprocessing phase. Long time recording signals are cut off in a windowing procedure as long as 20,000 samples or 10 second records with 2kHz sampling rate. Each window is split into sub-windows with the length of 100 to 5000 samples. For all windows 70% of the samples are set for the training procedure and the rest of samples for the testing purpose. After multiple runs of training and testing procedures for different lengths of windows, windows length of 2000 samples (corresponding to 1 second signal recording) were chosen. Therefore, each window (with 20,000 samples) is split into 10 sub-windows each one with 2000 samples. Seventy percent of sub-windows are still considered for training purpose (7 sub-windows) and the rests for testing purpose (3 sub-windows). For evaluating the classification task, Mean Squared Error is used which is the most common criterion defined as below

$$MSE = \frac{1}{N}\sum_{i=1}^{N}(y_i - \bar{y}_i) \qquad (1)$$

where y_i and $\bar{y}_i$ are real and desired outputs of the network, respectively, and *N* is the total number of samples. MSE of the training process shows the trainability of the system and MSE of the testing samples indicates the system's modeling capability.

True classification rate is defined as the rate of true assigned samples to their classes to the whole number of samples as below

$$Classification\ Rate = \frac{True\ assigned\ samples}{Total\ number\ of\ samples}$$

The results of sample classification over the three classes of contraction states for EMG signals of normal subjects are shown in Table 5. It can be seen that among the three classifiers used in our experiments the fuzzy neural network with two Gaussian-shaped fuzzy membership functions for each input node yields the best classification rates and also the lowest MSE values averaged over the samples. Among the two other classifiers, feed forward neural network with one hidden layer and 20 neurons in the hidden layer performs better that fuzzy C-means both in classification rate and MSE of testing.

It can also be seen from the Table 2 that for the two feature sets of statistical and chaotic features, the chaotic features set which consists of largest Lyapunov exponent and approximate entropy describes the signals behavior better. This superiority is interpreted as the features characteristics in signals dynamics modeling. Therefore it can be inferred from the results given in Table 2 that by a fuzzy neural network we can model the dynamics of EMG signals with chaotic features better than the statistical features and this issue demonstrates the nonlinear complex dynamics of these biological signals. Table 3 shows the results of classification of three different signal classes by fuzzy neural network. Results demonstrate complex features are discriminative for signal classification. Improvement of the classification rate by adding complex features imply some dynamical features of the signals are finely represented by chaotic features.

DISCUSSION AND CONCLUSION

The EMG signals of biceps, deltoid, triceps, tibialis anterior and quadriceps muscles were recorded in three states of isometric contraction (ISO), maximum voluntary contraction (MVC) and dynamic contractions from 22 normal subjects aged between 20 and 30 (11 males and 11 females). Totally, 7 extracted features are analyzed to find the most discriminating features for muscle force classification. A multilayer perceptron with one hidden layer and 10 neurons in the hidden layer is trained with 70 percent of the recorded EMG cut off windows and then it is employed for classification and modeling purposes. It was found that the combinations of RMS+WL and RMS+MAV+WL yield the best result for the quadriceps muscle and for the biceps muscle the lowest MSE corresponds to the combination of MAV and VAR features. It was also inferred that the isometric contraction test, compared to the two other contractions, has lower MSE values in signal modeling so it is more discriminative and effective in EMG signals classification.

ACKNOWLEDGMENTS

The authors declare that this work has been supported financially by Borujerd Branch, Islamic Azad University, Borujerd, Iran.

REFERENCES

[1] Katsis, Christos D., Themis P. Exarchos, Costas Papaloukas, Yorgos Goletsis, Dimitrios I. Fotiadis, and Ioannis Sarmas. "A two-stage method for MUAP classification based on EMG decomposition." Computers in Biology and Medicine 37, no. 9 (2007): 1232-1240.

[2] M. Zardoshti-Kermani, B. C. Wheeler, K. Badie, and R. M. Hashemi, "EMG Feature Evaluation for Movement Control of Upper Extremity Prostheses," IEEE Trans. Rehabilitation Engineering, vol. 3, no. 4, pp. 324-333, Dec 1995, doi:10.1109/86.481972.

[3] Boostani, R., & Moradi, M. H. (2003). Evaluation of the forearm EMG signal features for the control of a prosthetic hand. Physiological Measurement, 24(2), 309–319.

[4] Phinyomark, A., Limsakul, C., & Phukpattaranont, P. (2009a). A novel feature extraction for robust EMG pattern recognition. Journal of Computing, 1(1), 71–80.

[5] Oskoei, M. A., & Hu, H. (2008). Support vector machine based classification scheme for myoelectric control applied to upper limb. IEEE Transactions on Biomedical Engineering, 55(8), 1956–1965.

[6] Zecca, M., Micera, S., Carrozza, M. C., & Dario, P. (2002). Control of multifunctional prosthetic hands by processing the electromyographic signal. Critical Reviews in Biomedical Engineering, 30(4–6), 459–485.

[7] Phinyomark, Angkoon, Pornchai Phukpattaranont, and Chusak Limsakul. "Feature reduction and selection for EMG signal classification." Expert Systems with Applications 39, no. 8 (2012): 7420-7431.

[8] B. Hudgins, P. Parker, and R. Scott, "A new strategy for multifunction myoelectric control," IEEE Trans. Biomed. Eng., vol. 40, no. 1, pp. 82–94, Jan. 1993.

[9] K. Englehart, B. Hudgins, and P. A. Parker, "A wavelet-based continuous classification scheme for multifunctionmyoelectric control," IEEE Trans. Biomed. Eng., vol. 48, no. 3, pp. 302–310, Mar. 2001.

[10] K. Englehart and B. Hudgins, "A robust, real-time control scheme for multifunction myoelectric control," IEEE Trans. Biomed. Eng., vol. 50, no. 7, pp. 848–854, Jul. 2003.

[11] N. Chaiyaratana, A. M. S. Zalzala, and D. Datta, "Myoelectric signals pattern recognition for intelligent functional operation of upper-limb prosthesis," in Proc. 1st Euro Conf. Disabil., Virtual Real. Assoc. Technol., U.K., 1996, pp. 151–160.

[12] T. C. Au and R. F. Kirsch, "EMG-based prediction of shoulder and elbow kinematics in able-bodied and spinal cord injured individuals," IEEE Trans. Rehabil. Eng., vol. 8, no. 4, pp. 471–480, Dec. 2000.

[13] B. Ajiboye and R. F. Weir, "A heuristic fuzzy logic approach to EMG pattern recognition for multifunctional prosthesis control," IEEE Trans. Neural Syst. Rehabil. Eng., vol. 13, no. 3, pp. 280–291, Sep. 2005.

[14] F. H. Y. Chan, Y. S. Yang, F. K. Lam, Y. T. Zhang, and P. A. Parker, "Fuzzy EMG classification for prosthesis control," IEEE Trans. Rehabil. Eng., vol. 8, no. 3, pp. 305–311, Sep. 2000.

[15] K. Kiguchi, T. Tanaka, K. Watanabe, and T. Fukuda, "Design and control of an exoskeleton system for human upper-limb motion assist," in Proc. IEEE/ASME Int. Conf. Adv. Intell. Mechatron. (AIM), 2003, pp. 926–931.

[16] M.Vuskovic and S. J.Du, "Classification of prehensile EMG patterns with simplified fuzzy ARTMAP networks," in Proc. Int. Joint Conf. Neural Netw., 2002, vol. 3, pp. 2539–2544.

[17] J. S. Han, Z. Z. Bien, D. J. Kim, H. E. Lee, and J. S. Kim, "Human–machine interface for wheelchair control with EMG and its evaluation," in Proc. 25th IEEE Int. Conf. Eng. Med. Biol. Soc., Mexico, Sep. 2003, pp. 1602–1605.

[18] Y. Huang, K. Englehart, B. Hudgins, and A. D. C. Chan, "A Gaussian mixture model based classification scheme for myoelectric control of powered upper limb prostheses," IEEE Trans. Biomed. Eng., vol. 52, no. 11, pp. 1801–1811, Nov. 2005.

[19] O. Fukuda, T. Tsuji, M. Kaneko, and A. Otsuka, "A human-assisting manipulator teleoperated by EMG signals and arm motions," IEEE Trans. Robot. Autom., vol. 19, no. 2, pp. 210–222, Apr. 2003.

[20] D. C. Chan and K. Englehart, "Continuous classification of myoelectric signals for powered prostheses using Gaussian mixture models," in Proc. 25th Ann. Int. Conf. Eng. Med. Biol. Soc., Mexico, Sep. 2003, vol. 3, pp. 2841–2844.

[21] C. Chan and K. Englehart, "Continuous myoelectric control for powered prostheses using hidden Markov models," IEEE Trans. Biomed. Eng., vol. 52, no. 1, pp. 121–124, Jan. 2005.

[22] Razjouyan J, Gharibzadeh S, Fallah A, Khayat O, Ghergherehchi M, Afarideh H, and Moghaddasi M, A Neuro-Fuzzy Based Model for Accurate Estimation of the Lyapunov Exponents of AN Unknown Dynamical System, International Journal of Bifurcation and Chaos 22:03, 2012.

Table 1. Extracted features of the recording EMG signals. (k: sample number and N: total number of samples)

Item	Features name	Features definition	Description
1	Integration of absolute of EMG signal	$IEMG = \sum_{k=1}^{N} \lvert emg_k \rvert$	Related to muscle activity
2	Mean Absolute Value of the signal	$MAV = \frac{1}{N}\sum_{k=1}^{N} \lvert emg_k \rvert$	Related to muscle contraction points
3	Root Mean Squared of the signal	$RMS = \sqrt{\sum_{k=1}^{N} emg_k^2}/N$	Related to muscle contraction indication with constant force before starting the muscle fatigue
4	Wave Length of the signal	$WL = \sum_{k=1}^{N-1} \lvert emg_{k+1} - emg_k \rvert$	-
5	Variance of the signal	$VAR = \frac{1}{N-1}\sum_{k=1}^{N} emg_k^2$	Related to the signal power
6	Zero Crossings of the signal	$ZC = \sum_{k=1}^{N} sgn(-emg_k emg_{k+1})$ $sgn(x) = \begin{cases} 1 & if\ x > 0 \\ 0 & otherwise \end{cases}$	For measuring the frequency shift and showing the number of signal sign varying
7	Simple Square Integral of the signal	$SSI = \frac{1}{N}\sum_{k=1}^{N} \lvert emg_k \rvert^2$	An indication of energy of the signal
8	Largest Lyapunov Exponents	LLE	Signal complexity and non-linearity
9	Mean Lyapunov Spectrum	MLS	Average dynamical complexity of signal

Table 2. Classification results of the three classifiers and two sets of features, MSE and C.R results are average values over the samples and classes respectively.

Classifier	Features	# of Classes	# of Samples	Ave. MSE	Ave. C.R
Feed Forward Neural Network	Statistical features	3	50	0.03	~90%
Feed Forward Neural Network	Chaotic features	3	50	0.02	~64%
Feed Forward Neural Network	All features	3	50	0.01	~91%
Fuzzy Neural Network	Statistical features	3	50	0.016	~90%
Fuzzy Neural Network	Chaotic features	3	50	0.012	~72%
Fuzzy Neural Network	All features	3	50	0.009	~93%
Fuzzy C-means	Statistical features	3	50	-	~84%
Fuzzy C-means	Chaotic features	3	50	-	~67%
Fuzzy C-means	All features	3	50	-	~90%

Table 3. Classification of three different classes of normal subjects, subjects with weakness and subjects with disorder with 5 features set.

Classifier	Features	# of Classes	# of Samples	Ave. C.R
Fuzzy Neural Network	RMS+WL+VAR	3	40	88.9%
Fuzzy Neural Network	LLE+MLS	3	40	89.4%
Fuzzy Neural Network	RMS+LLE	3	40	89.2%
Fuzzy Neural Network	RMS+WL+VAR+ LLE+MLS	3	40	90.7%

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Using Climatic Parameters to Determine the Suitable Area for Constructing Solar Power Plant in GIS Software

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Received: 24 Dec 2014 Revised: 11 Jan 2015 Accepted: 31 Jan 2015

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ABSTRACT

The main purpose of this study is to determine the best place for constructing solar power plants. Solar power is the conversion of sunlight into electricity, either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP). For this purpose GIS software is applied for analyzing the data of climatic parameters in Chaharmahal o Bakhtiari province in Iran.The most important parameters relating to absorbing sun energy which should be taken into account are: annual sunshine hours, the number of cloudy days, height, relative humidity and rainfall which provided by four whether stations in the area named Koohrang, Lordegan, Borujen and Shahrekord. The results show that the best area for solar power plant is the south of the province.

Keywords: solar power plant, climatic parameters, geographic information system. (GIS).

INTRODUCTION

The main purpose of this study is to determine suitable area for constructing solar power plants in Chaharmahal o Bakhtiari province in Iran by GIS software. Solar power is the conversion of sunlight into electricity, either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP). Concentrated solar power system uses lenses or mirrors and is a tracking system to focus a large area of sunlight into a small and powerful beam. Photovoltaic converts light into electric current using the photovoltaic effect.

GIS provides tools to collect and elaborate information in order to give to decision makers (Caiaffa, 2005) the widest and clearest possible set of information to operate onto and to perform the best possible choices. In simpler words, a GIS is a set of computer tools able to visualize, treat and analyze geographical data and also link them to databases,

thus allowing the production of clear and easy to analyses information through "dynamic maps"(Caiaffa, 2005; Pellegrino et al., 2008).

Commercial concentrated solar power plants were first developed in the 1980s. The 392 MW Ivanpah installation is the largest concentrating solar power plant in the world, located in the Mojave Desert of California. Other large CSP plants include the SEGS (354 MW) in the Mojave Desert of California, the Solnova Solar Power Station (150 MW) and the Andasol solar power station (150 MW), both in Spain. The two 550 MW solar farms, Topaz Solar Farm and Desert Sunlight Solar Farm in the United States, are the world's largest photovoltaic power stations (Pellegrino et al., 2008).There are some studies about solar power plant (Alsema et al., 2006; Fridleifsson et al., 2009; Reich-Weiser et al., 2008)

There are also many large plants under construction. The Desert Sunlight Solar Farm is a 550 MW power plant under construction in Riverside County, California, that will use thin-film CdTe-modules(Cadmium telluride photovoltaic's)by First Solar . The Blythe Solar Power Project is a 485 MW project under construction also in California. As of November 2014, the 550-Mega Watt Topaz Solar Farm is the largest photovoltaic power plant in the world.The Blythe Solar Power Project is a 485 MW project under construction also in California. As of November 2014, the 550-MegaWatt Topaz Solar Farm is the largest photovoltaic power plant in the world.The Geographic Information System (GIS) is a computer-based tool that enables users to perform spatial analyses through digital representations of a geographic area, combined with other geographically referenced information existing on the same area (Wyatt and Ralphs , 2003). Accordingly, it is useful to see the GIS as a tool for collecting, organizing and processing all the necessary information to assess the current status of the territory in order to plan its sustainable development (Caiaffa, 2003). In this plan the energy issue shouldn't be missed, also for its implications with the social, economical and environmental local frame.

METHODS

Case study

The study area is located in Chaharmahal o Bakhtiari province, in Iran, which is shown in Figure 1. The case study consists of four stations Koohrang in North West, Lordegan in South, Borujen in East and Shahrekord in North East.

The following data are used:

Topographic map sat a scale of 1: 250,000.
Co ordinates and characteristics of four meteorological stations (Table 1):
Monthly and annual climatic parameters. Some station's statistical data are shown in Table 2.

Inverse distance weighted (IDW)

Inverse distance weighted (IDW) interpolation determines cell values using a linearly weighted combination of a set of sample points. The weight is a function of inverse distance. The surface being interpolated should be that of aregionally dependent variable.

Each input point has local influence that diminishes with distance.
Estimates are averages of values at n known points within window.

$$Z(x) - \sum_i w_i z_i / \sum_i w_i \quad (1)$$

Where W is some function of distance.

$$w_i = 1/d_i^2 \quad (2)$$

The above formula is the simplest form of IDW which was introduced by Shepard (1968).

RESULTS

Sunshine hours

In order to prepare Sunshine hours pattern used the annual sunshine hours of weather stations are used.
In order to prepare sunshine hours value the corresponding data of the weather stations are used.
Weight of sunshine hours was shown in table 3. Also annual sunshine hours map pattern was shown in Fig. 2 and 3.

Cloudiness

When it's sunny and there is no cloud in the sky, much of the sun's energy reaches the earth. Weight of Cloudiness was shown in table 4. Also annual cloudiness map is shown in Fig.4 and 5.

Relative humidity

In order to provide relative humidity values, the average annual relative humidity is used.
Weight to relative humidity is shown in Table 5. Also relative humidity maps are shown in Fig.6 and 7.

Height (m)

In order to obtain height values the altitude of the meteorological stations is applied.
Weight of height is shown in table 6. Also relative humidity map was shown in Fig.8 and 9.

Rainfall

For determining the precipitation layers values, the data of the meteorology stations of the study area are used.
Weight of rainfall is shown in table7. Also rainfall maps are shown in Fig.10 and 11.
Finally total layers including annual sunshine hours, the number of cloudy days, height, humidity and rainfall are overlapped. The weighting of each of the layers is given in table 8.
Figure 12 shows a map of the region's potential. Based on Figure12 the best places for solar power plant is South of the province.

CONCLUSION

The aim of this study was determining suitable area for constructing solar power plants. To reach this goal the Geographic Information System (GIS) software is applied. The GIS is a computer-based tool that enables users to perform spatial analyses through digital representations of a geographic area, combined with other geographically referenced information existing on the same area. Information the Data of the weather stations including annual sunshine hours, the number of cloudy days, height, humidity and rainfall are used. In the study area four stations data are used (Koohrang, Lordegan, Borujen and Shahrekord). The results show that the best places for building solar power plant is south of the province.

REFERENCES

1. Alsema, E.A.; Wild - Scholten, M.J. de; Fthenakis, V.M. Environmental impacts of PV electricity generation - a critical comparison of energy supply options ECN, September 2006; 7p. Presented at the 21st European Photovoltaic Solar Energy Conference and Exhibition, Dresden, Germany, 4–8 September 2006
2. Caiaffa E., "Geographic Information Science for geo-knowledge-based governance", Proceedings of the 8th Agile Conference on Geographic Information Science, May2005, Estoril, Portugal, pp. 659-664.
3. Caiaffa E., "Geographic Information Science in Planning and in Forecasting", IPTS Report, JRC Seville, July 2003, vol, 76, pp.36-41.
4. Fridleifsson, Ingvar B.; Bertani, Ruggero; Huenges, Ernst; Lund, John W.; Ragnarsson, Arni; Rybach, Ladislaus (11 February 2008). O. Hohmeyer and T. Trittin, ed. "The possible role and contribution of geothermal energy to the mitigation of climate change" (pdf). IPCC Scoping Meeting on Renewable Energy Sources. Luebeck, Germany. pp. 59–80. Retrieved 6 April 2009.
5. Pellegrino, M. Caiaffa, E. Pollino, M. Grassi, A. Corbella. L. ISES-AP-08 - 3rd International Solar Energy Society Conference, Asia Pacific Region, Proceedings, 2008
6. Reich -Weiser, C. Dornfeld, D. and Horne. S. Environmental assessment and metrics for solar: Case study of solfocus solar concentrator systems. UC Berkeley: Laboratory for Manufacturing and Sustainability, 8 May 2008.
7. Shepard D, 1968, A two-dimensional interpolation function for irregularly-spaced data. In: ACM 68: Proceedings of the 1968 23rd ACM national conference. ACM, New York, USA, 517-524.
8. Wyatt P, Ralphs M, "GIS in Land and Property Management", Spon Press (UK), 1st May 2003, p.390.

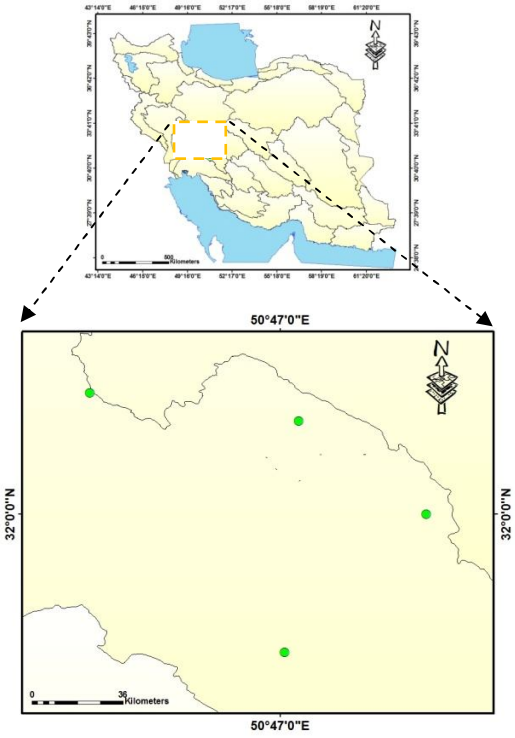

Figure1. Location of the study area

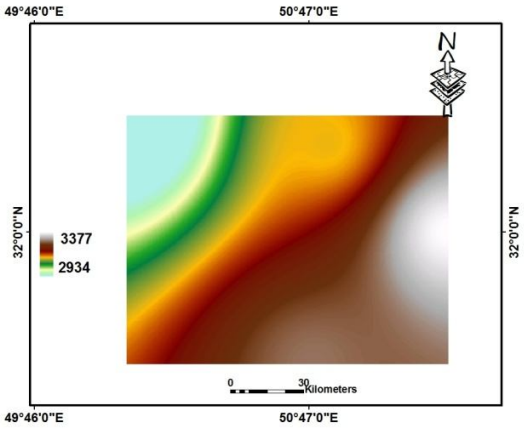

Figure 2.Sunshine hours map of the study area

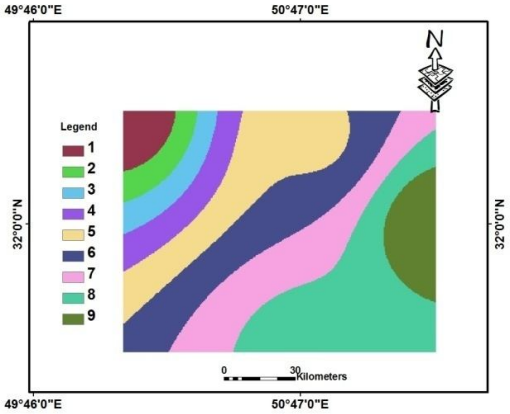

Figure 3 . Classes of sunshine hours map in the study area

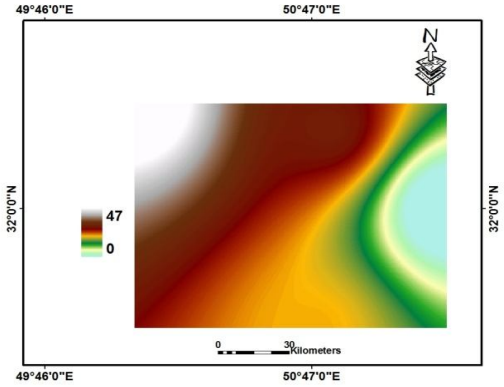

Figure 4. Cloudy days' map of the study area.

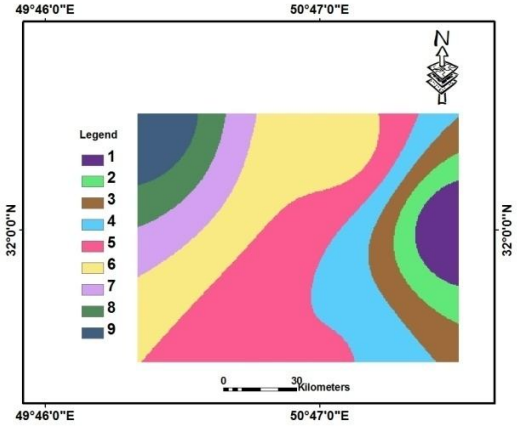

Figure 5. Classes of cloudy days map in the study area

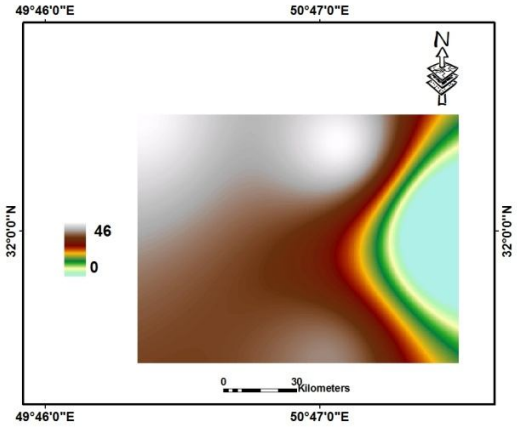

Figure 6. Map of Relative humidity for the case study

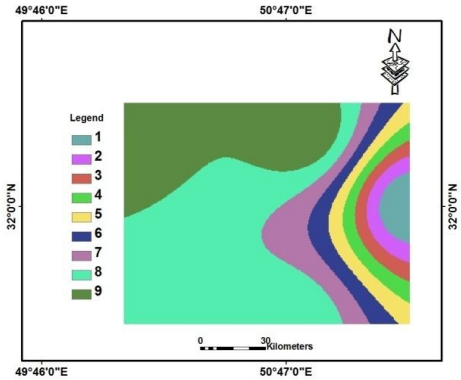

Figure 7. Classes of relative humidity map in the study area

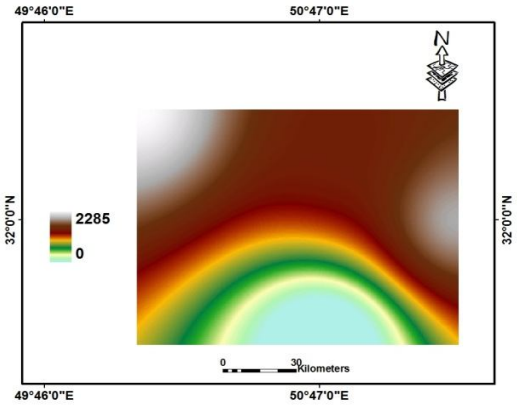

Figure 8. Map of the height for the case study

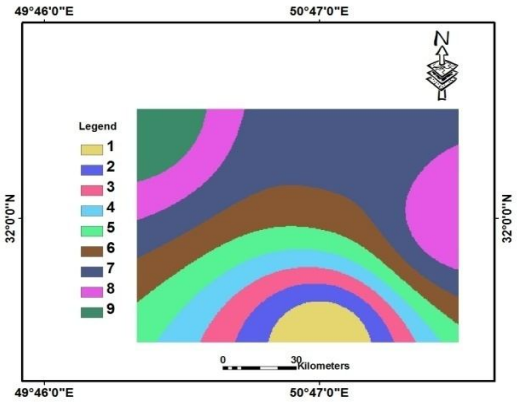

Figure 9. Classes of height map in the study area

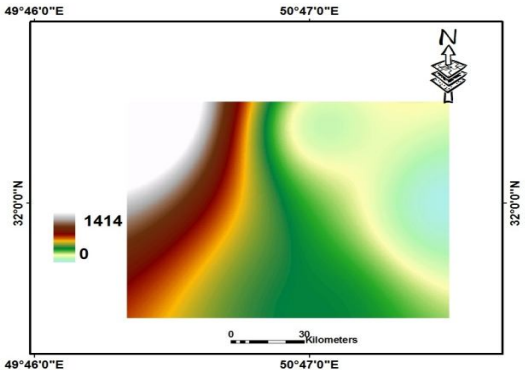

Figure 10. Map of rainfall for the case study

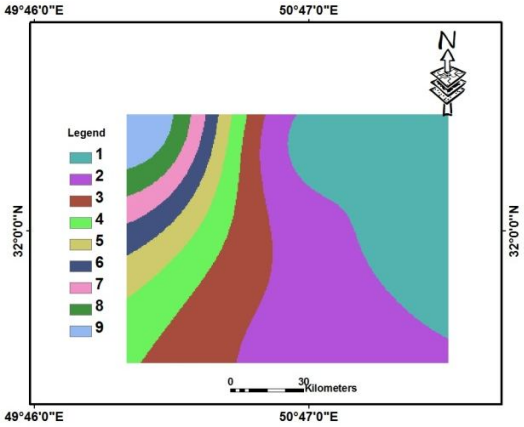

Figure 11. Classes of rainfall map in the study area

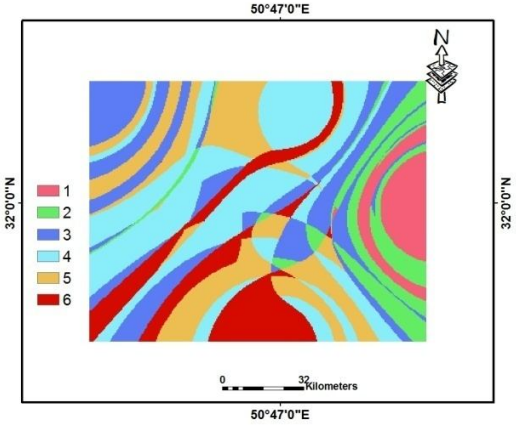

Figure 12. Map of potential areas for constructing power plant station

Table1: Characteristics of stations (Meteorological Organization of Chaharmaha lo Bakhtiari province)

Koohrang	Lordegan	Borujen	Shahrekord	Station name
32 - 26″	31- 31″	32- 00″	32- 20″	Latitude
50 - 07″	50 -48″	51 -18″	50 -51″	Longitude
Mountain	Plain	Plain	Plain	Situation of region's nature
Semi-Steppe	Oak Forest	Steppe	Steppe	Vegetation

Table 2: Climatic parameters in case study area

Koohrang	Lordegan	Borujen	Shahrekord	Station name
1414	475	245	319	Rain (mm)
46	45	38	46	Relative humidity
2879	3296	3377	3144	Annual sunshine hours
47	33	21	37	Number of total cloudiness days
2285	1564	2197	2061	Height above sea level(m)

Table 3: Amount of sunshine Hours and the weight applied to it

Weight	Sunshine(hours/year)
1	2934
2	2989
3	3045
4	3100
5	3155
6	3211
7	3266
8	3321
9	3377

Table 4: Shows the number of cloudy days and the weight applied to it

Weight	cloudy days
9	0-23
8	23-26
7	26-29
6	29-32
5	32-35
4	35-38
3	38-41
2	41-44
1	44-47

Table 5: Relative humidity and weight applied to

Weight	**Relative humidity**
9	0-38
8	38-39
7	39-40
6	40-41
5	41-42
4	42-43
3	43-44
2	44-45
1	45-46

Table6: The altitude and the weight applied to it

Weight	**Height (m)**
1	0-1644
2	1644-1724
3	1724-1804
4	1804-1884
5	1884-1964
6	1964-2044
7	2044-2124
8	2124-2204
9	2204-2285

Table 7: The amount of precipitation and the weight applied to it

Weight	**Rainfall (mm)**
9	0-375
8	375-504
7	504-634
6	634-764
5	764-894
4	894-1024
3	1024-1154
2	1154-1284
1	1284-1414

Table 8: Weight of the layers for the study area

Parameters	Sunshine	Height	Humidity	Cloudy days	Rainfall	Weight
Sunshine	1	2	3	4	5	0.42
Height	0.5	1	2	3	4	0.27
Humidity	0.33	0.5	1	2	3	0.16
Cloudy days	0.25	0.33	0.5	1	2	0.10
Rainfall	0.2	0.25	0.33	0.5	1	0.06

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

An Investigation of the Relationship between Trust in School and Organizational Citizenship Behaviour among the Teachers in Neishabour

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Received: 20 Dec 2014 Revised: 19 Jan 2015 Accepted: 27 Jan 2015

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ABSTRACT

The present study is correlation and aimed to evaluate the relationship between trust in school and organizational citizenship behavior. The study population is all the first of the high school teachers in Neishabour (1130 people). They were selected by random-stratified sampling method as 287 people (134 men, 153 women).The data were collected by two questionnaires of trust in school Hoy &Tschannen-Moran(2003) and Organizational citizenship behavior of Podsakoff et al., (1990). The data were analyzed using single t- test , Pearson correlation coefficient and stepwise regression were applied for data analysis. The results showed that there was a positive and significant association between trust in school and organizational citizenship behavior. The results of stepwise regression analysis showed that among trust in school dimensions, predictive dimensions of trusting co-workers 0.505 and trusting customer 0.392 predicted organizational citizenship behavior.

Keywords: Trust in school, Organizational citizenship behaviour, Teachers, Neishabour.

INTRODUCTION

Today, schools need the teachers not only doing their duties well but also going beyond it and helping more effectiveness of school, achieving teaching and learning goals. It is expected that the extra-role behaviors are increased by trust between school elements including teachers, principal, students and their parents. It can be said trust and organizational citizenship behavior are the most necessary aspects of a school and by entering the era of increasing responsiveness and reduction of resources, the importance of these two items is increased (McKenzie, 2011). Trust plays important role in this process and is a basic element for cooperative relations (Louis et al., 1996). Trust is a basic asset of organizations with high performance. The researchers showed that trust is associated with positive and supportive climate in school (Hofman et la., 1994). Based on review of literature, the trust-based relations create good learning environment and positive climate in school (Hoy, Gage & Tarter, 2006) and they are associated with school effectiveness and improving academic achievement of students (Smith , Hoy & Sweetland;2001). Recently, many researches focus on trust and outcomes of it in school (Godard, Tochman and Hoy, 2001; Tschannen-Moran 2004).

Although organizational citizenship behaviour has received much attention from the researchers, this concept is less considered in schools. The researchers regarding organizational citizenship behavior in schools showed that this concept is effective considerably on academic achievements of students (DiPaola and Hoy, 2005) and open school climate (DiPaola, &Tschannen-Moran).

The successful schools have teachers with extra-role duties (McKenzie, 2011). DiPaola and Hoy (2005) stated citizenship behaviour refers to the tendency of teachers to do the duties beyond their formal job. The teachers showing organizational citizenship behavior go beyond job role during teaching to help the students, peers, coworkers and others. According to DiPaola and Hoy (2005) and Dipaola, Tarter and Hoy (2005), the teachers with high organizational citizenship behavior help innovation sharing and they can be volunteer for extracurricular activities.

As it was said and based on the importance of trust in school and OCB and as it is less considered in school and as these two concepts have more positive organizational outcomes and help the school to fulfill its goals, teaching and learning, the researchers attempted to conduct a study regarding the relationship between trust in school with OCB among teachers of Neishabour town. At first, we consider trust in school and its dimensions and then OCB is discussed. Later, review of literature regarding trust in school and OCB is discussed.

Organizational citizenship behaviour

The organizational citizenship behaviour was applied for the first time by Organ in 1983 to evaluate the relationship between job satisfaction and performance. Before him, Bernard expressed excitation to cooperation and Katz and Kahn by spontaneous, cooperative and supportive behaviors considered this issue (Abily et al., 2009). Vigoda et al., (2007) showed that OCB includes informal and voluntarily aids doing without considering the formal rewards as a free person or don't do them (Sobhaninejad et al., 2010). The results of study showed that managers can develop OCB by creating or improving positive work place. In other words, instead of resorting to force, they can rely on selection, employment or sociability to create these behaviours in work place (Ternispid and morkison cited in Sobhaninejad et al., 2010).

According to DiPaola and Tschannen-Moran (2001) the success of educational institutions depends upon the tendency of teachers to go beyond their duties and help the fulfillment of educational institution goals.

Based on this issue, educational managers attempt to motivate the teachers to be involved in such behaviors (OCB) (Hargerious and Iwans cited in Oplatka , 2006). This causes that educational institutions have the teachers going beyond the minimum formal expectations of their job and they resort to the goals and values of school (Oplatka, 2006). According to DiPaola and Tschannen-Moran (2001), such teachers help each other to share educational ideas with their co-workers and help the other teachers with the details of their duties and it is useful for the goals of educational organization as presenting service to students and improving their learning. Researchers referred to various components for OCB and the most practical one is Organ (1988) as 5 concepts including Altruism, Conscientiousness, Civic virtue , Sportsmanshipand Courtesy .

Indeed, the trust in an organization including school creates the background to express many useful organizational variables helping the fulfillment of organizational goals. Various researchers indicate the positive relation between trust and OCB (Robinson& Morrison, 1995; Van Dyne et al., 2000; Bulent 2000, MacKenzie et al., 2001; Wech and Aryee 2002; Korsgard et al., 2002; Denholm 2002; Wech 2002; Wong, Ngo, & Wong 2003; Tschannen-Moran 2003; Dolan, STzafrir, & Baruch 2005; DiPaola and Hoy, 2005; Chiaburu& Lim 2008;Altuntas& Baykal, 2010; Rubin, Bommer, &Bachrach 2010; MacKenzie 2011; Ayla, Müge 2012; Yilmaz, &Yahya 2012; Taleghani and Rezayimehr, 2013) and each of them are explained later.

MacKenzie et al., (2001) in a study showed that trusting manager is associated positively with sportsmanship behaviors of employees. Aryee et al., (2002) in a study found that trusting the supervisors is associated with the expression of OCB. Korsgaardet al., (2002) in their study found that there is a positive association between trusting manager and OCB. According to another study Chiaburu& Lim (2008) associated the relationship between manager trust, interactive justice and OCB among 142 subordinates and 18 supervisors in a company in US. The results of the study showed that by controlling trust to manager, interactional justice can predict OCB. In addition, the results showed that besides controlling interactional justice, trusting the manager can predict OCB of employees. They found that trusting in manager compared to interactional justice predicted OCB more. Altuntasand Baykal (2010) conducted a stud y “Relationship between organizational trust of nurses and their OCB”. In this study, 482 nurses of 11 hospitals in Istanbul were selected as sample. The results of the study showed that the trust of nurses in managers, co-workers and organization affects their OCB. In other words, there was a positive and significant association between OCB of nurses and trusting managers, co-workers and organization.

Following another study Rubin, Bommer&Bachrach(2010), the intermediary effect of trust on leader behaviours and OCB was investigated among 474 employees working in manufacturing companies. The results of the study showed that trust had intermediary role in relationship between leader behaviors and OCB of employees. In other words, based on trust, OCB of employees is increased.

MacKenzie (2011) in his study evaluated the relationship between trust and OCB among the teachers of 112 schools in Texas. The study findings showed that there was a positively significant association between trust and its dimensions with OCB. Also, the results showed that trust in customers and co-workers are significant predictors of OCB. In addition, the findings showed that trust in co-workers was the best predictor for OCB.

In another study of Ayla and Muge (2012), it was found that there is a positive and significant association between organizational trust and OCB. In addition, the study findings showed a significant and negative association between self-centeredness and OCB and between self-centeredness and organizational trust, it means that by increasing self-centeredness, OCB of employees and organizational trust are reduced. The results showed that self-centeredness had significant effect on relationship between organizational trust and OCB.Yilmaz and Yahya (2012) conducted a study “ relationship between organizational justice, organizational trust and OCB among 466 teachers in high schools of Turkey. The results of study showed the positive relation between organizational trust and its dimensions, trust in co-workers, managers and stockholders with OCB. The results also showed the trust in co-workers, manager and

stockholder predict OCB of teachers respectively. Also, according to Taleghani and Rezayimehr (2013), there was a positive and significant relation between trust and OCB.

Based on the grounds and as trust is one of the important factors in OCB, it fulfills organizational goals better, the present study evaluated the relationship between trust in school and OCB among teachers in Neishabour town. The following four hypotheses are responded as:

The trust in school condition and its dimensions are relatively good among teachers in Neishabour town.The organizational citizenship behavior condition and its dimensions are relatively good among teachers in Neishabour town.There is as significant association between trust in school and its dimensions with organizational citizenship behaviour of teachers.There is a multiple significant association between trust in school dimensions with organizational citizenship behaviour.

Study method

As the present study evaluates the relationship between variables, trust in school and OCB of Neishabour city teachers, the study method is correlation and it is applied study.

Study population, sample and sampling method

This study population is including all the first of high school teachers in Neishabour town and based on the latest information from education organization in Neishabour town, they are 1130 (men: 530, women: 600). At first, stratified sampling is used and in second stage, simple random sampling method is used. By Cochran's formula, the sample size was 287, of which 134 men and 153 women were selected as the study sample.

Measures

Two questionnaires are used in the present study:

Trust in school of Hoy &Tschannen-Moran (2003)

Hoy &Tschannen-Moran (2003)designed a survey to evaluate trust in school with three dimensions (trust in manager, trust in co-worker and trust in customer) and it is composed of 26 questions. Trust in manager 8 questions, trust in co-workers 8 questions and trust in customer 10 questions. This survey is designed based on 5-item Likert scale ranging strongly disagree to strongly agree. The researches showed high reliability (above 0.90) for this measure. For example, MacKenzie (2011) in his study reported trust in manager with reliability 0.98, trust in co-worker with reliability 0.93 and trust in customer with reliability 0.94. As the environment of survey is changed and it is translated into Persian language, it is required to calculate its reliability again.

Organizational citizenship behavior of Podsakoff et al., (1990)

We use Podsakoff et al., (1990) survey to evaluate organizational citizenship behaviour in this study. This scale is based on 5- item model of Organ (1988) including: Sportsmanship, Altruism, Civic virtue , Conscientiousness and Courtesy. The measure is including 24 questions, of which altruism 5 questions (5, 10, 20, 24), Conscientiousness 5 questions (1, 6, 11, 16, 21), Sportsmanship 5 questions (2, 7, 12, 17, 22), Courtesy 5 questions (4, 9, 14, 19, 23) and civic virtue 4 questions (3. 8, 13, 18).Podsakoff et al., (1990) reported computed Cronbach's alpha coefficient for each of

OCB dimensions as: Altruism 0.85, Conscientiousness 0.82, sportsmanship 0.85, courtesy 0.85 and civic virtue 0.70 (Nam, 2003:76).

Data analysis methods

To respond the study questions and data analysis, descriptive statistics as mean, frequency and percentage are used and inference statistics as single t-test, correlation coefficient and stepwise regression are used.

Data analysis

Based on the first hypothesis of the study "The trust in school condition and its dimensions are relatively good among teachers in Neishabour town?" As 5 -item Likert scale is used, 3 is used as the standard mean. The results of the study showed that observed t is greater than critical value at the level ($P<0.05$), null hypothesis is rejected. Based on the results, the trust in school with mean 3.27 and standard deviation 0.595 at relatively good was significant statistically (Table 1). The results of the study showed that trust dimensions in co-workers (mean:3.24, SD:0.605), trust in manager (mean 3.33, SD:0.730) and trust in customer (mean:3.24, SD:0.834) at relatively good condition are significant statistically (Table 1).

Regarding the third hypotheses of the study "There is as significant association between trust in school and its dimensions with organizational citizenship behaviour of teachers?" The results of Table 3 showed that there is a significant association between trust in school and OCB of teachers in Neishabour city. Correlation coefficient between trust in school and OCB of teachers in Neishabour city is 0.756. In other words, the higher the trust in life from the view of teachers in Neishabour city, the more their organizational citizenship behaviour.

Also, the results of Table 3 showed that there is a positive and significant association between trust in co-workers, trust in manager and trust in customer with OCB of teachers in Neishabour city. Correlation coefficient between trust in co-workers, trust in manager and trust in customer with OCB of teachers in Neishabour city is 0.722, 0.447 and 0.671, respectively. In other words, the higher the trust in co-workers, trust in manager and trust in customer among teachers in Neishabour city, the higher their OCB.

Regarding the fourth hypothesis of the study "There is a multiple and significant association between trust in school dimensions (trust in manager, trust in co-workers, trust in customer) with organizational citizenship behavior of teachers?"

Stepwise regression is used to determine the relative share of predictive variables between the trust in school in prediction of organizational citizenship behavior of teachers in Neishabour city. Predictive values of trust in school (trust in manager, trust in co-workers, trust in customer)and the fields with highest share in prediction of OCB of teachers in Neishabour city are determined.

In first step, trust in co-workers entered the equation and 0.722 of organizational citizenship behavior among the primary school teachers in Neishabour city were predicted by this variable.

In the next step, trust in co-workers and trust in customer entered the equation simultaneously. The results of the study showed that by entering trust in customer, trust in co –worker share is reduced from 0.722to 0.505 and the share of each of trust in co-workers and trust in customer variables were 0.505 and 0.392, respectively. Indeed, the results of the table in step 2 showed that trust in co-worker variable predicted 0.722 and trust in customer predicted 0.392 of organizational citizenship behaviour among the teachers in Neishabour (Tables 4, 5).

DISCUSSION AND CONCLUSION

The present study is aimed to evaluate the relationship between trust in school and its dimensions (trust in manager, trust in co-workers, and trust in customer) with organizational citizenship behavior among the teachers in Neishabour city. Four hypotheses were explained as follows:

Regarding the first and second hypotheses of the study "The trust in school condition and its dimensions are relatively good", managers and authorities of education by required preparation can improve trust in school to increase OCB of teachers.

Regarding the third hypothesis of the study "there is a significant association between trust in school and its dimensions (trust in manager, trust in co-workers, and trust in customer) with organizational citizenship behavior of teachers", the results showed that there is a positive and significant association between trust in school and organizational citizenship behavior of teachers. In other words, it can be said that the higher the trust in school, the more their organizational citizenship behavior. The results of the study are in line with the study of Robinson& Morrison, 1995; Van Dyne et al., 2000; Bulent 2000,Aryeeet al.,2002; MacKenzie et al., 2001Korsgard et al., 2002; Wech 2002; Wong, Ngo, & Wong 2003; Tschannen-Moran 2003; Dolan, STzafrir, & Baruch 2005; DiPaola and Hoy, 2005; Ayla, Müge 2012 and Taleghani and Rezayimehr 2013.

It can be said that trust in school causes that school elements get nearer and to have intimate relations. According to Tschannen-Moran (2004), trust links all school elements and as oil it reduces friction and facilitates easy operation in school. Such intimate climate is created by trust between elements of school and it causes that school elements help each other if necessary and share their experiences with less risk and are absent rarely and use their time optimally, they work with each other and emphasize more on their professional activities than personal activities. It can be said that trust in school causes that its elements act as a team and have high effectiveness in their duties. According to Bryck, & Schneider (2002), in the schools with high trust, it is more probable that the academic achievement of students is increased. It can be said high trust creates a climate in which teachers act for extra-role and from this view, effectiveness of school, more success of students is increased.

The results of study showed that there is a positive and significant association between trust in school dimensions (trust in manager, trust in co-workers, and trust in customer) with organizational citizenship behavior. Based on study results, it can be said that by increasing trust in school dimensions, trust in co-workers, principal of school and students and their parents, the extra-role activities are increasingly done by teachers. The results of this study are in line with the studies of Denholm (2002) regarding the positive and significant association between three dimensions of trust in school with OCB, Chiaburu& Lim (2008) regarding the relationship between trust in manager and OCB from employees, Altuntas& Baykal (2010) regarding the positive and significant association between trust in co-workers, manager and organization with OCB, Rubin, Bommer, &Bachrach(2010) regarding the relationship between trust in leader and OCB, MacKenzie (2011) and Yilmaz, &Yahya (2012) regarding the relationship between three dimensions of trust, trust in co-worker teachers, trust in principal of school and trust in students and parents with OCB.

It can be said that a climate of trust in school causes that there is a consistency between elements of school. The climate in which all people consider each other and rely on each other under hard conditions.MacKenzie (2011) stated that trust in principal of school can affect knowledge sharing and collaboration in school. It can be said that one of the features of school with high performance is the trust between school elements. It can be said that trust-based relations between school elements, manager, teachers, students and parents lead to improving learning opportunities and it is the aim for which the schools are created for it.

DiPaola and Hoy (2005) showed that trust among the co-workers create a climate in which OCB is facilitated. In other words, the climate in which co-workers trust in each other causes that they show more altruism behaviors and accept high risks and share new ideas with each other. The importance of trust among teachers in school is as the trust among them causes that they are united to fulfill a common aim, the education of students. To do this, they are informed of each other plans and share teaching methods and they create a positive climate in school in which teaching general level is increased in school. On the other hand, the teachers should believe in the capabilities of their students and attempt more to actualize their talents. The main purpose of education is that all students be successful and learn. In other words, trust in students causes that teachers make more efforts to actualize their talents. The students and parents should attract teachers trust with good intention and efforts.

Regarding the fourth hypothesis" There is a multiple significant association between "trust in school and its dimensions (Trust in manager, trust in co-workers and trust in customer) with OCB, the study results showed that among trust in school, two dimensions of trust in co-workers and trust in customers can predict 0.505 and 0.392 of OCB of teachers. The results showed that trust in co-workers is the best predictor of OCB of teachers. Also, the results showed that trust to principal of school can not be a good predictor to show OCB among primary school teachers.

It can be said that principal of school can affect creating a climate of trust in school and a centralized climate on students is created. However, she can not oblige the teachers to trust in other school elements or oblige them to show OCB. Indeed, teachers are free to establish trust-based relations to have trust in school elements. Based on the definition of organizational citizenship behavior, citizenship behaviors are beyond the minimum expectations being obliged to do them, the expectations the manager can interfere in the work of teachers. As it was said, compared with other trust dimensions (trust in co-workers and trust in customers), the trust in principal of school cannot predict OCB of teachers.

REFERENCE

1. Abili, Khodayar; Shateri, Karim; Yuzbashi, Alireza; Farajidesorkhi, Hatam. 2008. OCB: Features, dimensions, pre-requirement and outcome variables. The articles of first conference of OCB. Management school of Tehran University.
2. Sobhaninejad, Mehdi; Yuzbashi, Alireza; Shateri, Karim. 2010. OCB (theoretical basics, correlated, evaluation tools), Tehran: Yastarun.
3. Shateri, Karim; Yuzbashi, Alireza; Zamanimanesh, Hamed. 2012. Evaluation of OCB of experts in Tehran University by combined research methods. Leadership and educational management journal. Year 6, NO. 4, p. 61-80.
4. AloinLv, XiuoinShen, Yongfu Cao, Yonggang Su, And XiaoyangChen(2002). Conscientiousness and organizational citizenship behavior: the mediannng role of organizanonal justice, Social Behavior and Personality, 40, 8.
5. Altuntas, S., & Baykal, U. (2010). Relationship between nurses' organizational trust levels and their organizational citizenship behaviors. Journal of Nursing Scholarship, 42(2), 186-194.
6. Aryee, S., Budhwar, P. S., & Chen, Z. X. (2002). Trust as a mediator of the relationship between organizational justice and work outcomes: Test of a social exchange model. Journal of Organizational Behavior, 23(3), 267-285.
7. AylaZehraÖncer, MügeLeylaYildiz(2012).Narcissism as a Moderator of the Relationship between rganizational Trust andOrganizational Citizenship Behaviour. International Journal of Business and Social Science Vol. 3 No. 21;
8. Bryck, A. S., & Schneider, B. (2002). Trust in schools: A resource of school improvement. New York: Russell Sage Foundation.

9. Bulent, M. (2000). An empirical investigation of a social exchange model of organizational citizenship behaviors across two sales situations: A Turkish case. The Journal of Personal Selling and Sales Management, 20(4), 205-214.
10. Chiaburu, D. S., & Lim, A. S. (2008). Manager trustworthiness or interactional justice? Predicting organizational citizenship behaviors. Journal of Business Ethics, 83, 453-467.
11. Cosner, S. (2005). Towards a human capital development strategy: Uncovering the approaches used by a high school principal to support teacher learning. In W.K. Hoy & C. Miskel (Eds.), Theory and research in educational administration: Educational leadership and reform(pp. 233-264). Greenwich, CT: Information Age Publishing
12. Denholm, P. J. (2002). A study of organizational citizenship behavior and trust in a public high school. Doctoral dissertation. Wilmington College, Delaware.
13. DiPaola, M. F., & Hoy, W. K. (2005). Organizational citizenship of faculty and achievement of high school students. High School Journal, 88(3), 35-44.
14. DiPaola, M. F., & Hoy, W. K. (2005). School characteristics that foster organizational citizenship behavior. Journal of School Leadership, 15, 387-406.
15. DiPaola, M. F., &Tschannen-Moran, M. (2001). Organizational citizenship behavior in schools and its relationship to school climate. Journal of School Leadership, 11, 424-447.
16. DiPaola, M. F., Tarter, C. J., & Hoy, W. K. (2005). Measuring organizational citizenship of schools: The OCB scale. In W. K. Hoy & C. Miskel (Eds.), Educational leadership and reform(pp. 319-341). Greenwich, CT: Information Age Publishing.
17. Dolan, S. L., Tzafrir, S. S., & Baruch, Y. (2005). Testing the causal relationships between procedural justice, trust and organizational citizenship behavior. Revue de Gestion des RessourcesHumaines, 57, 79-89.
18. Dorothea W. A. (2012). Relationship motives, personality, and organizational citizenship behavior in academic staffs in indonesia. International Journal of Business and Social Scienece. Vol 3. No. 20
19. Forsyth, P. B., Barnes, L. L. B., & Adams, C. M. (2006). Trust-effectiveness patterns in schools. Journal of Educational Administration, 44(2), 122-141.
20. Fukuyama, F. (1995). Trust: The social virtues and the creation of prosperity. New York: Free Press
21. Goddard, R. D., Tschannen-Moran, M., & Hoy, W.K. (2001). Teacher trust in students and parents: A multilevel examination of the distribution and effects of teacher trust in urban elementary schools. Elementary School Journal, 102(1), 3-17.
22. Goddard, R., Salloum, S., and Berebitsky, D. (2009). Trust as a mediator of the relationships between academic achievement, poverty and minority status: Evidence from Michigan's public elementary schools. Educational Administration Quarterly. 45 (2), p. 292-311.
23. Hoffman, J., Sabo, D., Bliss, J., & Hoy, W. K. (1994). Building a culture of trust. Journal of School Leadership, 4, 484-501
24. Hosmer, L. T. (1995). Trust: The connecting link between organizational theory and philosophical ethics. Academy of management Review, 20(2). 379-403.
25. Hoy, W. K., &Kupersmith, W. J. (1985). The meaning and measure of faculty trust. Educational and Psychological Research, 5, 1-10.
26. Hoy, W. K., &Tschannen-Moran, M. (2003). The conceptualization and measurement of faculty trust in schools. In W. K. Hoy & C. Miskel (Eds.), Studies in leading and organizing schools (pp. 181-207). Greenwich, CT: Information Age Publishing.
27. Hoy, W. K., Gage, C.Q., & Tarter, C.J. (2006). School mindfulness and faculty trust: Necessary conditions for each other? Educational Administrative Quarterly, 42(2), 236-255.
28. Kochanek, J. R. (2005). Building trust for better schools: Research based practices. Thousand Oaks, CA: Corwin Press.

29. Korsgard, M. A., Brodt, E. S., & Whitener, M. E. (2002). Trust in the face of conflict: The role of managerial trustworthy behavior and organizational context. Journal of Applied Psychology, 87(2), 312-319.
30. Levy, P.S. &Lemeshow, S.(1999). Sampling of population. John Wiley, Newyork.
31. Louis, K S., Kruse, S., & Marks, H. M. (1996). School-wide professional community: Teachers' work, intellectual quality and commitment. In F. W. Newman & Associates (Eds.), authentic achievement: Restructuring schools for intellectual quality (pp. 179-203). San Francisco: Jossey-Bass.
32. MacKenzie, S. B., Podsakoff, P., & Rich, G. A. (2001). Transformational and transactional leadership and salesperson performance. Academy of Marketing Science Journal, 29(2), 115-135.
33. McKenzie S. G.(2011). Trust and organizational citizenship: a study of the relationship of the three referents of trust and the organizational citizenship of elementary school teachers. Doctoral dissertation.University of Texas at San Antonio. College of education and human development department of educational leadership.
34. Oplatka, I. (2006). Going Beyond Role Expectations: Toward an Understanding of the Determinants and Components of Teacher Organizational Citizenship Behavior, Educational Administration Quarterly, 42(3), 385-423
35. Robinson, S. L., & Morrison, E. W. (1995). Psychological contracts and OCB: The effect of unfulfilled obligations on civic virtue behavior. Journal of Organizational Behavior, 16(3), 289-298.
36. Rousseau, D. M., Sitkin, S. B., Burt, R. S., &Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. The Academy of Management, 23(3), 393-404.
37. Rubin, R. S., Bommer, W. H., &Bachrach, D. G. (2010). Operant leadership and employee citizenship: A question of trust? Leadership Quarterly, 21(3).
38. Scarborough, C. S. (2005). Aspects of school Mindfulness and dimensions of faculty trust: Social processes in elementary schools. Doctoral dissertation. The University of Texas at San Antonio. San Antonio.
39. Shaw, R.B. (1997). Trust in the balance: building successful organizations on results, integrity, and concern. San Francisco: Jossey- Bass Publishers.
40. Smith, P. A., Hoy, W. K., &Sweetland, S. A. (2001). Organizational health of high schools and dimensions of faculty trust. Journal of School Leadership, 11, 135-151.
41. Taleghani1, M. &Rezaee, R. M. (2013). The Relationship between Servant Leadership and Organizational Citizenship Behavior in Executive Organizations of Guilan Province. Journal of Basic and Applied Scientific Research. J. Basic. Appl. Sci. Res., 3(1)910-917.
42. Tschannen-Moran, M. (2003). Fostering organizational citizenship: Transformational leadership and trust. In W. K. Hoy & C. J. Miskel (Eds.), Studies in leading and organizing schools (pp157-179). Greenwich, CT: Information Age.
43. Tschannen-Moran, M. (2004). Trust matters: Leadership for successful schools. San Francisco: Jossey-Bass.
44. Tschannen-Moran, M., & Hoy, W. K. (1998). A conceptual and empirical analysis of trust in schools. Journal of Educational Administration, 36(1), 334-352.
45. Tschannen-Moran, M., & Hoy, W. K. (2000). A multidisciplinary analysis of the nature, meaning and measurement of trust. Review of Educational Research, 70(4), 547-593.
46. Tyler, T., &Degoey, P. (1996). Trust in organizational authorities: The influence of motive attributions on willingness to accept decisions. In R. Kramer & T. Tyler (Eds.), Trust in organizations: Frontiers of theory and research (pp. 331-356). Thousand Oaks, CA: Sage
47. Van Dyne, L., Vandewalle, D., Kostova, T., Latham, M. E., & Cummings, L. L. (2000). Collectivism, propensity to trust, and self-esteem as predictors of organizational citizenship in a non-work setting. Journal of Organizational Behavior, 21(1), 3-17.
48. Wech, B. A. (2002). Trust context: Effect on organizational citizenship behavior, supervisory fairness, and job satisfaction beyond the influence of leader-member exchange. Business and Society, 41(3), 353-360.

49. Whitener, E. M., Brodt, S. E., Korsgaard, M. A., & Werner, J. M. (1998). Managers as initiators of trust: An exchange relationship framework for understanding managerial trustworthy behavior. Academy of management Review, 23, 513-530.
50. Wong, Y.T., Ngo, H.Y., & Wong, C.S.(2003). Antecedents and outcomes of employees' trust in Chinese joint ventures. Asia Pacific Journal of Management, 20: 481-499.
51. Yılmaz, Kursad&Tasdan, Murat(2009). Organizational citizenship and organizational justice in Turkish primary schools, Journal of Educational Administration, Vol. 47 No. 1, pp. 108-126
52. Yilmaz,Kursad&YahyaAltinkurt(2012), The Relationship between Organizational Justice, Organizational Trust and Organizational Citizenship Behaviors in Secondary Schools in Turkey. Advances in Educational Administration. V. 13
53. Youngs, P., & King, M.B. (2002). Principal leadership for professional development to build school capacity. Educational Administration Quarterly, 38(5), 643-670.

Table 1- The comparison of trust in school and its dimensions among the teachers in Neishabour city with the mean 5 value range (m=3)

Variable	Mean	SD	T	sig	Condition
Trust in school	3.27	0.595	7.75	0.000	Relatively good
Trust in co-worker	3.24	0.605	6.97	0.000	Relatively good
Trust in manager	3.33	0.730	7.77	0.000	Relatively good
Trust in customer	3.24	0.834	4.90	0.000	Relatively good

Table 2- The comparison of OCB and its dimensions among the teachers in Neishabour city with the mean 5 value range (m=3)

Variable	Mean	SD	T	sig	Condition
OCB	3.24	0.695	6.08	0.000	Relatively good
Altruism	3.24	0.753	5.59	0.000	Relatively good
Sportsmanship	3.45	0.719	10.74	0.000	Relatively good
Courtesy	3.22	0.777	4.90	0.000	Relatively good
Civic virtue	3.15	0.932	2.80	0.005	Relatively good
Conscientiousness	3.14	0.831	2.96	0.003	Relatively good

Table 3 - The correlation coefficient between trust in school and its dimensions with organizational citizenship behavior of teachers in Neishabour city

Criterion variable	Predictive variable	Correlation coefficients	Significance level	N
Trust in school	OCB	0.756	0.000	287
Trust in co-worker		.722	0.000	
Trust in manager		.447	0.000	
Trust in customer		0.671	0.000	

Table 4 :The results of ANOVA

	SS	df	MS	F	Sig
Regression **residual** **total**	72.05 66.29 138.35	1 285 286	72.05 0.233	309.751	0.000
Regression **residual** **total**	86.791 51.561 138.352	2 284 286	43.396 0.182	239.023	0.000

Table 5: Regression analysis to determine the share of trust in school dimensions in predicting organizational citizenship behavior of teachers in Neishabour town

Step	Variable		2		eta		sig
First	Trust in co-workers	722	.521	.829	722	7.60	0.000
Second	Trust in co-workers	.792	.627	580	.505	1.61	0.000
	Trust in customer			326	392	.00	0.000

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Evaluation of Nutritional, Anti-Nutritional and Bioactive Compounds in Juice and Powder of *Stevia rebaudiana*

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Received: 18 Dec 2014 Revised: 9 Jan 2015 Accepted: 31 Jan 2015

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ABSTRACT

The study aimed to estimate the nutritional, anti-nutritional and bioactive compounds in juice and dried powder of *Stevia rebaundiana* leaves. The energy, carbohydrate, protein, fat and total ash content (332.22, 72.60, 8.17, 1.02 and 10.72g% on dry weight basis) was found maximum in dried powder in comparison to juice. Mineral analysis shows high content of calcium, iron and phosphorus in the dried powder (470.33, 7.64 and 27.00 mg/100g). The anti-nutritional analysis revealed the presence of high concentration of phytate in juice (61.39mg/100 g) in comparison to dried powder which is high in tannin content 5.68mg/100g. Presence of bioactive compounds in leaves of *Stevia rebaudiana* showed that β-carotene (344.0µg/100g) was a major content in dried powder whereas the juice extract with comparatively higher amount of ascorbic acid (30.13mg/100g), chlorophyll (1.69mg/ml) and total phenolic content (85.56mg gallic acid equivalents (GAE)/100g). The DPPH radical scavenging activity of *Stevia rebaudiana* leaves was found to be higher in juice (86.90%) than dried powder (74.90%). The obtained results indicate that the composition of *Stevia rebaudiana* leaves in the form of dried powder and juice reflect a high nutritive value with tremendous source of natural antioxidants which has a significant potential to use as natural sweetener that possess health-promoting properties.

Key words: *Stevia rebaudiana*, proximate composition, minerals, anti-nutritional factors, bioactive compounds.

INTRODUCTION

Plants comprise a vital source of dynamic natural products which change widely in conditions of structure and biological properties. They have played an extraordinary role in the traditional medicine of different countries. Numerous investigations have revealed that many medicinal plants have high total antioxidant activities due to presence of some bioactive compounds like phenolic, carotenoids, tannins, alkaloids and flavonoids [1] which are important for maintaining human health naturally.

Stevia rebaudiana (Bertoni) of Asteraceae family is conventionally used as a high potency zero-calorie natural sweetener. Leaves of Stevia rebaudiana is known to be 50-100 times sweeter than sucrose and is a common substitute to many synthetic sweeteners which is associated with the possible risk of cancer. The leaves naturally contain eight sweet diterpene glycosides stevioside, steviobioside, rebaudiosides (A- F) and dulcoside A. The non sweet constituents include diterpenes, triterpenes, labdane, flavonoids, sterols, phenols, chlorophylls, xanthophylls, aminoacids, ascorbic acids, lipids, β- carotenes, volatile oils, inorganic matters, essential oils and trace elements. It has been reported that Stevia rebaudiana (Bertoni) possess health promoting property which works as therapeutic agent and an efficient medicine for curing degenerative diseases [2] such as hypertension [3] diabetes [4] cancer [5] diarrhea [6] and HIV [7]. The leaves of Stevia rebaudiana possess the potency to inhibit bacterial and fungal growth [8]. The bioactivity potential greatly varies in juice and powder of Stevia rebaudiana leaves. Therefore, the present study aimed to estimate the nutritional (Proximate and ultimate composition), anti-nutritional factors (phytate and tannin) and bioactive compounds (Chlorophyll, Ascorbic acid, Total Phenolic Content, Beta-carotene) in juice and powder of Stevia rebaundiana leaves which has not been seen in previous studies.

MATERIALS AND METHODS

Chemicals

The analytical grade chemicals were purchased from Hi-Media and Merck, India.

Plant material

Leaves of *Stevia rebaudiana* were procured from “Bioved Research Institute of Agriculture and Technology” Allahabad.

Powder preparation

Fresh *Stevia rebaundiana* leaves were collected, stems and other unwanted parts were removed and washed with slightly warm distilled water to remove the dirt particles, excess water was drained out and leaves were dried under sunlight for about 5 days. The dried leaves were grinded to powder using a high-speed blender (25000/min) and stored in airtight polythene bags at 4°C for analysis of further study [9].

Juice preparation

For the preparation of juice, fresh leaves of *Stevia rebaudiana* were used. Grading of leaves were done followed by washing to remove the dirt then crushed in pestle mortar to form juice which was then filtered by muslin cloth and stored in refrigerator at low temperature [10].

Extract preparation

The sun-dried leaves of S. rebaudiana (10g) were powdered and then extracted with 100ml of organic solvents (methanol and acetone) by merceration process. The crude extract were filtered using filter paper (Whatman No.42) and concentrated to dryness at 40°C in hot air oven to get crude extracts. All the fractions were further dissolved in 10ml DMSO and stored at four °C for further analysis [7].

Determination of proximate and mineral composition

The proximate composition of fresh juice and dried leaves powder of Stevia rebaudiana were determined for moisture, ash, crude protein, fat and dietary fiber by the method of the Association of Official Analytical Chemists [11]. World Health Organization (1985) [12] described Atwater system was used for the calculation of energy (kcal/100 g) by multiplying the values obtained for protein, carbohydrates and fat by 4.00, 3.75 and 9.00, respectively; the results are expressed in kcal. Moisture percent was determined using the drying oven method, by drying a required amount of sample in an oven at 105ºC for 3 hours. Total carbohydrates (g/100g) were determined by difference method described by [13], by subtracting the sum of the percent of protein, moisture, fat and ash from 100, Protein was estimated by Micro-kjeldhal method using a conversion factor of 6.25, Fat by Soxhlet extraction method using petroleum ether (B.P. 60 -70°C). Dietary fibre was analyzed by an enzymatic gravimetric method using the Tecator Fibertec E System (Foss Tecator, Sweden).

The analysis of minerals were first done by dry ashing at 550ºC in a muffle furnace and dissolved in deionised distilled water to standard volume. Based on the Association of Official Analytical Chemists [14] calcium content was determined by potassium permanganate volumetric method and iron content was estimated by the calorimetric method.

Characterization of bioactive compounds

Determination of Tannin and Phytate

The extraction and precipitation of phytate and tannin content in the fresh and dried samples were analyzed by the method given by [15].

Determination of total phenolics

The total phenolics in *Stevia rebaudiana* extracts were estimated using the method of [16]. Four hundred microlitres of extracts was added in 1.0ml of Folin-Ciocalteu reagent and shaken. After 5 min. 0.8ml of 7.5% of sodium carbonate was added. The mixture was allowed to stand for 30 min and the absorption verses prepared blank was recorded at 765nm. The total phenolic contents were expressed as mg of gallic acid equivalents (GAE) / g of fresh extract or dry powder.

Determination of ascorbic acid

Ascorbic acid content was determined by the procedure given by [17]. For the estimation of ascorbic acid, the method used involved the titration of the ascorbic acid, in the presence of a redox indicator 2,6-dichlorophenol-indophenol (DCPIP) which acts as both an oxidant so as to oxidise the ascorbic acid to dehydroascorbic acid, and it acts as an indicator to determine the end point of the titration. The samples of ascorbic acid used have to be made acidic first by adding metaphosphoric acid to remove proteins and ferric ions which would precipitate.

Determination of beta carotene

Analysis of beta-carotene consisted of the extraction procedure of pigment, followed by liquid/liquid partitioning with hexane concentration and column chromatography [18]. The extracts obtained from the leaves of Stevia rebaudiana were used for the estimation of beta-carotene. Hexane extracts was filtered over anhydrous sodium sulphate on filter paper (Whatman No.1equivalent) and was made up to a known volume. The extract was concentrated 10- fold by evaporation and loaded onto the column. Columns (150 × 10mm) were packed with aluminium oxide to a length of 10mm and covered with a 10mm of anhydrous sodium sulphite, then were washed with hexane containing 1% acetone. The orange colored eleunt containing beta-carotene was collected to a volumetric flask. The concentration of beta-carotene was measured at 450nm in Shimadzu UV 16A spectrophotometer.

Chlorophyll Estimation

The chlorophyll concentration was estimated in the dried powder and juice of Stevia rebaudiana. Chlorophyll was extracted in 80% acetone and the absorption at 663 and 645 nm were read in a spectrophotometer. 1ml of 80% acetone was added to the samples and mixed well. At ambient temperature (25±1º C) the samples were centrifuged for 10 minute at 10,000 rpm. The supernatant was taken into cuvettes and the absorbance of the sample extract was recorded at (663,645 nm) using spectrophotometer against an 80% acetone blank. The concentration of total chlorophyll content mg/ml in fresh and dried weight of leaf tissue was calculated according to the formula given below [19].

$$\text{Total Chlorophyll (mg/ml)} = 20.2 \times A_{645} + 8.02 \times A_{663} \times \frac{V}{1000 \times w}$$

Where,

A = Absorbance of chlorophyll extract
V = Final volume of solution (ml)
W = weight of leaf tissue

In-vitro antioxidant study:

DPPH scavenging activity

The antioxidant activity of the plant extract was estimated using a slight modification of the DPPH radical scavenging protocol reported by [20]. A solution of 0.1mM DPPH in methanol was prepared and 2.4 ml of this solution was mixed with 1.6 ml of extract in methanol at different concentration. The reaction mixture was incubated in the dark for 15 minutes and there after the optical density was measured spectrophotometrically at 517nm against the blank. For control 2.4ml of DPPH in methanol was mixed with 1.6ml of methanol and the optical density of the solution was recorded after 15min. Percentage DPPH radical scavenging activity (% DRSA) was calculated by the following equation,

$$\% \text{ DRSA} = [(A_1 - A_0)] / (A_0) \times 100$$

Where A_0 is the absorbance of the control, and A_1 is the absorbance of the extractives/standard. Then % of inhibition was plotted against concentration.

Statistical analysis

In each two parallel samples (dried powder and juice), all analysis was carried out in triplicates, and data were expressed as mean ± SD (standard deviations). For establishing the possible differences in the level of analyzed indices of bioactive compounds and antioxidant activity between the juice and dried powder of Stevia rebaudiana

leaves, an analysis of student-t tests was calculated for testing the significance (P0.05). SPSS (Statistical package for the Social Sciences) v.12.0 and Microsoft Excel 2007 were used for statistical and graphical evaluations.

RESULTS

The proximate composition of the dried powder and fresh juice of Stevia rebaudiana leaves was showed in Tables 1. On an average, the dried leaves powder contains maximum energy, carbohydrate, protein, fat, fiber and total ash content (332.22Kcal/100g, 72.60g/100g, 8.17g/100g, 1.02g/100g, 15.60g/100g and 10.72g/100g respectively on dry weight basis) while the fresh juice samples contained on average 24.46Kcal/100g energy, 2.38g/100g carbohydrate, 3.40g/100g protein, 0.32g/100g fat, 2.863g/100g fiber and 1.74g/100g total ash content. The respective mean values for calcium, iron and phosphorous in the dried leaves powder were 470.33mg/100g, 7.64mg/100g and 27.00mg/100g where as in case of fresh juice 432.00mg/100g of calcium and 0.98mg/100g of iron and 26.16mg/100g of phosphorous content as shown in Tables 2. According to Abou-Arab et al. [21] Stevia plants are a good source of carbohydrates (61.93% d.w.), protein (11.41% d.w.), crude fiber (15.52% d.w.) and minerals (K, 21.15; Ca, 17.7; Na, 14.93 and Mg, 3.26 mg/100 g d.w. and Cu, 0.73; Mn, 2.89; Fe, 5.89 and Zn, 1.26 mg/100 g d.w.).

The phytate and tanin content of both the dried powder and fresh juice of the Stevia rebaudiana leaves were shown in Table 3. Generally, the concentrations of these components were higher in the dried samples than in the fresh ones. Phytate level in the dried powder is 30.76mg/100g where as in case of juice 61.39mg/100g. The amount of tannin detected in dried powder is 5.68mg/100g and in fresh juice 4.26mg/100g respectively. Savita et al. [22] in another work established a high percentage of anti-nutritional factors in extracts of Stevia leaf dissolved in water i.e., oxalic acid and tannins were 2295.0 and 0.010mg/100g. Gasmalla [23] reported the tannin content in dried leaf of Stevia powder ranged between 5.43-5.91%.

The total amount of phenolic content, Vitamin C, β- carotene, Total Chlorophyll and DPPH radical scavenging activity present in dried powder and juice of Stevia rebaudiana leaves is shown in Table 4. The quantitative analysis of total phenolic content in juice and powder of Stevia rebaudiana leaves revealed that juice contained the highest total phenolics content 85.56mg gallic acid equivalents/g of fresh extract while powder comprised of lowest total phenolics content 73.73mg gallic acid equivalents/g of dry extract. In another study carried out by Shivanna et al. [24] the total phenolic content in leaves of Stevia rebaudiana was 91.0mg/g.

The content of vitamin C in juice (30.13mg/100g) extracted from the leaves of Stevia rebaudiana was significantly higher ($p < 0.05$) than those of dried powder (15.03 mg/100g). The reason for this could be that ascorbic acid is a thermolabile vitamin and was possibly degraded when the Stevia powder was prepared. According to previous study by Kim et al. [25] water soluble vitamin C content in dry base of Stevia rebaudiana leaf extract was 14.97mg/100g.The β- carotene content in dried powder obtained from leaves of Stevia rebaudiana was high (344.0μg/100mL) in comparison to juice 154.33μg/100g. The carotenoid content in leaves of Stevia rebaudiana was measured as 0.354mg/g dry weight [26].

The total chlorophyll contents were estimated by extraction of the leaf material in 80% acetone. The mean comparisons in juice and dried powder of Stevia rebaudiana leaves indicated that juice (1.69mg/ml) had the highest chlorophyll concentration in comparison to dried powder (0.72mg/ml). Kaushik et al. [27] reported the total chlorophyll concentration of *Stevia rebaudiana* in ethanol extract is 0.8mg/mlIn this study, both juice and powder of Stevia rebaudiana were able to scavenge DPPH radicals in a concentration dependent manner. Results clearly indicate that the mean score of percent antiradical activity in juice was significantly higher (86.90%) than dried powder (74.90%) obtained from leaves of Stevia rebaudiana. The analyzed data revealed that Stevia rebaudiana act as free radical scavenger and thus function as a primary antioxidant. Literature states that 250μg/ml of methanolic extract of Stevia rebaudiana leaf show 77.7% inhibition according to Ahmad et al. [28].

DISCUSSION

The above findings potentially specified that leaves of *Stevia rebaudiana* are well gifted with all essential nutrients required for human consumption and maintenance of good health.

The proximate analysis showed that dried powder obtained from leaves of Stevia rebaudiana are good source of energy, protein, carbohydrate and fat than juice. This gives a reason to consumers for replacing artificial sweetener from their daily diet with natural sweet leaves of *Stevia rebaudiana* which possess nutritional and therapeutic properties. High protein content in Stevia helps in raising water holding capacity and physical entrapment of fat and oil [22].A low fat value confirms that leaves are not a good source for oil and it cannot be used for domestic purposes. The low-calorie property of *Stevia rebaudiana* leaves are due to presence of bioactive compounds, minerals and salts etc. High ash content indicates that leaves of *Stevia rebaudiana* is an excellent source of inorganic materials. Mineral analysis revealed that dried leaves powder contains higher amount of calcium, iron and phosphorus when compared with juice. The high proportions of mineral elements in leaves of *Stevia rebaudiana* show its importance for medicinal and commercial purposes. Few inorganic constituents like calcium and phosphorus helps in maintenance of normal glucose level in blood by releasing hormone insulin from pancreas [29]. Iron is an essential element for maintaining hemoglobin level in blood and for combating iron deficiency anemia. A variety of minerals maintains the metabolic mechanism and boost immune system of the host [30].

The presence of secondary metabolites in Stevia like phytate and tannin shows its health promoting capability and numerous pharmacological activities [31]. It is reported that they work as antioxidants and scavenge free radicals [32]. Phenols are important class of antioxidant compounds found in plant constituents, helps in detoxification and scavenging of free radicals, which is attributed to their hydoroxyl (eOH) groups [33] and the methyoxy (eOCH3) substituent in the molecules [34]. These phenolic compounds show medicinal activity and exhibit physiological functions by playing a preventive role in development of chronic diseases like cancer, allergy and cardiovascular disease [35]. The high amount of phenolic compounds present juice extracted from leaves of Stevia rebaudiana prevent the oxidative degradation of lipids (rancidity) and improve the overall nutritional value and quality, thus enhancing the shelf life of food.

The plant products have shielding effects and specific mechanisms of actions due to the occurrence of several components like proteins, enzymes and vitamins of low molecular weight [36]. Reports indicate that in stressed animals oxidative damage is increased due to decrease in plasma antioxidant vitamin C [37]. Presence of high amount of ascorbic acid (Vitamin C) in fresh leaves of *Stevia rebaudiana* shows antioxidant activity as it reacts directly with superoxide and the hydroxyl ion with the ability to donate hydrogen and electrons.

Beta-carotene, the precursor of vitamin A with an antioxidant activity is an effective scavenger of alkoyl and hydroperoxyl radicals it protects cells and tissues from free radicals and reactive oxygen species. Carotenoids work as accessory pigments, it harvest light for photosynthesis and act as photoprotective agent limiting the damage caused by high irradiance [38]. β-carotene act as physiological bioactive substances actively present in leaves of *Stevia rebaudiana* with antitumor and antioxidant activity [39].

Chlorophyll is frequently referred to as the blood of plants; it is a pigment that naturally absorbs light energy for photosynthesis. The strength and capability of plant for photosynthesis, strongly reliant on chlorophyll content which differ in every leaves [40]. Studies have shown that chlorophyll helps in detoxification of the body and supports liver function. Algae are the world's most chlorophyll loaded foods and they fall in 2% range [41]. Chlorophyll counts are significantly higher in the juice of *Stevia rebaudiana* leaves than in powders as degradation of chlorophyll occurs upon exposure to heat and oxygen which creates a byproduct called pheophorbide. Higher chlorophyll counts also indicate the quality of the growing, juicing and drying process.

Antioxidant potential of *Stevia rebaudiana* leaves were investigated by DPPH (1,1-diphenyl1-2- picryl hydrazine), it is a stable free radical with an odd e^- widely used to estimate the radical scavenging ability of antioxidants [42]. Major antioxidant activity of methanolic leaf extract of *Stevia rebaudiana* provides a systematic validation for conventional use of this plant as an available source of natural antioxidants and offer valuable protection from free radicals with resultant health benefits.

CONCLUSION

In the view of the present study the results reports that dried leaves powder and fresh juice extract obtained from leaves of *Stevia rebaudiana* is an excellent source of health-promoting phytochemical constituents. The results showed that dried leaves are rich in carbohydrates, protein, crude fiber, calcium, iron and phosphorus where as juice extracted from leaves of *Stevia rebaudiana* is a potent source of natural antioxidants which enhance the bioavailability of bioactive compounds. However, the replacement of artificial or synthetic sweetener with natural sweetener rich in active constituents would be more advantageous for better human health.

ACKNOWLEDGMENTS

We thank the Department of Science and Technology, New Delhi, India for providing financial assistance under Women Scientist Scheme.

REFERENCES

1. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. Afric J Biotech 2005;4:685-688.
2. Gupta E, Purwar S, Sundaram S, Rai GK. Nutritional and Therapeutic values of *Stevia rebaudiana*: A Review, J Med Plants Res 2013;7:3343-3353.
3. Hsieh MH, Chan P, Sue YM, Liu JC, Liang TH, Huang TY, Tomlinson B, Chow MS, Kao PF, Chen YJ. Efficacy and tolerability of oral stevioside in patients with mild essential hypertension: A two-year, randomized, placebo-controlled study. Clin Ther 2003;25:2797-2808.
4. Benford DJ, DiNovi M, Schlatter J. "Safety Evaluation of Certain Food Additives: Steviol Glycosides"(PDF). WHO Food Additives Series (World Health Organization Joint FAO/WHO Expert Committee on Food Additives (JECFA) 2006;54:140.
5. Satishkumar J, Sarvanan MM, Seethalakshmi I. *In-vitro* antimicrobial and antitumor activities of *Stevia rebaudiana* (Asteraceae) leaf extracts. Trop J Pharm Res 2008;7:1143–9.
6. Takahashi K, Matsuda M, Ohashi K, Taniguchi K, Nakagomi O, Abe Y, Mori S, Sato N, Okutani K, Shigeta S. Analysis of anti-rotavirus activity of extract from *Stevia rebaudiana*. Antiviral Res 2001;49:15–24.
7. Takahashi K, Iwata Y, Mori S, Shigeta S. *In-vitro* anti-HIV activity of extract from *Stevia rebaudiana*. Antiviral Res 1998;37:A59.
8. Jayaraman S, Manonharan MS, Illanchezian S. *In-vitro* antimicrobial and antitumor activities of *Stevia rebaudiana* (Asteraceae) leaf extracts. Trop J Pharm Res 2008;7:1143-1149.
9. Satwase AN, Pandhre GR, Sirsat PG, Wade YR. Studies on drying characteristic and nutritional composition of drumstick leaves using sun, shadow cabinet and oven drying methods. Open access scientific reports 2013;2:584 doi: 10.4172/ scientific reports.584
10. Doneen LD. Method for preparation green material for the extraction of juices. Plant Physiol 1934;9:839-843.
11. Association of Official Analytical Chemists. Determination of Moisture, Ash, Protein and Fat. *Official* method of analysis of the association of analytical chemists, 18th Ed. Washington DC; 2005.
12. World Health Organization, Energy and Protein Requirements. Report of a Joint FAO/WHO Ad Hoc Expert Committee. World Health Organization, Geneva; 1985.

13. FAO. Food Composition Table for Use in Africa. Calculations to derive nutrients [online]. Rome: FAO; 1985. Available from /http://www.fao.org/docrep/003/x6877e/X6877E20.htmS.
14. Association of Official Analytical Chemists. Official method of analysis (Vol. 1, 15th ed.). Washington, DC; 1990.
15. Sadasivam S, Manickam A. Biochemical methods, New age International (P) limited publishers, New Delhi, India; 1996.
16. Singleton VL, Rossi JA. Colorimetry of total phenolics with phosphomolybdic–phosphotungstic acid reagents. Am J Enol Viticult 1995;16:144–158.
17. Sadasivam S, Balasubramanian. Practical Manual in Biochemistry (pp. 14), Tamilnadu agricultural university, Coimbattore; 1987.
18. ISO/ 6558-2. Fruits, vegetables and derived products-determination of carotene content. Part 2 Routine methods, International organization for standardization, Case Postale 56, CH-1211, Geneve 20, Switzerland; 1992.
19. Arnon, DI. Copper enzymes in isolated chloroplasts polyphenoloxidase in Beta vulgaris. Plant Physiol 1949;24:1–15.
20. Desmarchelier C, Bermudez MJN, Coussio J, Ciccia G, Boveris A. Antioxidant and prooxidant activities in aqueous extract of Argentine plants. Int J Pharmcog 1997;35:116-120.
21. Abou-Arab A, Abou-Arab A, Abu-Salem MF. Physico-chemical assessment of natural sweeteners steviosides produced from *Stevia* rebaudiana Bertoni plant. Afr J Food Sci 2010;4:269–281.
22. Savita S, Sheela K, Sunanda S, Shankar A, Ramakrishna P. *Stevia rebaudiana* – A functional component for food industry. J Hum Ecol 2004;15:261–264.
23. Gasmalla MAA, Yang R, Amadou I, Hua X. Nutritional Composition of *Stevia rebaudiana* Bertoni Leaf: Effect of Drying Method, Trop J Pharm Res 2014;13:61-65.
24. Shivanna N, Naika M, Khanum F, Kaul VK. Antioxidant, anti-diabetic and renal protective properties of *Stevia rebaudiana.* J Diabetes Complicat 2013;27:103-113.
25. Kim I, Yang M, Lee O, Kang S. The antioxidant activity and the bioactive compound content of *Stevia rebaudiana* water extracts. LWT – Food Sci Technol 2011;44:1328–1332.
26. Upadhyay S, Sharma S, Kumar R. In vitro Morphological, Biochemical and Microbial Studies on Elite Clones of *Stevia rebaudiana* for Enhanced Production of Stevioside. International Journal of Traditional and Herbal Medicine 2013;1:6-12.
27. Kaushik R, Narayanan P, Vasudevan V, Muthukumaran G, Antony U. Nutrient composition of cultivated *Stevia* leaves and the influence of polyphenols and plant pigements on sensory and antioxidant properties of leaf extracts. J Food Sci Tech 2010; 47:27-33.
28. Ahmad N, Fazal H, Abbasi B, Farooq S. Efficient free radical scavenging activity of Ginkgo biloba, Stevia rebaudiana and Parthenium hysterophorous leaves through DPPH (2,2-diphenyl-1-picrylhydrazyl). Int J of Phytomed 2010;2:231-239.
29. Choudhary K, Bandyopadhyay N. Preliminary studies on the inorganic constituents of some indigenous hyperglycaemic herbs on oral glucose tolerance test. J Ethnopharmacol 1999;64:179–184.
30. Tadhani M, Subhash R. Preliminary studies on *Stevia rebaudiana* leaves: Proximal composition, mineral analysis and phytochemical screening. J Med Sci 2006;6:321-326.
31. Ghanta S, Banerjee A, Poddar A, Chattopadhyay S. Oxidative DNA damage preventive activity and antioxidant potential of *Stevia rebaudiana* Bertoni leaf extracts against 10 pathogens. Inter J Integr Biol 2007;2:27-31.
32. Bharani A, Ganguly A, Bhargava KD. Salutary effect of *Terminalia arjuna* in patients with severe refractory heart failure. Int J Cardiol 1995;49:191-199.
33. Hatano T, Edamatsu R, Mori A, Fujita Y, Yasukara T, Yoshida T. Effects of the interaction of tannins with co-existing substances. VI. Effects of tannins and related polyphenols on superoxide anion radical and on 2,20-diphenylpicrylhydrazyl. Chem Pharm Bull 1989;37:2016–2021.
34. Cai YZ, Sun M, Xing J, Luo Q, Corke H. Structure–radical scavenging activity relationships of phenolic compounds from traditional Chinese medicinal plants. Life Sci 2006;78:2872–2888.
35. Kahkonen MP, Hopia AI, Vuorela HJ, Rauha JP, Pihlaja K, Kujala TS, Heinonen M. Antioxidant activity of plant extracts containing phenolic compounds. J Agri Food Chem 1999;47:3954–3962.

36. Halliwell B, Gutteridge JMC, Arurma OI. The deoxyribose method: a simple "test-tube" assay for determination of rate constants for reactions of hydroxyl radicals. Anal Biochem 1987;165:215-219.
37. Sahin K, Kucuk O, Sahin N, Sari M. Effects of vitamin C and vitamin E on lipid peroxidation status, some serum hormone, metabolite, and mineral concentrations of Japanese quails reared under heat stress (34ºC). Int J Vitam Nutr Res 2002;72:91-100.
38. Johnson GN, Scholes JD, Horton P, Young AJ. Relationships between carotenoid composition and growth habit in British plant species. Plant Cell Environ 1993;16:681-686.
39. Di Mascio P, Kaiser S, Sies H. Lycopene as the most efficient biological carotenoid singlet oxygen quencher. Arch Biochem Biophys 1989;274:532-538.
40. Carter AG, Spiering BA. Optical properties of intact leaves for estimating chlorophyll concentration. J Environ Qual 2002;31:1424-1432.
41. Singh SK, Bansal A, Jha MK, Dey A. An integrated approach to remove Cr (VI) using immobilized *Chlorella minutissima* grown in nutrient rich sewage wastewater. Bioresour technol 2012;104:257-265.
42. Tanaka M, Kuie CW, Nagashima Y, Taguchi T. Application of antioxidative Maillard reaction products from histidine and glucose to sardine products. Nippon Suisan Gakkaishi 1988;54:1409–1414.

Table 1: Proximate composition of juice and powder of *Stevia rebaudiana* leaves (per 100 g fresh or dried weight)

S. rebaudiana	Moisture (%)	Ash (g)	Energy (kcal)	Protein (g)	Fat (g)	Fibre (g)	Carbohydrates (g)
Juice	92.16±0.57	1.74±0.04	24.46±0.25	3.40±0.17	0.32±0.04	2.86±0.26	2.38±0.06
Powder	7.5±0.5	10.72±0.54	332.22±1.23	8.17±1.01	1.02±0.51	15.6±0.34	72.60±2.17

Each value in the table is represented as Mean ± SD (n=3)

Table 2: Mineral content of juice and powder of *Stevia rebaudiana* leaves (mg per 100 g fresh or dried weight)

S. rebaudiana	Calcium (mg)	Iron (mg)	Phosphorus (mg)
Juice	432.0±2.64	0.980±0.10	26.16±0.28
Powder	470.33±1.26	7.641±0.68	27.00±1.73

Each value in the table is represented as Mean ± SD (n=3)

Table 3: Phytate and Tannin content of juice and powder of *Stevia rebaudiana* leaves (mg per 100 g fresh or dried weight)

S. rebaudiana	Phytate (mg)	Tannin (mg)
Juice	61.39±0.20	4.26±0.15
Powder	30.76±1.58	5.68±1.01

Each value in the table is represented as Mean ± SD (n=3)

Table 4: Bioactive compounds (Total phenol, Ascorbic acid, Beta-carotene, chlorophyll) and antioxidant capacity in juice and powder of *Stevia rebaudiana* leaves

S. rebaudiana	Total Phenolics (mg GAE/g DW)	Ascorbic acid mg/100g	Beta-carotene μg/100g	Chlorophyll (mg/ml)	DPPH activity (Inhibition %)
Juice	85.56±2.34	30.13±0.40	154.33±2.08	1.69±0.10	86.90±0.98
Powder	76.73±1.38	15.03±4.0.15	344.0±2.00	0.72±0.06	74.90±0.61

Each value in the table is represented as Mean ± SD (n=3)

Indian Journal Of Natural Sciences *www.tnsroindia.org. © IJONS*

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Accounting Earnings Forecast by Multi Layer Perceptron Artificial Network Compared to Artificial Neural Network of Radial Basis Function

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Received: 20 Nov 2014 Revised: 11 Nov 2014 Accepted: 18 Dec 2014

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ABSTRACT

The present study predicted the earnings of Tehran Stock Exchange (TSE) companies. Two neural network models including perceptron and Radial basis function are used. The present study applied four independent variables of debt to asset ratio, price to earnings ratio, total liabilities, equity and the sale to market value ratio for earnings forecast. Three main and subhypotheses are used and tested. The following results were achieved in the following study:1- The rejection of first hypothesis: radial Basis Function Neural Network is more exact than perceptron method. 2- Rejection of first subhypothesis: perceptron neural network prediction has significant difference with real results. 3- Supporting second subhypothesis: The prediction of radial Basis Function Neural Network has no significant difference with the real results. To test each of the study hypotheses, the information of the companies listed in TSE during 2002 to 2012 is used.

Keywords: Profit, Perceptron neural network, Radial basis function, neural network;

INTRODUCTION

Investment is one of the important factors of development in current era. Investors, creditors, management and other people rely on prediction and expectations for economic decisions. Also, considering the annual budget of the company, prediction of production, sale and earnings per share and budget control in mid-period reports and fulfilling the predictions have crucial role in stock price changes. The most important information source of investors, creditors and other users of information is prediction of the profit presented at definite interval. Various studies are

regarding the determination of effective factors on earnings prediction emphasizing on relevance of predicted earnings and its effect on decision making of financial statement users.

By efficient methods, the present study helps the accounting earnings prediction for future years. The purpose of present study is determining an appropriate method of accounting earnings prediction. This aim is fulfilled by identification of effective factors on accounting earnings and its future prediction by artificial neural networks. Thus, this study compared two methods of accounting earnings forecast and the prediction precision of each of artificial neural networks is investigated.

Based on the limitations and shortage of knowledge in some fields as ownership valuation, the results of the study can provide suitable tool to improve earnings forecast. According to the study of Saghafi and Aghayi (1994), the shortage of such knowledge caused that in the past, the investors in Iran didn't use quantitative methods to valuate stock and the judgments are mostly based on non-scientific information and imagination. The evidences of recent researches (Saghafi and Kordestani, 2004; Aghayi and Mokhtarian, 2004) showed that the belief of investors to information content of accounting figures is changing. Some of the researchers (Finger, 1994, Sloan 1996, Dechow and Dichow 2002) regarding the relationship between earnings volatility and its forecast believe that earnings volatility is based on economic factors as economic shocks or accounting factors as the problems of determining accounting profit. The significance of the study is based on the fact that it provides required conditions for appropriate policy making for development of various industries by appropriate accounting earnings forecast. Thus, accounting earnings forecast gives the power of taking suitable decisions to designers and policy makers. In addition, appropriate accounting earnings prediction reduces the decision making risk and it leads to better selection and it has crucial effect on profitability of investors.

Theoretical basics

Various models are presented for earnings forecast in the past studies as particle swarm optimization algorithm (Kennedy and Eberhart, 1995), Time series models (Abasinejad, 2005), Multilayer earnings forecast models (Haykin, 1998), Multilayer perceptron neural network (Menhaj, 2002) and Basis Function Neural Network. In particle swarm optimization algorithm, gbest5 neighborhood location concept is used. It means that each particle moves towards its bestprevious position and towards the best particle in the Whole swarm (Kennedy and Eberhart, 1995). Time series models that are used for short-term forecast can explain the behavior of a variable based on its previous values of the variable (Abasinejad, 2005). Multilayer earnings forecast models: It is used as a common tool to estimate ANN relations in non-linear artificial neural networks (Haykin, 1998). Artificial neural networks are techniques solving the problems by imitating the biological neural system of human being. Although artificial neural networks are not compared with natural neural system, some important features as learning capability, generalizing, parallel processing and errors restoration capability and etc. can distinguish these networks in cases we need a linear or non-linear mapping .

Multilayer neural networks are more capable than single-layer neural networks and two-layer feedforward neural networks with sigmoid functions in first layer can approximate any function with their precision while single-layer neural networks can not do this. Learning feature of neural networks is of great importance. Multi-layer perceptron neural network: In this network, connection is only via I to i+1 and the contrary is not true. Signal flow in network is done in feedforward path (left to right and from one layer to another one). Each layer can have some various neurons with various conversion functions. It means that neurons models in layers can be considered different. In perceptron network, two types of signals are used, the signals going (left to right of network) and other signals return (right to left). The first group is function signals and second group is error signals (Menhaj, 2002). Radial Basis Function Neural Network: Neurons of hidden layer in : radial Basis Function Neural Network has non-linear Gaussian function. : radial Basis Function network has an input layer, one hidden layer and one output layer and the relationship between input layer neurons and hidden layer is not as simple as perceptron network. Hidden layer

neurons are multi-dimensional units and the dimension of these neurons is equal to the number of inputs of the network. Training radial basis function network is done in supervised and non-supervised sections. The neural network models based on genetic algorithm: Genetic algorithm is one of searching algorithms integrating "Survival of the Fittest" of Darvin by random information series and creates a searching algorithm with the feature of natural evolutionary methods (Shu-Heng, 2002). These algorithms can solve the real world issues via simulation of natural genetic processes. Some of the features of this algorithm are including 1- Genetic algorithms work with a code of answers not the answers, 2- Genetic algorithms search in a population of answers not a single answer, 3- These algorithms only use the required information of target function not derivative or other aiding information, 4- Genetic algorithms only use probable rules not its absolute rules.

Review of Literature

A selection of studies by other researchers is shown in Table 1.

Study method

This study is semi-empirical and ex post facto in terms of correlation and methodology of study in positive researches of accounting and it is based on real information and it is applied as it can be used in using information. By direct interpretation of required information of financial statements, Tadbirpardaz and stock organization, the required data was collected for hypothesis test. After selecting the sample companies and their classification in industries, Excel software is used in computations. Stock market classification is considered for companies' classification. For data analysis, perceptron artificial network and neural network of Radial basis function models are used and Matlabe software is used for data analysis.

Study population and sample

The study population is all groups of TSE industry listed during 2002 to 2012. According to statistical theories, as by the increase of sample size, bias of estimated parameters is decreased, the number of selected companies of study population was increased to 40 companies and the data of 10 years (2002-2012) of the mentioned companies was collected. The study sample is selected by elimination sampling. The companies of each industry should have the following features:1- The fiscal year of companies should lead to 29 Esfand, 2- The companies shouldn't change their fiscal year, 3- The companies shouldn't be holding, insurance and leasing of industries as their nature is different form other member companies, 4- Due to the need to 12-month return (first of Tir to the end of Khordad of next year) and considering the 4-month lag to the beginning and end of each period, trading of securities (common security) of company is considered and 5- Their information is available.

The study population is 41 firms, equipment and machineries industry 19 companies, pharmacology industry 10 firms, auto and parts industry 29 companies and basic meta industry 21 companies and food industry except sugar 16 firms and chemical industry 18 firms are selected. The data of profit are collected as dependent variable and other independent variables are collected of TSE during 2002-2012.

Based on the results of Pearson correlation coefficient, earnings variable has positive relation with all the variables except earnings to debt and correlation coefficient of variables was supported accurately based on t-statistics. It means that the only variable with negative relation with profit is debt to asset ratio and it is rejected at level less than 10% based on t-statistics.

Study model

The main hypothesis of the study is that earnings forecast method by multilayer perceptron artificial network is more exact compared to Radial basis function. Also, the subhypotheses of the study are as: Earnings forecast method by multilayer perceptron artificial network with real values has the lowest error. The prediction method of artificial network of Radial basis function with fulfilled real values has the lowest error.In the first stage, the input data enter genetic algorithm. The fitting function of the study is multilayer perceptron artificial network and artificial network of Radial basis function and after the combination part of model selects the combination of input variables, these variables enter artificial neural network designed for prediction in accordance to the selected variables. After the data of previous section selected variables trained the mentioned neural network, the network is tested by evaluation data and prediction error can be measured. By this error, the comparison of this prediction method with other methods is possible.

Dependent and independent variables: The present study attempted to predict future cash earnings of stock and the stock cash earning is considered as dependent variable.Company profit= F(The ratio of debt to asset, price to earnings, sum of debts and equity, ratio of sale to market value).Cash earnings of stock: It is distribution of cash flow, non-cash assets or stock of company among the stockholders based on the number of issued stocks of each stock group.

The ratio of debt to total assets: Debt indicates how much the institution used its borrowing capacity about total assets. If the company is flexible regarding acquiring foreign resources, it can increase stock cash earning. Although internal resources of cash are not adequate to cover all needs, this variable shows the financing of institution except equity. The voluntarily separation of financing via equity and debts show that their effect on stock cash earning decision is different.

Debt and equity: It is a general regulation and it has suitable combination of debt and equity in financing the assets of institution. From the view of institution, debt has high risk. Using debt is useful for stockholders as they can control the institution easier and their income is increased if the return rate of applied total capital is higher than borrowed interest rate. The increase of return of stockholders via debt is called financial leverage.

The ratio of price to earnings: It is the price of each share divided by the earnings per share. TO estimate value, it is required to associate stock price with company earnings. This ratio shows that how much we should invest in stock to achieve one Rial earnings. Sale to market value: It is sale divided by stock market value. This ratio shows that to each Rial investment, how much sale is occurred. This ratio is important as it indicates the use of institution resources.

Data analysis

In this stage, the effect of each of variables is investigated. Thus, the change coefficient of each of the variables is defined. Based on the results, the explanatory power of variable of debt to asset in cash earnings model is 3% and the ratio of price to return defines 9% of cash profit changes. While sale to market value ratio shows above 99% of cash earnings changes and it indicates the high importance of this variable in cash earnings function. Also, the total debts and equity variables explain about 88% of cash earnings changes.By defining neural network architecture, this architecture is trained by training set data as a percent of total data (e.g. 70% in the present study) to determine the optimal weights of connections and biases. Optimization of these weights based on minimizing is dependent upon prediction error (as SSE, MSE or MAE). There are various procedures in this regard and one of the most exact and rapid methods is using Levenberg–Marquardt training function and learning function of Gradient Descent with Momentum.

The results of neural network model by multilayer perceptron artificial network

In this stage, the input data to neural network is divided into three sections 70% and section 2 15% and third section 15% and first section is dedicated to training and second section to test. As is shown training is the biggest group and it is used for training and achieving weight parameters and etc. The data of validation during learning with training data to network are presented only for prediction (these data are never used for training and changing weights in network) to at first evaluate the network ability in prediction and second, to avoid over-learning of network. Finally the test data are presented to measure the generalizing of network. As shown in Figure 1, neural network with two hidden layers is formed and the number of neurons is defined inside them. The input layer includes 4 inputs and 1 outputs (final component of the vector) and the hidden layer has n_1 neurons, second hidden layer n_2 neurons and third hidden layer with n_3 neurons. Each of the neurons in each hidden layer or output layer has a bias link.

Due to indefinite optimal value of repeating training, based on concurrent timely stopping method, by training and optimization of network weights, the data of validation is presented only to achieve prediction and until the error is not minimized, training repetitions is continued. Finally, the best repetition is selected based on minimum value of the sum of training and validation data. The following figure shows the absolute error and error optimization in repetition cycles: As shown in figure, from the second repetition cycle, error optimization is lowered. Thus, network training is stopped and after training stop, software selected repetition optimal point. The neural network prediction model process by MLP is as followings.

The model training chart process is as followings:

In “Trial and Error” method, the researcher by the best number of stops and best pre-processing, starts from a simple network with a hidden layer and one neuron and trains the network. Then, he adds one neuron and this is repeated again. Finally, to achieve 10-15 neurons, if the performance criterion in the sample is improved, the researcher adds another hidden layer and it is repeated to the end. Finally, the architecture with the best performance in the above tests is selected as optimal architecture.

The above chart indicates the relationship between square prediction error and the number of training repetition periods. The vertical axle indicates the squared prediction error and horizontal axle show the number of training period repetitions and the curves of training, test and validation error are plotted. The best repetition is 3 based on the movement of these curves. The following chart shows the number of training repetitions and its error and 9 repetitions are shown as sample.

After selecting the number of training repetition periods, we can investigate prediction model. Then, the error of prediction model is calculated. Table 3 computes study model error by which we can judge which method is useful. Table 4 describes Error criterion. Then, model determination power is shown in this table 5.Later, the model error chart is achieved and it is shown in Figure 3. The histogram curve of training, test and validation errors is plotted. Based on histogram chart of model prediction error, the normality of prediction trend error of model is shown.Also, the calculation error is obtained by the difference between output and prediction model. Later, regression model is extracted for prediction model. As shown in Figure 4, explanatory power values are calculated and the charts are plotted.

The above charts show explanatory power of each of training, test and validation sets and the charts are plotted separately. Finally, in another chart, explanatory power for total state is calculated. As shown, validation error is the highest and it shows much deviation of real values.

Now we plot the curve of real and predicted values on a chart to show their difference the model error well. Thus, in target and output are shown in Figure 5 and the data distribution is shown in the right side.

basis function The results of artificial network of Radial

Later, the second method is obtained by Matlab software. The designed model in this method is defined as 4 independent variables, inputs and an output variable (Table 6).Company earnings= F (the debt to asset ratio, price to earnings, total liabilities and equity, the ratio of sale to market value).The optimal point is extracted in the following model.

In figure 7, the chart of the number of repetitions of optimal training for radial function is obtained. Based on the chart, the best training repetition is 3. Based on the result we can extract prediction model and its error.
Then, the prediction error model of radial function is calculated and shown in Table 7. Based on the error in this section and the error of the previous section, we can compare both methods. Then, the model determination power is shown in table 8.

Finally, for radial function model, a prediction model is plotted for neural network of radial basis function with its real values and it is in the right side. The model error is perceived based on the difference between real values and prediction values. The right side also shows the data distribution.The layers and neurons of model are shown exactly in Figure 9.

Hypotheses investigation

Main hypothesis of the study

Null hypothesis

Earnings forecast method by multilayer perceptron artificial network is much exact thanneural network of radial basis functions.Table 10 shows the error criterion of neural network of radial basis functions and perceptron artificial network

H1: Earnings forecast method by multilayer perceptron artificial network is not much exact than neural network of radial basis functions.

In this section, we can investigate study hypothesis with the comparison of the error in both models. As the error of neural network with radial function is less than the error of the first model, perceptron artificial network, the first hypothesis is rejected and second hypothesis is supported.

Subhypotheses of study

Null hypothesis
Earnings forecast method by multilayer perceptron artificial network is different from real values.
H1: Earnings forecast method by multilayer perceptron artificial network is not different from real values.
H0: Earnings forecast method by multilayer radial basis function artificial network is different from real values.
The evaluation of subhypotheses based on t statistics is shown in Table 11.

To evaluate the subhypotheses of the study based on t statistics, null hypothesis and H1 are evaluated. Based on first hypothesis and calculation of t-statistics as -23.04, null hypothesis is not rejected and in multilayer perceptron artificial network, real values are different from predicted values.

t statistics is also used in second hypothesis and the value is -0.2 and it can be said that null hypothesis regarding the difference of real values and predicted values with radial function method is rejected and H1 is supported. It means that neural network with radial function can predict the profit of companies.

CONCLUSION

As earnings for investors show the infrastructure of economic events of company activities and it shows the payment and distribution. The effective variables on company earnings can be mentioned.Also, in addition to the recognition of effective variables on earrings prediction, the applied method for earnings prediction is very important. In the previous studies, various methods have been used including linear time series models but using neural networks as non-linear models can be a new experience in exact earnings prediction of companies.

Graham et al., (2005) inclined to earnings smoothness. They found that 80% of managers believe the report and volatile profits can reduce its prediction considerably.Zhang et al., (2004) conducted a study including 283 companies in the form of 41 industries by linear model and neural network and predicted the earnings per share. Of seven fundamental variables of accounting invoice, current asset, received accounts, gross profit margin, administrative and sale costs, effective tax rate and labor force productivity and they found that neural networks in prediction of earnings per share had better performance compared to the linear models being applied as well.

Francis et al., (2004) considered other applications of accounting figures as fundamental analyses of analysts and other activists of capital market. These groups mostly need new information for their prediction. Based on all the requirements, the existing knowledge regarding accounting earnings prediction namely in long-term is restricted. The previous studies provided some models for earnings prediction in short-term.

This study uses two various structures of neural networks, radial basis function (RBF) and (MLP) multilayer perceptron to estimate earnings prediction. Multilayer perceptron artificial network has public activity function and based on its name, it is in multilayer neural networks, but neural network with radial basis functions has local activity functions and it is in single-layer neural networks. Based on simulation results, RBF network is best in training and test set. In addition, it is expected MLP network despite RBF network has good local training capability.

Recommendations

- The financial market experts can use this method in earnings prediction in future.
- Investment in TSE can use these results.
- The experts of other markets as monetary market can use this method.

REFERENCES

1. Aghaei M, Mokhtarian DO, (2006). Factors Effecting to Investor Decisions.IranianAccount.Audit. Rev., 36: 30-39
2. Cao, Q., Parry, M. (2009). Neural Network Earnings per Shar Forecasting Models: A Comparison of Backward Propagation and the Genetic Algorithm. Decis. Support Syst., 47, 32-41.
3. Chih-Fong Tsai,Yen-JiunChiou(2009).”Earnings management prediction: A pilot study of combining neural networks and decision trees.” Expert Systems with Applications.Volume 36, Issue 3, Part 2, April 2009, Pages 7183–7191.
4. Dechow, P. M.; Dichev, I. (2002), The quality of accruals and earnings: The role of accrual estimation errors, Accounting Review (Supplement), pp. 35 – 59

5. Finger, S. (1994). *Origins of Neuroscience: A History of Explorations into Brain Function.* New York: Oxford University Press. Association of American Publishers honorable mention for best professional/scholarly publication in 1994.Second printing in 2001.Paperback 2003.
6. Francis, J., LaFond, R., Olsson, P., Schipper, K., 2004. Costs of equity and earnings attributes.TheAccounting Review 79, 967–1010.
7. Graham AL, Lamb TJ, Read AF, Allen JE.2005. Malaria-filariacoinfection in micemakes malarial disease more severe unlessfilarial infection achieves patency.J.Infect.Dis.191:410–21
8. Haykin,Simon(1998)."Neural Networks: A Comprehensive Foundation"Prentice Hall PTRUpper Saddle River, NJ, USA©1998.
9. HosseinAbbasi-Nejad&ShapourMohammadi, 2005."Structural Changes in NICs: Some Evidences on Attractor Points," Econometrics 0502016, EconWPA, revised 02 Mar 2005.
10. Kennedy, J. and Eberhart, R.: Particle Swarm Optimization. In Proceedings of the Fourth IEEE International Conference on Neural Networks, Perth, Australia. IEEE Service Center(1995) 1942-1948.
11. Kinsler VA, Paine SM, Anderson GW *et al*. (2012c) Neuropathology of neurocutaneousmelanosis: histological foci of melanoticneurones and glia may be undetectable on MRI. ActaNeuropathol123:453–456.
12. Malekian ,Esfandiar et al (2010) , the effective factors on the forecasted profit accuracy through the companies from the evidences of the stock exchange , accounting observations , period 17 , No 61 , pp 23
13. Menhaj,mohammad; Rouhani, Mojtaba(2002)." A novel neuro-based model reference adaptive control for a two link robot arm" Neural Networks, 2002. IJCNN'02.Proceedings of the 2002 International Joint Conference on.47-52.
14. Noorvash, I.,&GholamZadeh, M. 2003. Investigating the behavior of accounting profit using Box-Jenkins time series approach.Accounting& Audit Studies, 10 (31).
15. Saghafi, A., &Aghaei, M.A. (1994). Behavior of Accounting Profit, Studying Accounting and Au-diting, 9, 5-21.
16. Saghafi, Ali and KordestaniGholamreza, 2004. Overview of the relationshipbetween quality of earnings and the market reaction to cash dividend changes,Iranian Accounting review, 37, 51
17. Shu-Heng Chen, "Agent-Based Artificial Markets in the AI-ECON Research Center: A Retrospect from 1995 to the Present," in Systems, Control and Information, Vol. 46, No. 9, 2002. pp. 23-30.
18. Sloan, Richard G(1996). "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?"The Accounting Review, Vol. 71, No. 3. (Jul., 1996), pp. 289-315.
19. Su M-T, Lin S.H., Lee I-W, Chen Y-C, Kuo P-L. (2011) Association of polymorphisms/haplotypes of the genes encoding vascular endothelial growth factor and its KDR receptor with recurrent pregnancy loss. Human Reproduction 26: 758-764.
20. Zhang, Y.-C., W.B. Rossow, A.A. Lacis, V. Oinas, and M.I. Mishchenko, 2004: Calculation of radiative fluxes from the surface to top of atmosphere based on ISCCP and other global data sets: Refinements of the radiative transfer model and the input data. *J. Geophys. Res.*, 109, D19105, doi:10.1029/2003JD004457**.**

Table 1- Review of Literature

Researcher name	Research date	Research topic	Research result
Sheng, Len and Cheng	2011	An evaluation of the relationship between future earnings and the policy of dividend on companies listed on stock exchange of Taiwan	The results of the study showed that dividend is related to the real earnings of two next years of company.
Kansler et al.	2012	The American companies that divided earnings during 2000 to 2006.	As earnings per share and cash flow of each share are good indices to predict dividend of

Researcher name	Research date	Research topic	Research result
			companies.
Cao and Parry	2009	Earnings per share forecast by neural networks and genetic algorithm by the variables applied in Zhang study	They found that neural network model with estimated weights by genetic algorithm has suitable performance compared to neural network model with estimated weights by back propagation algorithm in earnings per share forecast.
ChifongTesay and Yen Jong Chio	(2009)	Earnings management forecast via neural network and decision tree	The main purpose of their study is evaluation of the use of neural networks for forecasting the top to down and bottom up
Zhang et al.	2004	Earnings per share forecast by linear model and neural network	Of seven fundamental accounting variables of invoice, current asset, received accounts, gross earnings margin, administrative costs and sale, Effective tax rate and labor force productivity are used and neural networks had better performance in earnings per share forecast compared to linear models being used.
Malekian et al.	2010	The identification of effective factors on predicted earnings of the companies in TSE.	The factors were size, life, prediction period, financial leverage, revision frequency, auditor report, presence in main or minor hall and type of industry and the results showed negative relation between prediction period, financial leverage and company life with prediction accuracy and the relationship between auditor report with prediction accuracy was supported. In other cases, there was no significant relation between the variables with prediction accuracy.
Noravesh and Qolamzade	2003	The evaluation of accounting profit behavior by Box-Jenkins time series	The showed that previous profits regarding future profits didn't present any information.

Table 2- MLP network study model

Number of input layers	4
Number of hidden layers	2
Number of output layers	1
Network activity functions	Hyperboic and pure line
Network training algorithm	LM
Information classification algorithm	random
Network evaluation functions	RMSE,R2
Good repetition of the selection criterion numbers	MSE
Network model	BP
Percent of training data	70
Number of test and validity data	30
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net.trainParam.max_fail	20
net.trainParam.epochs	500

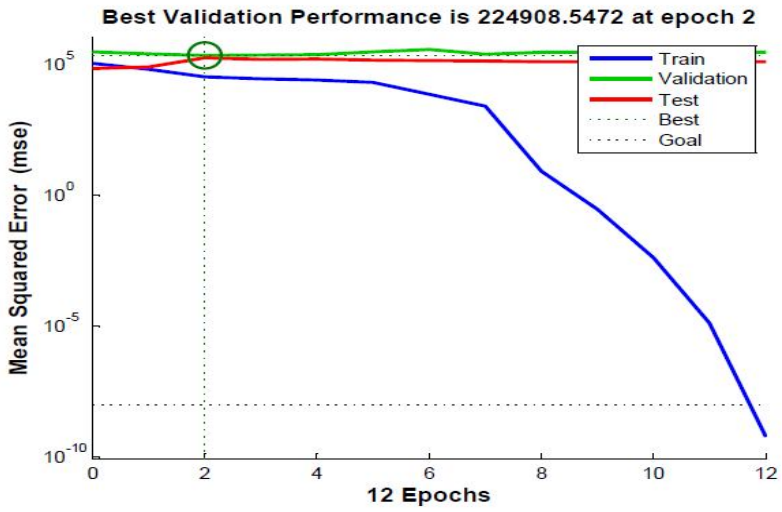

Figure 1- Reduction of model error by MPL

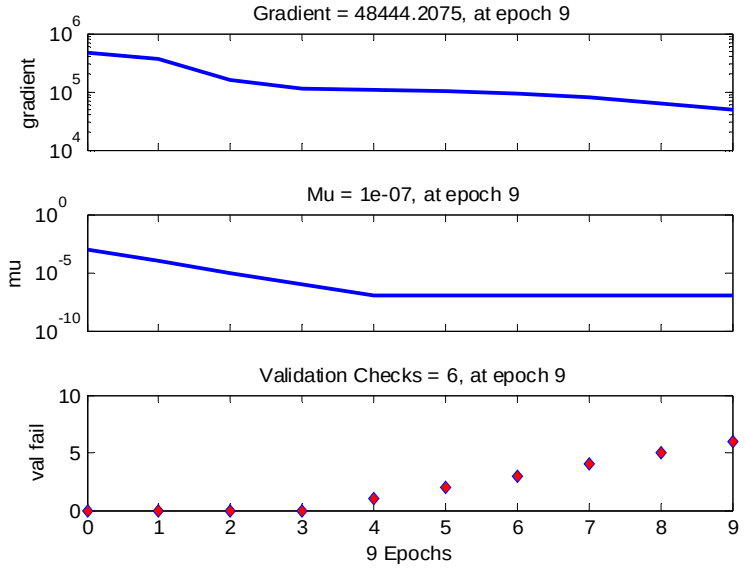

Figure 2- MU error reduction chart

Table 3- MLP network error criterion chart

Neural network error	Error criterion	
Perceptron artificial network	SE	RMSE
Total	3273	115.21
Learning	3032	108.88
Test	2987	102.23

Table 4- Error criterion table

Error criterion		
RMSE	MSE	Neural network model
115.21	13273	Multilayer Perceptron artificial network

Table 5- model determination power

	^{2}	Perceptron
.8	.64	Validation
.95	.9025	Training
.84	.7056	Test
.87	.7569	All

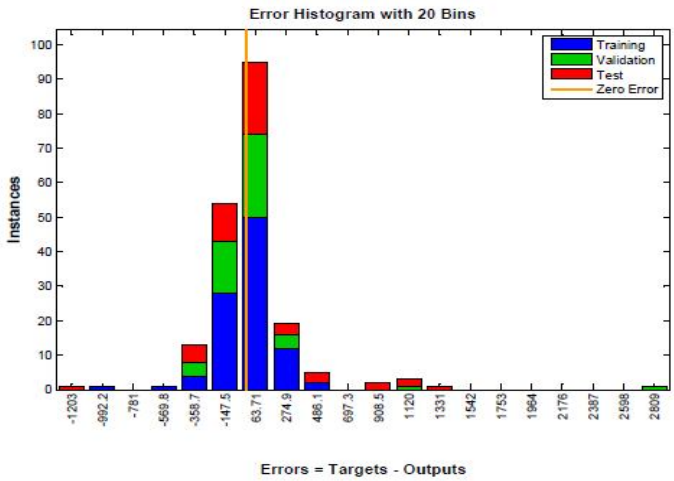

Figure 3- Error normal chart

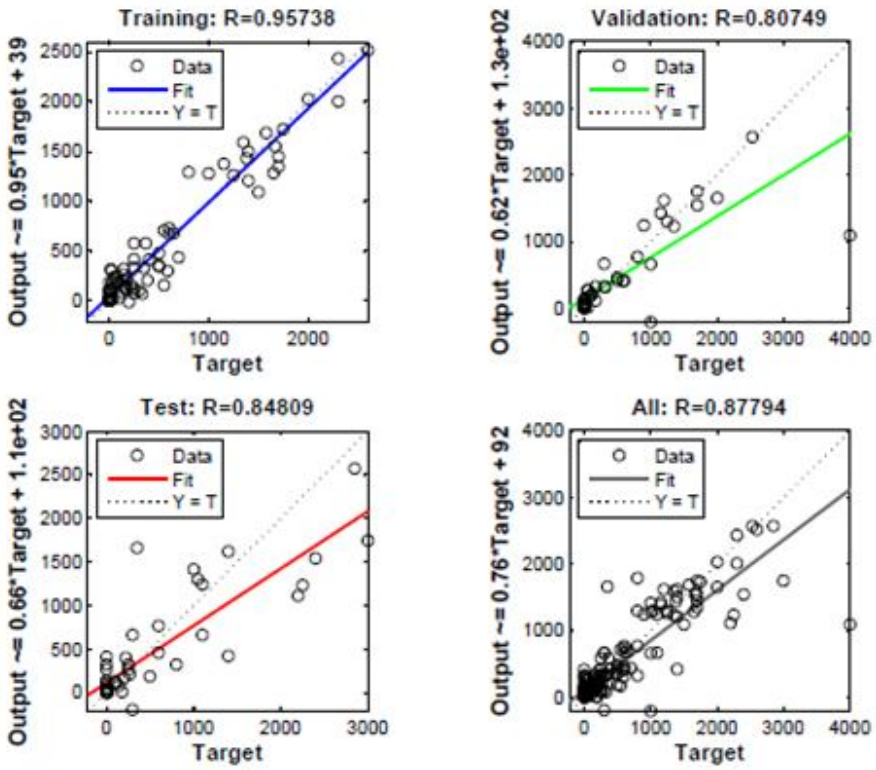

Figure 4- Explanatory power of prediction model

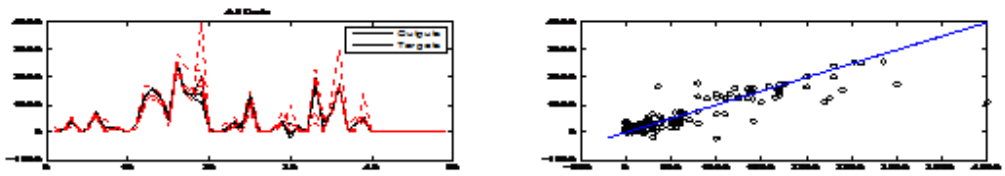

Figure 5- Geometry of earnings prediction

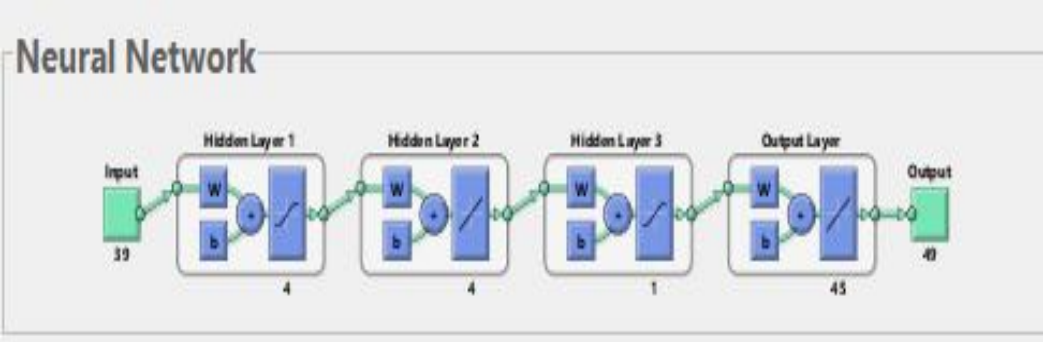

Figure 6- The applied layers and chromosomes in the model

Table 6- Research model in rbf network

Number of input layers	4
Number of hidden layers	1
Number of output layers	1
Network activity functions	Hyperbolic and pure line
Network training algorithm	RBF
Information classification algorithm	Random
Network evaluation functions	RMSE ,R2
Good repetition of the selection criterion numbers	MSE
Percent of training data	70
Number of test and validity data	30
Goal	0
Spread	0.2
MaxNeuron	100

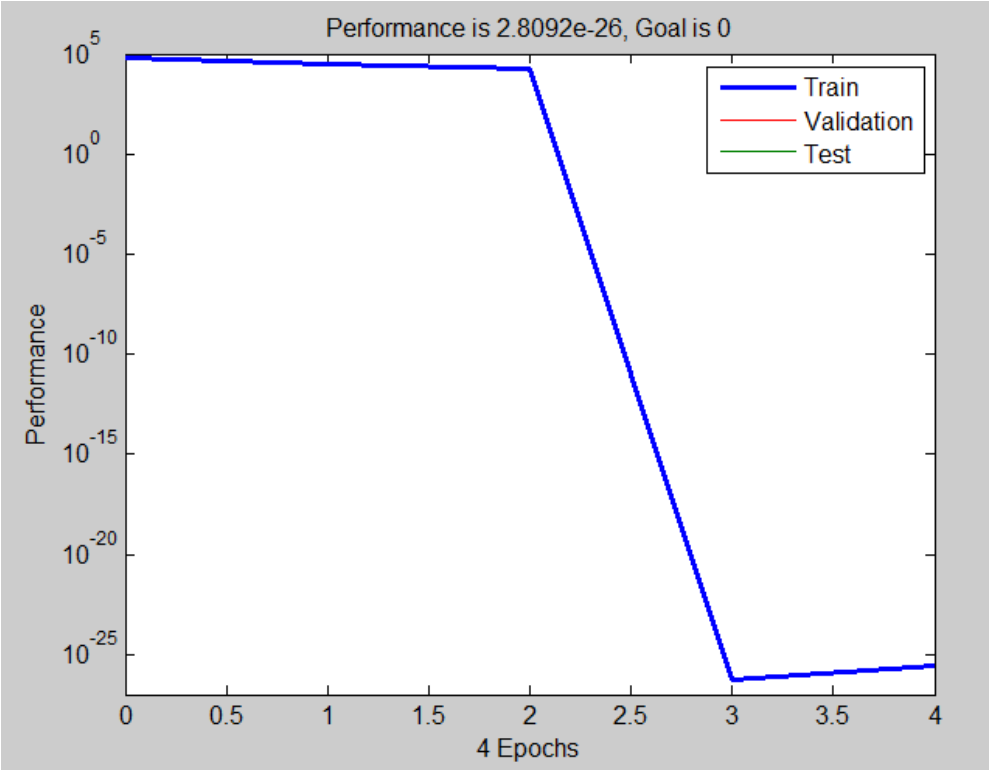

Figure 7- Reduction of error in Rbf model

Table 7- Error criterion for rbf

Neural network model	Error criterion	
Artificial network of radial basis function	SE	MSE
All	277	9.29
Learning	122	8.1
Test	988	7.34

Table 8- Model determination power

Radical basis function	^{2}	
validation	.7396	.86
training	.9801	.99
test	.81	.9
All	.8836	.94

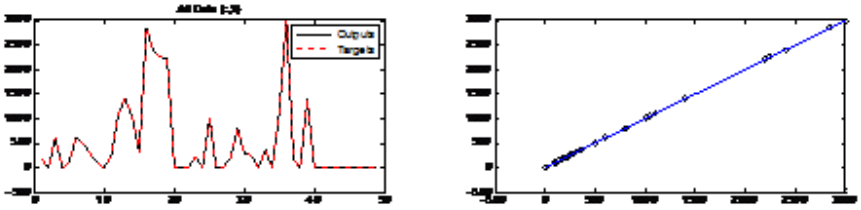

Figure 8- Geometry display of earnings prediction

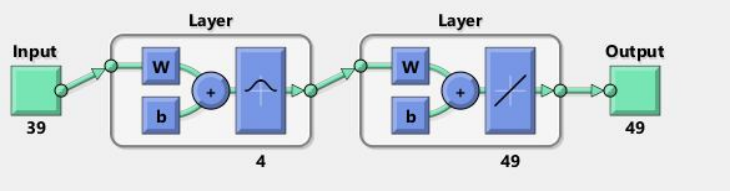

Figure 9- The layers and neurons of model

Table 10- The error criterion of neural network of radial basis functions and perceptron artificial network

Neural network model	Error criterion	
	SE	MSE
neural network of radial basis functions	277	9.29
multilayer perceptron artificial network	3273	15.21

Table 11- The evaluation of subhypotheses based on t statistics

t statistics for radial basis function	t statistics for MPL	Earnings per share for each company	
-23.04	-0.2	622	Mean
Null hypothesis is not rejected	Null hypothesis is rejected	166972	SD
H0: The predicted value in radial basis method is equal to actualized value 622.	H0: The predicted value in MPL method is equal to actualized value 622		

Indian Journal Of Natural Sciences *www.tnsroindia.org. © IJONS*

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Comparison between the Acceptances of Non-Pharmacological Invasive Behavioral Management Techniques and General Anesthesia by the Parents of Uncooperative 3-5 Years old Children

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Received: 12 Dec 2014 Revised: 23 Jan 2015 Accepted:31 Jan 2015

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ABSTRACT

Behavior management techniques are the methods which are used by dentistry groups to treat children effectively and efficiently inducinga positive attitude about dentistry in children simultaneously. This study wasconducted in order to compare the acceptance of non-pharmacological invasive behavioral management techniques with general anesthesia by the parents of uncooperative 3-5 years old children in 2014.Inthiscross sectional study, 102 parents (51 fathers and 51 mothers) after viewing the film of non-pharmacological invasive behavioral management techniques (including voice control, parents separation, active restraint, mouth prop and hand over mouth) and general anesthesia in the operating room, completed the questionnaire.To measure patient's satisfaction, Visual Analog Scale (VAS) was used. The data were analyzedby McNemar, Chi-Square, Repeated Measure Test and t-test.A P-value less than 0.05 was considered statistically significant.In this study, 51 patients with an average age of 4.04 ± 0.82 years old and with age range between 3 to 5 years old were attended which included 25 (49%) boys and 26 (51%) girls.The acceptance rate of non-pharmacological invasive behavioral management techniques by the parents was 66 (64.7%) cases and the general anesthesia was 36 (35.3%) caseswhich were significantly different (p=0.003).Hand OverMouth had the lowest acceptance rate among all the methods. The acceptance of non-pharmacological invasive behavioral management techniques or general anesthesia had no significant relationship with gender, education, age, and residence of the parents.

Also it was independent from gender, age, and birth order of the children.Based on the results of this study, invasivebehavioral management techniqueswere more acceptable for parents in comparison to general anesthesia. It seems that dentists should attempt to treat children with these methods before considering general anesthesia as a treatment modality.
Keywords: general anesthesia, non-pharmacological, behavioral management techniques, uncooperative children.

INTRODUCTION

The purpose of pediatric dentistry is to prevent or resolve oral-dental problems of pediatric patients (1). Fortunately, most children spend their dental appointments easily and do not imposeany unwanted pressure on themselves or thedental group (2), (3).On the otherhand there are some children who do not cooperate. Children dental treatment is not possible without the use of children behavioral management techniques (2).Pediatricbehavioral management techniques, are the basis of good communication between thedental group and the children (3).In addition to child's cooperation and the dentist's skill in applying various methods of behavioral management techniques,their parentsareanother important issue. Parents havean important roleinteachingthe necessary skills to children to deal with their stress. Hence, dental treatment of children has a major difference with adults in terms of communication (4).Adult treatment involves a one-to-one relationship which means a patient and dentist relationship.But child treatment is a one-to-two relationship which means child-dentist and child-parentsassociation . This type of communication in pediatric dentistry creates a therapeutic triangleof the patient, dentist and parents. Theyoung patient is placed at the top of the triangle and recently the society has been located in the center of the triangle (4). Theaccepted methods of treatment in community and sociolegal demands are also the factorsthat affect treatment. On the otherhand, since the personality ofeach person is changing by the time, we shouldconsidera frequent probability of some changes in the dynamic relation among the corners of triangle including the child, the family and the dentist (3) ,(4). To accomplish a successful treatment, the dentist uses a variety of behavioral management techniquesto obtain a good quality of treatment. AmericanAssociation of Pediatric Dentistry (AADP) has approved different useful techniques to control the behavior of child during dental appointments (1). Some of these methods include voice control, parent separation, active restraint, mouth prop, handovermouth and general anesthesia (5).In various studies, parents'commentson theacceptability ofbehavioral management techniqueshave beenstudied.Recent studies in this context have shown physically invasive techniques, such as HOME (Hand over mouth) and restraints were less acceptable in the past two decadeswhile pharmacological methods were more acceptable. Studies were conducted on the role of social class and ethnicity in adoption of these methods. However, there are few studies in this contextand the parents' acceptance in different societies and cultures may be different (6). It seems parents' acceptance of these techniques shouldbefrequentlyunder evaluationfor better communication between parents and dentists.The current study was conducted to compare the acceptance rate of non-pharmacological invasive behavioral management techniqueswith the general anesthesia by the parents of uncooperative 3-5 years old children.

METHODOLOGY

This research was performed in the Dental School of Babol University of Medical Sciences in 2014. At the first step,a video clipwhich included a child being treated by a pedodontist under behavior managementtechniques approved by AADP was recorded.The management techniques included voice control, parents separation, active restraint, mouth prop, andhandover mouth.Another video clipwas made from another child who was referred for dental treatment under general anesthesia in the hospital. Taping sessions were repeated until desired examples of all techniques were recorded. Consent for videotaping and using them for research was obtained from the parents of each child.

After a brief explanationwas presented by a pedodontistabout the character, the purpose and how each method was done, the created video clips were played.The explanationswere recorded in video clipsto have similar conditions for all the participants. The duration of bothnon-pharmacological invasive behavioral management techniques and general anesthesia video clipswas 5 minutes.The methods were shown in this order: 1- non-pharmacological invasive behavioral management techniques (voice control, parents' separation, active restraint, mouth prop and hand over mouth) and 2- general anesthesia (table 1).

At the end of the video clips, some explanation is presented by the pedodontistabout the advantages and disadvantages of each method whichhave beenrecently played. Then a pilot study was performed on 10 parents and some evaluation and changes were carried out. The video clipswere also evaluated and approved by two pedodontists.Inclusion criteria included uncooperative childrenbetween 3 to 5 years oldwho were classified as 1 or 2 in Frankl behavioral rating scale (6, 8), no history of any dental treatment, and the need for extensive dental treatment. Exclusion criteria included single parent child, any child with a mental disability and a history of a systemic disease and prolonged hospitalization. The original sample size was determined 102 parents (51 fathers and 51 mothers). Initially the demographic data were recorded (age, sex, birth order of the child, parent's age and education level). Before the showing of videos, mothers and fathers were justified about how to respond to the questionnaire and were asked to mark their acceptable procedure in questionnaire developed for this purpose. After showing films, one minute was considered to mark the queries and then the next method was shown. It should be noted that all parents who participated in this study were literate and had no problem in reading.To measure patient satisfaction, Visual Analog Scale (VAS) was used in 0-10 range (9).VAS is auseful toolfor measuring the specific features that we think are in the range of value and we cannot measure them easily and directly.VAS is divided into 10 parts, where zero means not acceptable and 10 means complete satisfaction.

Also in two separate questions, stress and anxiety of the parents' about behavioral management techniques and stages of anesthesia were assessed in a comparison form. The level of prior knowledge in the case of non-pharmacologic behavioral management techniques and general anesthesia was also questioned. The data was analyzed using SPSS v.20 statistical software and also with McNemar, Chi-Square, Repeated Measurement Test and t-test statistical tests and a P-value less than 0.05 was considered statistically significant.

RESULTS

In this study, 51 patients with an average age of 4.04 ± 0.82 years old and the age range of 3-5 years were attendedthat included 25 (49%) males, and 26 (51%) females. The children's age distribution and other demographic data are shown in Table 2.The parents were in the age range of 22-47 years. The mean age of the fathers was 34.75 ± 6.00 years and the motherswas 30.02 years.Parental demographic data are shown in Table 3.Totally,non-pharmacological behavioral management techniques of 66 patients(64.7%) compared to general anesthesia in 36 cases (35.3%) were more acceptable (p =0.003) (Figure2).

The most satisfactory method wasrelated to mouth propandless acceptance was related to Hand Over Mouth. The acceptance of general anesthesia compared to the voice control and the father's comment about HOM, was not significant.($p > 0.05$).In comparasion to general anesthesia , parents sepration(fathers: 7.51± 2.485 , mothers: 6.61±2.743), active restraint (fathers: 7.90 ± 2.193,mothers:6.88 ± 2.688) and mouth prop(fathers:8.59±1.972 , Mothers:8.75± 1.842) were significantly more accepted by parents.But in comparison to general anesthesia, Hand Over Mouth(3.76± 2.732) was significantly less accepted by the mothers.(Fig 3).

In examining the relationship, no significant relationship was found between the acceptance of non-pharmacological invasive behavioral management techniques and general anesthesia on the basis of age, gender, parents' educational level, place of residence and with the age, gender, birth order and number of children ($p>0.05$). Among the non-pharmacological invasive behavioral management techniques, most stress and anxiety was reported in the hand over

mouth in 59 (57.8%) cases and the least amount of stress were reported in activerestrainet with 4 (9.3%) cases. In the case of general anesthesia, inductionphase with 52 (51%)cases and hospitalization in the wardwith 4(3.9%) caseshad the highest and lowest levels of stress and anxiety, respectively.49 (48%) cases of parents had no previous knowledge about the variety of methods and 1 (1%)case,had recognized of all methods.

DISCUSSION

Fear of the dentists and dental treatmentis one ofthe most important factorsthat prevents dental services received by children. Different ways are used to control the children's behavior to overcome their fear. Choosingthe appropriate procedure to controlthe behavior ofchildrenisthe responsibility ofthe dentist whileprovidingappropriatetreatment forthe child to reduce physical or psychological harm to the child(8). In Razavi et al. (2009)and Lawrenceet al. (1991) studies as our study, the non-pharmacological invasive behavioral management techniques were more acceptable than general anesthesia(4, 11). It seems that most parents prefer the non-pharmacologicalbehavior management techniques to the pharmaceutical techniques (12, 13).Since the sedative methods are various and this variation may mislead parents in response to questionnaire, this procedure was not used in this study and the only pharmaceutical technique used was general anesthesia. One of the main reasons forless acceptances of general anesthesia can beconsidered public fear of general anesthesia. This fear often experienced before anesthesia operation. Most of the fear is related to waking up after unconsciousness and pain after surgery (14).

In the current study, like otherstudies, comparison ofdifferent methods of invasive behavioral management techniques andgeneral anesthesia showed that, hand over mouth had the lowest acceptance(1, 15, 16).Inrecent years, instruction of invasive behavioral management techniques inrelation to active restraint andHOMEhas changed and handover mouth procedure has been excluded from AAPDguidelines of 2006(9). Invasive behavioral management techniques in acivilized and modern society that children's rights areclearlyspecified are less acceptable, But in somestudiesindifferent countries, the acceptance ofthese methodsshowed to be morethanpharmacological techniques(17).

In Bokas study (2014) only10% of Greekparentspreferred to use general anesthesia to active restraint, HOME and voice control(13). In the study ofMuhammad et al. (2011), most Kuwaiti parents preferred non-pharmacological techniques to pharmaceutical techniques(12). In the study of Razaviet al.(2009) the acceptance of general anesthesia by Iranian parents were also lower than HOME procedure andinmother's with higher education,their acceptance rate of anesthetic techniques declined(4). The acceptance studies of American parents on behavior guidance techniques in studies conducted over25 years, indicated that over time,physical and invasive techniques were less acceptable,and the acceptability of pharmacologic techniques had a greater increase. Ease of surgery in one day and more acceptance of drug use by people may be effective in these changes(17). Indeed, by comparing the recentand previous studies, it can be concluded that parents acceptance of the firm and decisive techniques such as hand overmouthandvoice control are less. Inseveralstudies, the acceptance of behavioral management techniques with age, sex, educational levelandsocialstatus ofthe parentswas not related(11, 16, 18, 19). In a study conducted byPeretzet al. (1999) andLawrenceet al.(1991) there is no significant relationship Between theacceptance of voice controlby parentsand number of children(11, 19). In the study of Eaton (2005), Abushal (2009) and Lawrence (1991) no significant relationship was achieved between the acceptance of general anesthesia by parents and their educational level (1, 11, 16). The consistencybetween these studies and our study shows that views and opinions ofparentsaboutthe acceptance of non-pharmacological behavioral management techniques orgeneral anesthesia, is regardless of their education, genderandsocialstatus and genderof children and ifthe information given by health professionals about these methodsaresufficient, the opinion of manypeople will be the same. The results ofsimilar studies conducted indifferentcircumstancesin terms of time,culture and countries had several differences with our study. Inthe study of De leonet al.(2010) there was a significant correlation between the socio-economic level and gender of parents and acceptance of different methods(15). In the study ofRazaviet al.(2009) onlythe children's mothers were studiedand

there was less acceptance of general anesthesia in more educated mothers.(4). Type of methods showed and their acceptance rate in these researcheswere also different from our study (1, 11). The differences between other studies and ourscouldbe of several reasons. Differences in the video tapes displayingthe techniques, the explanations given about the techniques, clarity of the questionairs and the time given to the parents for the queriesmay be the reasons fordifferences in the results. In this study,the parents filled the questionairs after each technique was showenwith complete explanation, and the number of displayed techniques was less than other studies. Thiscan lead to increasedattentionof parentsto respondthe questions more accurately. In our study, both father and mother of each child answered the questions separately and according to the results, their opinion had not significant differences. Nowadays, fathersare involvedinupbringingandhealth of their children along withmothers, perhapsthisis notan unexpectedresult(17).The only exception was more negative attitude towards HOME that is probably because of their more compassion on their children.

The age range of children in our study was different from other studies. As well the studied children had no history of dentistry treatment which this field was also different from other studies. The other reason for the difference in results of different studie scan be of cultural differences of society and changing attitudes of communities over time. Althoughthe dentistry with anesthesiain children, eliminatesalldentaltreatment needs ofchildreninonesession and can lead to significant improvement in their quality of life, but in our studied population,the behavior management techniques were more acceptable for parents in comparisontogeneral anesthesia. This result in our society may be due to cultural differences, fear of anesthesia and lack of confidence to public health care. Children also may suffer from several complications after anesthesia in which the most common are pain, malaise, nausea and vomiting after surgery(20). The medical emergency for those who under went general anesthesiais more than those who were treated as outpatients (21). Therefore,the fear of general anesthesiaor the fear of complications associated withgeneral anesthesia, could be the reason for parents' less acceptance. Given the large differences between studies in different parts ofthe world,it can be concluded that the acceptance of parents invarious communities is different based on theprevailingand culturalprinciples. Variables such asinsurance coverageandthe costsofdifferent servicescan also affect parents'decision(18). In any case, informed consent taken from the parentsand spending timeto explain thetechniques andalso well communication with parents in all casescan be effective in parental acceptance and avoid legal consequences.According to the results of this study, since most children older than 3years have good communication skills for dental treatment withnon-pharmacological approaches, the dentist should consider care and diligence to perform behavior management techniques in dealing with non-cooperative children. Because ofthe role of general dental practitioners in caring for the children's oral health, the training of behavioral management techniques should be given as practical form. Also,firm and decisive methods such as, hand over mouth and voice control should be used with caution due toless acceptanceof the parents.

CONCLUSION

Considering reviews conducted in this study,non-pharmacological invasive behavioral management techniques were more acceptable than general anesthesia by the parents. Therefore,it seemsthat dentists should exert more effort to treat children with methods other than general anesthesia.

REFERENCES

1. Abushal M, Adenubi JO. Attitudes of Saudi parents toward separation from their children during dental treatment. Saudi Dent J. 2009 Jul;21(2):63-7.

2. Kupietzky A, Ram D. Effects of a positive verbal presentation on parental acceptance of passive medical stabilization for the dental treatment of young children. Pediatr Dent. 2005 Sep-Oct;27(5):380-4.

3. MC Donald RE, Avery DR. Dentistry for the child and adolescent. 9th ed. St Louis: Mosby Co; 2011: 35-9.

4.Razavi SH, purtaji B. Determinig the behavior management techniques acceptance of mothers reffered to the department of pediatric dentistry in Qazvin. JQUMS. 2009; 13(3): 81-6.

5.Guideline on behavior guidance for the pediatric dental patient.

Pediatr Dent. 2008;30(7):125-33.

6. Pinkham JR, Cassamassimo PS. Pediatric dentistry infancy through adolescence. 5th ed. Philadelphia: W.B Saunders Co; 2013: 360-8.

7.Elango I, Baweja DK, shivaprakask PK. Parental acceptance of pediatric behavior management techniques: a comparative study. J Indian SOC Pedod Prev Dent. 2012; 30(3): 195-200.

8. Winer GA. A review and analysis of children's fearful behavior in dental settings. Child Dev. 1982;53(5):1111-33.

9.Ozgur O,Kuşcu O, Çağlar E, Sandallı N. Parents' assessments on the effectiveness of nonaversive behavior management techniques: A pilot study. Journal of Dental Sciences. 2014; 9(1):29-34.

10. Wewers M.E, Lowe N. K. A critical review of visual analogue scale in the measurement of dinical phenomena. Reaserch in nursing and health.1990;13:227-236.

11. Lawrence SM, McTigue DJ, Wilson S ,Odom JG, Waggoner WF, Fields HW, Jr. Parental attitudes toward behavior management techniques used in pediatric dentistry. Pediatr Dent. 1991;13(3):151-5.

12. Muhammad S, Shyama M, Al-Mutawa SA. Parental attitude toward behavioral management techniques in dental practice with school children in Kuwait. Med Prince Pract 2011; 20(4): 350-55.

13.Boka V, Arapostathis K, Vretos N, Kotsanos N. Parental acceptance of behavior-management techniques used in paediatric dentistry and its relation to parental anxiety and experience. Eur Paediatr Dent 2014;15(5):333-9

14. Kindler CH, Herms CH, Amsler F, Ihde Scholl T, Scheidegger D. The visual analogue scale allow effective measurement of preoperative anxiety and detection of patients anesthetic concerns. Anesth Analg 2000 March; 90(3): 706-12.

15. Luis De leon J, Guinot Jimeno F. Acceptance by Spanish parents of behaviour management techniques used in pediatric dentistry. Eur Arch Pediatr Dent. 2010; 11(4): 175-8.

16. Eaton JJ, McTigue DJ, Fields HW, Jr., Beck M. Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry. Pediatr Dent. 2005; 27(2):107-13.

17. Strange DM. The evolution of behavior guidance: a history of professional, practice, corporate and societal influences. Pediatr Dent 2014; 36(2): 128-31.

18.Kupietzky A. Effects of Video Information on Parental preoperative anxiety level and Their Perception of conscious sedation vs. General Anesthesia for the Dental Treatment of Their Young Child. Journal of Clinical Pediatric Dentistry. 2008; 31(2):90-2.

19. Peretz B, Zadik D. Parents' attitudes toward behavior management techniques during dental treatment. Pediatr Dent. 1999; 21(3):201-4.

20. Gharavi M, Soltani GH. Evaluation of general anesthesia in pediatric dental procedures. J of mashhad dental school 2008; 32(1): 41-6 .

21.Atherton GJ, McCaul JA, Williams SA.Medical emergencies in general dental practice in Great Britain. Part 2: Drugs and equipment possessed by GDPs and used in the management of emergencies. Br Dent J. 1999;186(3):125-30.

Table 9 : Brief explanation of non-pharmacological behavioral management techniques, and general anesthesia

Voicecontrol	Voice control includes changes in sound volume or the manner of expression in order to gain the attention of the patient and prevent the formation of negative behavior. This method can also be used justby facial expressions. The success of this technique requires dentist'sself-confidence (6).
Parents separation	Although the presence of parents usually help the behavioral management techniquesButin the case of a childwho behaves inappropriately, the dentist may decide to separate the child from his/her parents. This is a perfect method in order to calm down and encourage children to cooperate (6).
Active restraint	Dentist can control a noncooperative child with obtrusive movements by bringing down arms and upper body of child or putting the head of the child between his/her body and arms. This action eliminates unwanted movement and protects the child and dentist from probableinjuries and increases quality of service (7).
Mouth prop	Usingintraoralrestraints canpreventpossibledamages to thesofttissueof a child's mouth. Alsoin most cases,it is helpful to continue and complete dental treatments of children with disabilities. This equipment is effective in maintaining and fixing the jaws in appropriate position. Also, it prevents the fatigue and discomfort of a child during the treatment (3).
Hand over mouth	The main purpose of hand over mouth is to gain the attention of a high resistant and stubborn child, in order to communicate and obtain his/her cooperation for a safe treatment. Maladaptive behaviors such as screaming and kicking will face with restrictions (hand over mouth) and behaviors with cooperation will be along with the removal of restrictions and the use of positive reinforcements (praise). It is important to say this behavior is not routinely used.It is only used as a last resort and usually in children between ages 3-6 yearsold who have some communication capabilities (3)
General Anesthesia	This method is suitable for children requiring extensive dental treatment,if all of thebehavioral management techniques fail. Children dental procedures will begin after the general anesthesia in operating room in only one session. This technique provides safety, effectiveness and high efficiency,eliminating pain, anxiety, and non-cooperative reactions. This treatment is used in children with medical, mental and physical problems (7).

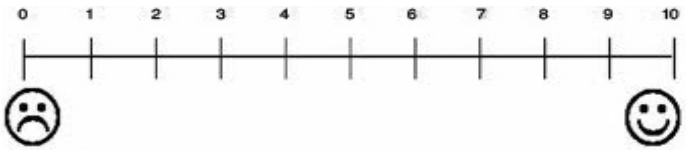

Figure 1:Visual Analog Scale

Table 2 : Shows the frequency distribution of age and demographics of 51 patient participants

Characteristics	Frequency	Percent
Age	-	-
3 years old	16	31.37
4 years old	17	33.33
5 years old	18	35.30
Number of children	-	-
1	31	60.80
2	15	29.40
3	5	9.80
Birth order	-	-
First	32	62.80
Second	16	31.40
Third	3	5.80

Table3: Educational level and Residency of referred parents

Characteristics		Frequency	Percent
Elementary (Literacy)		4	3.90
Middle School		16	15.70
High School		27	25.60
The first university degree		48	47.10
Master's degree or higher		7	6.90
Residency	Urban	72	70.60
	Rural	30	29.40

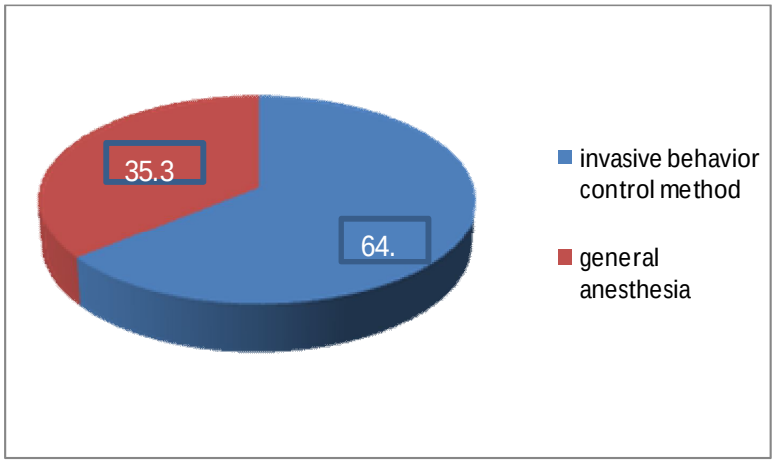

Figure 2: Parents acceptance of the invasive behavior control methods compared to general anesthesia

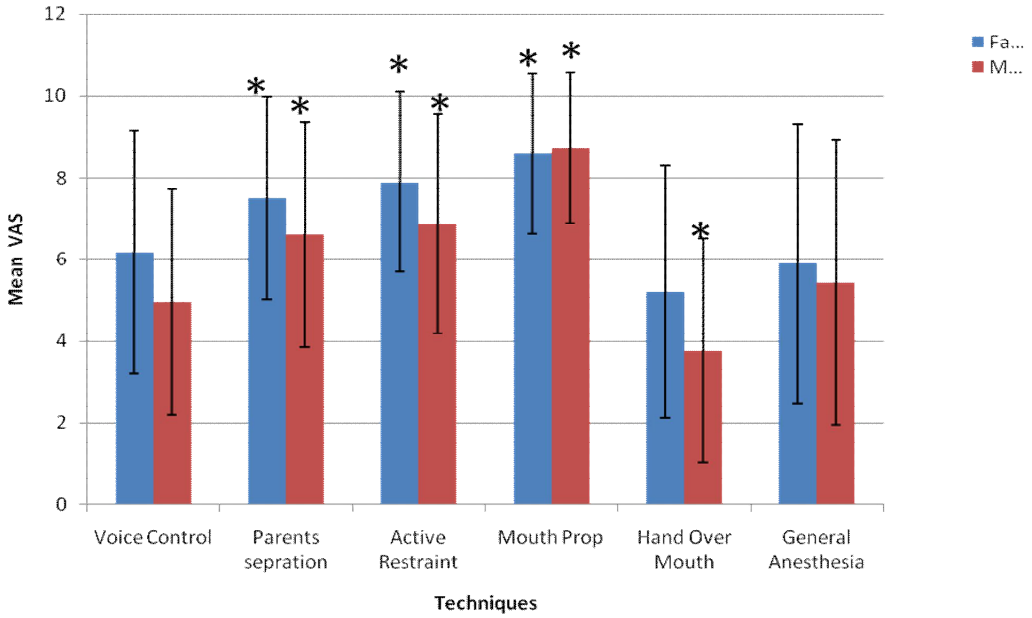

Fig.3. Mean values of acceptance (±SD) of five behaviour-management techniques and general anesthesia. The stars indicate statistically significant differencesbetween the ratings from parents to invasive manangment techniques compared to general anesthesia. Fa: Father , M: Mother

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

The Comparative Framework Study in the Works by Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali

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Received: 25 Nov 2014 Revised: 8 Dec 2014 Accepted: 18 Dec 2014

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ABSTRACT

Gajar age can be considered as one of the significant ages in Iran history, change periods, affected by the west in most of the arenas such as political, social, cultural, and art. The most obvious influence on art is the western human-oriented attitude and technical changes in Iranian painting. Court iconography doctrine is the most important painting style in Gajar age. Iconography in Fath Ali Shah age has been always emphasized as the top point in Gajar art. Famous artists of this age are Mirza Baba and Mehr Ali that have portrayed the most beautiful painting of Gajar court.Illustrated manuscript arbitration Shahname belongs to the thirteenth century AH in Gajar age consists of the works by Lotf Ali Suratgar Shirazi and arbitration brothers. Portraits of this prescription are the witness of the last attempts for making alive the principals of Iranian painting. Adherence to the principles and aesthetic thought of Gajar are evident in this prescription.The purpose of this study is introducing the common structural specifications of iconography among the works by Suratgar Shirazi, Mirza Baba, and Mehr Ali. The way of using the common elements of portraits in artists' work has been considered. Studying the paints shows some common elements in the painting of these artists. The common fundamental principles among the works by Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali have been observed by protecting and transmission of the indicators.

Keywords: Gajar, Iconography, Lotf Ali Suratgar, Mirza Baba, Mehr Ali.

INTRODUCTION

Painting in Gajar age has passed various ups and downs. Gajar's painting has root in the Zand's painting. Court iconography took place during the thirty years of Karim Khan's monarchy. Framework composition reached itspeak ofprosperityandbeauty in Fath Ali Shah time of monarchy. Art of Gajar age includes the considerable characteristics. Art rather clumsily, artificial, and fully human represents the spirit of this time. Contents and methods are like the past ages from some angels and from the other angels are different. In fact, Gajar age is one of the wonderful ages in Iran history and the contact time of the new and old elements, occurring political and social evolutions, and the beginning of art and cultural changes.

Sir Lotf Ali Suratgar is a painter adheres to tradition but used to use the recent paintings in his approach to the traditional Iranian painting. Aesthetics in Iranian painting in thirteenth century AH was revived with the portraits by Lotf Ali Suratgar. Two great artists of this age, Mirza Baba and Mehr Ali under Fath Ali Shah's commission have made some works in big size to be shown in the new palaces. Among the kings and the Gajar's princ, many paintings remained from the Fath Ali Shah that shows him in different positions and garments sitting on the ground or laying on the royal couch.

The attempt of this study is introducing the court iconography in Fath Ali Shah Gajar age and comparative studies among the artists' work of this age including Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali. The method of this study is analysis the content, library study, and descriptive. The main procedure of collecting the data in this study is using library, note taking tools, and pictorial archives. The following questions will be answered in this study: 1.What is the common portrait and structural specifications in iconography of Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali's works? 2. Can we find any relation in the meaning and content of the Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali's works? In addition to the recognition of court iconography in Fath Ali Shah's age, changes principal of drawing human framework, topics and their usage will be considered.

The First Age of Gajar Monarchy

"History of the Gajar dynasty in political arena of Iran back to the late ninth century AH."(Zarin Koub, 1996) they struggled with Nader Shah and Karim Khan for acquiring the power, but they couldn't. Aqa Mohammad Khan who was in Shiraz under supervision of Karim Khan Zand, raised after he died in 1193 AH". (Pakbaz, 2005) and he possessed some areas such as Gorgan, Gilan, and Mazandaran in this chaos at that age. He established Gajar's chain after overcoming the Lotf Ali Khan, "and brought back peace and safety to the land in which local war, famine, and decreasing the population impoverished them." (Amanat, 2004)

Finally, Aqa Mohammad Khan was killed by some of his attendants in 1212 AH. His position was replaced with Khan Baba Khan, his nephew. So, Baba Khan Known as Fath Ali Shah sat on the royal couch in 1212 AH and ruled Iran until 1248 AH for 36 years. Aqa Mohammad Khan had tried so hard in order to bring back peace and stability to the country so the background for renewing the art was ready at the time of his nephew. "Fath Ali Shah was not interested in warfare and conquest, but had artistic spirit, and was so interested in painting and scribe. Also, he had a nice handwriting with taste and talent for poetry. He used to write poetry by using his nickname "Khaqan" and feeling proud by sending different prescriptions of his court poetry to European countries." (Skarchiya, 2005) "Also, epic was written in describing the history of the Gajar dynasty under his command that at least five prescriptions was awarded to the European kings and officials." (Rabi, 2006)

After forming the Gajar government and especially after the presence of second king of Gajar, Fath Ali Shah, the art lover king, gathered the artists in Tehran to work in king workhouse to be the first mover of the style which is known as Gajar's doctrine today. The first age of portrait art began at his time.

Court Iconography

"Forming original court iconography accomplished in the Karim Khan reign of thirty years (1163-1193 AH) that Shiraz became capital. Short period safety caused the artists and order voters get together and consolidate the style of Zand's doctrine." (Aghdashlu,2005) Due to this, great painters of Fath Ali Shah court could show their art with convenience and offer paint doctrine of Fath Ali Shah age as the most significant art ages after the brilliant age of Safavi art.

Court icon writing doctrine is a combination of some intellectual attitudes that with combining some European styles with some Iranian styles of thinking painting, a fusion of aesthetics emerges. (Human orbital thought + using the traditional Iranian painting style). This doctrine is norm between traditional art of Iranian painting and modern art. In fact, Iranian art age is considered from traditional forms to modern forms. The most significant points of court iconography are as following: "1.Emphasaizing on human body, offering human, decorative versions 2.Addressing the early issues in the new format and the new topics 3.Combining European style with traditional elements 4.Application of the especial structure (vertical elements, horizontal, and curve) 5.Addressing the trapping court life.'(Rasouli, 2006)

"In Qajar art, the way of drawing face changed. The eyebrows became wider; eyes became more natural and larger, but the way of drawing hands remained the same. The form of lips became more natural with more alive faces, but without emotional mood."(Aghdashlu, 1997) and "in those ages, the ideal beauty of women was consisting of: round face, narrow nose, a mouth like a flower bud."(Rabinson, 1972) Men in the court iconography painting often had long and black beard, slim waist, usually formal, very solemn, sitting on knees with sword or standing and having scabbard in one hand while the other hand was on the shawl belt. Women had an oval face, unibrow, black eyes using kohl, fingers full of henna while dancing, playing an instrument, standing or sitting with full dignified and obscenity offering flower or cup.

Pattern of staged painting is retrieved from architecture palaces and it is totally courtier; So that the bodies of men and women have been portrayed all in brocade and pearl dress, drowned in jewelry, very dignified and graceful beside niche and window with gathered curtain that shows the perspective of nature and architecture. "As kings and prince of Gajar age considered themselves as same as the historical and mythological characters, imaging the legendary heroes and the past Iranian kings was included in their agenda."(Pakbaz, 2011) The remained works from the beginning of Gajar age are the best examples that show human attention.

Short Commentary on the Lives of Artists

Mirza Baba Hosseini Esfahani

"He used to work in Karim Khan's court at the beginning" (Taj Bakhsh, 2003) and "it seems that Mirza Baba was the first Gajar court painter who has worked in Estarabad before this. He worked as a painter between 1785/1199 and 1810/1225. His work was oils, illuminated manuscripts, painting, and cover. Actually, his first work is tiny drawing of dragon and phoenix in 1789/1203 in Estarabad. The initial work by Mirza Baba was portraying the poetry by Fath Ali Shah that later on was awarded to the king of England in 1812 AD." "One of the features of his painting is its novelty so that viewer doesn't get tired of repetitive portraits."(Ozerli, 2010) Also it can be said that "Mirza was famous because of using perspective in his painting's background."(Rahnemoud, 2007) He continued with his naturalism style in Gajar age with a little change in the title of his works. With support of Gajar court, Mirza was able to create more valuable works until was appointed as a supervision of Fath Ali Shah gallery.

Mehr Ali Tehrani

Mehr Ali was a painter and formal portraits of Fath Ali Shah (1212 to 1260 AH). He has portrayed symbolic mode of Shah for several time. The face portrait size by Mehr Ali often was natural. Mehr Ali was interested in European style of portraying. His works show his vast understanding of traditional art. Mehr Ali was so skillful in using the oil colors and the other tools. "Mehr Ali had so many offers for face portraying and used to sign his works as a "the least figure by Ghulam Ali." He has mentioned the name of the characters of his works – often implemented in vertical frame – added one to two beat poetry at the top and right side of his works using Nastaliq writing. Special characteristics of Mehr Ali's works were attempting in presenting the physical details of characters in suspended two-dimensional position with warm colors and a setofdecorativesurfacesin empty space of background. Therefore, these are the reasons show his creativity more than other artists in Gajar age and make him different from others."(Jalali Jafari, 2003)

Lotf Ali Suratgar Shirazi

"Sir Lotf Ali, watercolor painter was born in 1217 or 1222 or 1223 AH in Shiraz. He passed away after 65 or 66 years in 1288 and buried in Imam Grave in Shiraz behind four arches. He was kind and tall." (Aghdashlu, 2010) "His style was a bit different from others as it can be seen Shahname painting arbitration. The paintings by Lotf Ali Khan in Shahname arbitration is complete set that shows his lengthy artistic attempt. This kind of epic and large gathering with many details were not the main specialty, but are novel and graceful in compare with the illustrated prescriptions of Gajar age."(Haman, 30: 31)

RESEARCH FINDINGS

Portrait studying of faces in initial paintings of Gajar age and analysis the specifications of these faces result in finding some criteria among them that represent the viewpoint of this age. As mentioned before in aesthetics part of Gajar faces, there are common principals of face portraying between men and women so, aesthetics rules which were non written but accepted rules have implemented on all face portraits.

Face and head of men in majority of works are shown in two aspects of court and non-court. In court portrait aspect, head is on the neck and indicate a formal mood. Eyes are portrayed without makeup with short eye lashes, eyebrows are linear. Eyes shown near to each other and they are not symmetric in Mehr Ali's works. But, Mirza Baba against Mehr Ali tried to shows the eyes as symmetric as possible. Three-dimensional positions are mostly felt in the works by Mehr Ali. Both of the artists emphasized on beard and mustache in court portraits. Linear and thick eyebrow in Fath Ali Shah's face and other men was less common. The symmetric eyebrow is observed in Mirza Baba's works. Noses are portrayed narrow and slender and usually side view. Lips are shown small. Showing long beard and long mustache in men was sign of power and manhood. Mirza Baba could show the cheeks more obvious by shading beards while Mehr Ali used to cover the face by drawing beard and mustache. Both artists have used the formal colors suitable with court space. They used warm colors mostly red and yellow.

After analysis Lotf Ali's works, it can be discovered that his works has so many significant. In addition to the portraits, this arbitration Shahname reflects the last supports to the manuscripts portraits and indicates the art significant of Gajar age. Influence of European art in the colors and perspective existence can be observed. But, still the Iranian identity is obvious in the works compared with the European art. Most of the portraits in this arbitration Shahname are epic not amorously or lyrical that can be observed in Shiraz doctrine. Backgrounds in most of the portraits are natural landscapes that are implemented in a simple way; human and animals are the main topics of portraits. This matter has reputation in the portraits of Shiraz doctrine. Natural landscapes were appropriate for producing various commercial prescriptions in Shiraz. There are pyramid and stair frames that make the composition

more symmetric. Square frame or rectangle close to square and also horizontal rectangle were used more than vertical frames in these portraits that created static composition.

Most of the paintings have been portrayed by Lotf Ali Suratgar for valuable arbitration Shahname is formal. In some cases he has portrayed many people in the same position with similar faces. The majority of them are portrayed with unexpressive faces. The details in faces are shown manly and he has tried to portray eyes using least make up and natural. In his paintings, eyebrows are linear and natural, face are side view close to three-dimensional position. One of the secrets of his works is portraying long and thick beard and mustache in order to show the manhood and athletic in his characters. Realism can be seen in his works. He has used happy and light colors.

CONCLUSION

Analysis some of the works by Lotf Ali Suratgar as an agent of Shiraz doctrine with the other two prominent painters in Gajar age, Mehr Ali and Mirza Baba, implies that there are somehow similarities and differences in their works. In continue, the questions of the introduction will be answered: 1. what are the common structural and pictorial characteristics in portraying by Lotf Ali Suratgar Shirazi, Mirza Baba and Mehr Ali?

Independence of thought in using colors and design is obvious in the works by Lotf Ali Suratgar Shirazi. There are some other characteristics that can be seen in the works by Lotf Ali more than the works by Mirza Baba and Mehr Ali such as: declaration, simplistic and naturalism, clarity in art language, static and balance in composition and contract states, applying artificial elements in portraying story, creating positive and negative space with full resolution, creating relative symmetric in majority of the portraits, and strong story telling.

The significant outward characteristics in portraying of three artists are in drawing the figures. Showing linear and black eyebrows, long beard, and penetrating glance in the face of all the portraits are obvious. Although all the portraits are not exactly the same, there are some similarities like their composition, balance, relative symmetric on the page, the position of different elements, the position of the main character, color processing, and some symbolist elements like using red, golden yellow, black and white color. These artists used light shadow rarely, so we are not able to identify the light source and there is light in whole page. They also used a little bit perspective. These portraits are similar to each other in three groups following the continuity artistic tradition.

It is notable in analysis the woks by Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali that the portraits in Shahname become meaningful when you look at them along with its text, because these portraits have close connection with the text of Shahname. The portraits by Mirza Baba and Mehr Ali can be analyzed with considering their environment because these tableaus were installed in special places with special conditions and sometimes with orders by customers. But, in this study, most of the portraits are selected in a way that is possible to reconcile the portraits by Lotf Ali with these groups of paintings.

Can we find the meaningful connection among the works by Lotf Ali Suratgar Shirazi, Mirza Baba, and Mehr Ali?

Indicators of traditional Iranian portraits have a direct relation with traditional society and insight characteristics of Iranian artists. Ferdosi brought in heart the feeling of being Iranian by showing the past glorious of Iran at the time when Iranian identity was threatened. After him, the Iranian identity continued as an integrated government in political, religious, cultural, literary, and art aspects. Selecting the themes of portraying Shahname implies gloom for the greatness of Iran and the great heroes in the past while Fath Ali Shah was the Fars governor before reaching the monarchy. The important factor of Shah's attention to the greatness of old civilization in Iran was when he became familiar with the past glorious history of Iran especially Sasani's age. He considered himself as heir of past kings and was inspired by their way of governing so this is one of the effective common points on the artists.

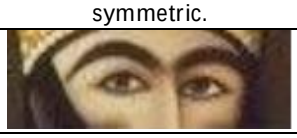
On the other hand, painting in Gajar age was in direct challenge with the European painting elements which was in relation with the main contrast of this age like custom and modernization. As the modern developments always happen in any ages, artists are appointed to find a way of combining them. Portraits by Lotf Ali, Mirza Baba, and Mehr Ali are illustrative and complete examples of combining the traditional style with the western one. Combining Iranian insight and western style is evident in the portraits by these artists. Using realistic elements and details in paintings make it close to the artist age.

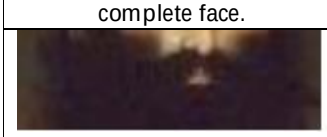
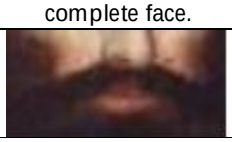
It seems that overview of the criteria was the same during the Iranian art history. Although this history had some changes but had kept its continuity in each age that distinguished it from other countries. Despite of being influenced by the western cultures, Iranian art has pure national express. At the end, while recalling the visual changes made in the artists' attitudes of Shiraz doctrine and the first age of Gajar, seems the especial characteristics in the art of two ages are reflection of the society conditions in those ages and reagent of the art that causes us feel the similarities and differences that have passed on the artists.

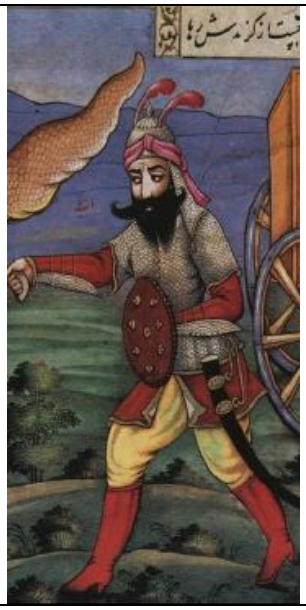
REFERENCES

1. Aghdashlu, Aidin, 1997, Sir Lotf Ali Suratgar Shirazi, Tehran, Cultural Heritage Organization, First Edition.
2. Aghdashlu, Aidin, 2005, An Introduction to the Gajar Paintings, Quarterly Artist, Fall.
3. Aghdashlu, Aidin, 2009, From Joys to regrets, Tehran, Ayeneh Publication.
4. Amanat, Abbas, 2004, The Universe Qibla, Translated by: Hasan Kamshad, Tehran, Karnameh Publication.
5. Azhand, Jacob, 2002, Iran Portraying, Second Edition, Tehran, Samt University Publication.
6. Azhand, Jacob, 2007, Painting and Painters of Gajar Age, Tehran, Ell Shahsavan Publication.
7. Azhand, Jacob, 2007, Wall Portraying in Gajar Age, Visual Arts, No.25
8. Diba, with Maryam Ekhtiyar, Royal Persian Painting, The Gajar epoch, 1999
9. Jalali Jafari, Behnam, 2003, Gajar Art, Tehran, Kavesh Qalam.
10. Julian. Raby, Gajar Portrait, L.B Tauris 1999.
11. Karim Zade Tabrizi, Mohammad Ali, 1997, Works and the Status of the Old Painters, London.
12. Pakbaz, Ruein, 2005, Birth of Custom, Modern Show, Quarterly Artist 13, Fall.
13. Pakbaz, Ruein, 2011, Art encyclopedia, Tehran, Karang Publication.
14. Rasouli, Zahra, 2006, Being Familiar with the Status and Works of Some of the Painters of Fath Ali Shah, Farhangestan Honar, No.43
15. Robinson and Others, 1972, Looking at the portraits of twelfth and thirteenth century, Tehran, Shahbanoo Office.
16. Robinson and Others, 2010, Iranian portraits art, Translated by: Mehdi Hosseini, Tehran, Art University.
17. Skarchiya, John Roberto, 2005, Safavi, Zand, and Gajar Art, Translated by Jacob Azhand, Tehran, Muli Publication.
18. Taj Bakhsh, Ahmad, 2003, Iranian History and Civilization (Gajar Age), Shiraz, Shiraz Publication.
19. Zarrin Koub, Abdulhossein, 1996, Days, Tehran, Sokhan Publication, Third Edition.

Table1: Comparative table Works by Lotf Ali Suratgar, Mirza Baba, and Mehr Ali

Mehr Ali	Mirza Baba	Lotf Ali Suratgar Shirazi	Face Components
In most of the paintings in court aspect, the head is placed on the neck and has a formal position.	In most of the works, the formal position and courtier is obvious.	In most of the works, are formal and official.	The face and head frame is three-dimensioned or close to round and sometimes oval.
			
The eyebrows are shown joined and arcuate.	The eyebrows are thick but less joined.	The eyebrows are thick, linear, and manly.	The eyebrows are thick.
			
Eyes are shown with less makeup, short eyelashes, close to Each other, and not symmetric.	Eyes are shown with makeup, hangover mood for more beauty.	Eyes are shown without makeup and as natural as possible.	Eyes
			
Nose is shown narrow and beautiful in side view or three-dimensioned position.	Nose is shown beautiful and in three-dimensional position.	Noses are shown side view close to three-dimensioned but manly.	Nose is shown narrow and slender.
			

Lips are portrayed in three-dimensioned position close to complete face.	Lips are portrayed in three-dimensioned position close to complete face.	Lips are portrayed in side view close to three-dimensional position.	Lips are portrayed small.
			
Beard and mustaches are sign of manhood and in the works by Mehr Ali has been emphasized on the beauty.	Beard and mustaches are sign of manhood and in the works by Mirza Baba has been emphasized on the beauty and glory.	Beard and mustaches are sign of manhood and in the works by Lotf Ali has been emphasized on the manhood aspect.	Beard and mustaches are shown long and elate.
			
Bodies are portrayed in formal and courtier position. He has tried to show the end of the beauty and youth even if the person doesn't have these characteristics.	Bodies are portrayed in formal and courtier position. He has tried to show the end of the beauty and youth even if the person doesn't have these characteristics.	Bodies have formal and official position in his paintings but the difference is characterization in his works. In some cases, the artist has portrayed many people as if all have the same position.	Bodies have formal and official position.

			
The colors are used appropriate with the formal and courtier space.	The colors are used appropriate with the formal and courtier space. The artist has used the warm and ripe colors.	Often used light and happy colors.	Colors
Three-dimension can be seen more and also helped to induce the volume.	Often portrayed with light predominance and least light shadow around the eyes and nose.	He has used light predominance and shadow on the three-dimensional face.	Volume processing
The light of the face is shown from the opposite.	The light of the face is shown from the opposite.	The light of the face is shown from the opposite with less shadowing.	Lighting
Simulation is along with the conventional rules.	Simulation is used less than conventional and metaphor.	Simulation is fully observed.	Simulation
He has used the inside space of simple architecture.	He has used simple architecture perspective to show the depth.	The background of the portraits are nature, mountain, and flat despite of being the battlefield. He didn't succeed a lot in creating the perspectives.	Architecture elements
He has used a horizontal rectangle in his paintings. Compositions are balance and symmetric.	He has used a horizontal rectangle in all of his works. Compositions are balance and symmetric.	He has put an element outside the framework in most of his portraits. Sometimes a character is portrayed outside the frame.	Framework

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Studying the Failure Mechanism of Base Plate Connection

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Received: 20 Nov 2014 Revised: 5 Dec 2014 Accepted:18 Dec 2014

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ABSTRACT

Parametric Studies aiming to investigate failure mechanism of conventional plate connections have been under the influence of interaction between bending anchor and shear. This study uses ABAQUS finite element software and considers both non-linear material behavior and non-linear geometric behavior. According to the results, for enhancing lateral stiffness, the appropriate solution would be to increase the thickness of angles instead of increasing the thickness of the bottom of the column. The reason can be the control of column scaling up at the connection of angle to the column and its bottom. In addition, lateral behavior of construction in elastic range is controlled mostly by the behavior of angle. However, inelastic behavior of structures is controlled by the interaction between angle and base plate. According to the investigation, it is recommended that lumped element models should consider the corner weld defects in the way of connecting angle to column and its bottom.

Keywords: Base Plate, Failure Mechanism, Lumped Element Model, Steel Fasteners, Structural Stiffness;

INTRODUCTION

One of the important issues in the study of seismic behavior of steel structures is the influence of connections on the behavior of structures. Since the bending connectors are commonly used in steel frames and the focus of the destruction caused by the earthquake is near the connections, researchers have studied the behavior of these connections and have proposed various behavioral models to examine the connections. In general, the behavior of moment frames depends on the performance and detailed behavior of connections (Federal Emergency Managment Agency, 2000). Connections are the most important sectors of steel structures and base plates are one of the important instances. This connection is important because of its significant impact on the overall behavior of structures as well as the nonlinear interaction of its component. In seismic areas, base plates are used mainly to move the axial load, shear and bending moment of the structure to foundation. Figure 1 shows an example of this connection. As seen, the connection consists of several parts, such as base plate, anchor rods, grout, and concrete foundation. As a result, the response of the connections (strength and stiffness) is controlled by the interaction of the various parts.

Review of Literature

Many researchers have been carried out on how to design and evaluate the interaction of the various components of base plate. In this regard, DeWolf and Sarisley's experimental studies (1980) Thambiratnam and Paramasivam (1986), Burda and Itani (1999) have led to development of methods (for example Drake and Elkin, 1999) to determine the resistance of these connections. In 1990, American Institute of Steel Construction (AISC) released a report by Diolf and Riker. A chapter titled 'AISC's Steel Design Guide Series 1' have described summary of information related to the design ofcolumn bottom under the influence of axial load and bending. Due to lack of experimental evidence, the report had some defects in shear loading part. In 2006, Fisher and Kloiber presented a new edition for design. In this manual, new information has been presented for design of shear (Gomez and Smith, 2009). In other words, the researchers have reached its peak by Fisher and Kloiber's publication American Institute of Steel Construction's Steel Design Guide (Fisher and Kloiber, 2006).

The next group of studies has been conducted to modify the proposed methods including studies of Gomez et al (2010), Ermopoulos and Stamatopoulos (1996) and Salmon et al (1957). Recently, Kanvinde et al (2012) introduced new analytical techniques with regard to the interaction between the various components of the connections; the techniques are reasonably consistent with the experimental results. In order to design this connection, the distribution of stress below the column bottom should be determined at first. Critical stresses in the bottom of the column can be calculated by access to yield line pattern and the severity of distributed stress using different methods of structure analysis; then, the base plate can be designed. That is to say, one of the maximum stresses and the overall distribution of strss in column bottom are important factors of design.

According to Figure 2, the methods of determining resistance are based on the assumption of constant or linear stress distribution under the column bottom. In these studies, the failure mode of the column is the default (shape and position of yield line). This distribution of stress and failure mode is controlled by complex interaction between different connecting components including slip and contact and nonlinear behavior of the grout, concrete and steel. For instance, according to Ermopoulos and Stamatopoulos, stress distribution under the base plate is more sensitive considering parameters like sheet thickness and hardness of the materials below base plate. In addition their study shows that the focus of stress in under toe of plate in thick plates while stress distribution in thinner plates would be more evenly. Despite these observations, all design methods [such as (Drake and Elkin, 1999 and Fisher and Kloiber, 2006)] examine distribution of stress with simplifications; these methods would not change with change in the thickness of the plate. The same as behavior of stress distribution, yield line pattern and its resistance are sensitive to sheet size and layout of bolts while generally design standards assume the parallelism of the yield line with column

wing. The assumptions are probably regarded because of design simplification and lack of accurate method in the measurement of stress distribution.

Research Objectives

Parametric studies to investigate the failure mechanisms of conventional connections are conducted in Iran under the influence of bending and shear interaction. According to part 1, stress distribution in base plate is sensitive to the size of connection components including sheet and column size. The exact behavior of structures with scale models will not be accepted. In this regard, this article employs finite element and full simulation of connection components to investigate the behavior of column bottom. The paper will study the effect of element thickness on failure mechanism after presentation and introduction of models, load-displacement diagram, and the behavior of connection components. Simulation and analysis are carried out by software ABAQUS V.6.10 (2010). It is noteworthy that the study considers both material nonlinearity and geometric nonlinearity behaviors.

Numerical Simulation in ABAQUS Software

S4R shell element is used for modeling the beam components, base plate, angle, and foundation. The element takes into consideration all shear deformations in plate thickness. Theoretical relationships governing the element are the reflected in such a way that the results of applying it in thin sheets are consistent with the results of the classical theory of plates. With increasing thickness, the results of applying the element will be led to the results of the theory of thick plates (Mindlin Shell Theory) (ABAQUS, 2010). In modeling, the soil around the foundation is considered rigid; moreover, there is no relative motion between the two elements by assuming full anchorage of bolts in the foundation. Area under the foundation is bounded in all respects to create support situation. In terms of large deformations, hard contact, or prohibition of element penetration, is defined to simulate accurately the behavior of the elements. Friction coefficient of 0.30 is used for the interaction between the steel components, column and foundation bottom (Diaz et al, 2006). It is notable that the linear elastic behavior of the the bolts is considered during the analysis. For column, column bottom, foundation and connection angles, nonlinear material properties have been considered. Furthermore, analysis method of Riks, which is able to identify the equilibrium path, is used in nonlinear analyses (ABAQUS, 2010).

According to the regulations of AASHTO (2010) materials used for steel components are M270M class 345 steel. Engineering stress-strain curve of the materials is based on data obtained from tensile and compressive test specimens in laboratory (Hartmann, 2005); finally, it is introduced to the software by transforming it to true stress - strain curve, as seen in Figure (3). One should be aware that average modulus of elasticity of steel materials is equal to 200GPa. Finite element software ABAQUS has different behavioral models for the confined concrete. All models are designed to have the capability of modeling reinforced concrete and non-reinforced concrete (ABAQUS, 2010). Concrete Damage Plasticity (CDP) has been used widely for modeling the behavior of concrete in finite element model. This article employs CDP presented by Lubliner et al (1989) and Lee and Fenves (1998) in this regard (ABAQUS, 2010). Two major failure mechanisms in this model are cracking due to tensile and smashing because of crush in concrete materials. Failure rate is evaluated by plastic strains equivalent to tensile and compressive. In order to study accurately the concrete behavior, specification of Jong experimental results is chosen (Jung and White, 2006). In the research, six compressive strength tests were performed on cylindrical samples that the average test data shown in Figure (4-A) based on a9-point description. Average compressive strength of concrete is equal to 33.58 MPa. Initial yield stress running of the concrete on stress according to the definition of Regulations ACI 318-02 is $0.45f_c^{'}$ that indicates $15.11(\mathrm{Mpa})$ in this experiment. According to this regulation, elastic modulus of concrete, E_c, is equal to the slope of connecting line from zero compressive stress to a point with $0.45f_c^{'}$ stress. According to data

obtained from the experiments, the average tensile strength of concrete is $f_{ct}=3.45(Mpa)$. Figure (4-B) shows the tensile behavior of concrete.

Geometric Features and Details of the Models

According to Table (1), 20 connections were considered for column base. Figure (5) shows a sample of meshing and connecting the components of column bottom. Two selected columns are 2IPE140 and 2IPE180 3m in length and angles of L80x80x8 and L80x80x10 with 10 cm length because they are widely used sections in construction industry. In order to investigate the failure mechanisms of connection and to disregard disconnection caused by a punch, foundation dimensions are selected so that to be consistent with provisions in the regulations (more than 2 times bigger than the area of the column); in addition, they should have enough depth to cut punch. In other words, foundation dimensions were chosen to be 200 x200x100 cm in accordance with the dimensions of column bottom that is 50x50 cm. In the location of bolts in foundation, 8 holes were created with dimensions of bolts, or 25 mm. Distance from the center of screws to the corners of the sheet is 6 cm. As shown in Figure (5-B), the angles are connected to column and column bottom by fillet welds and the elastic behavior. 'Tie' command in ABAQUS software is used to implement the behavior of weld and complete connection of angles. In order to establish the actual welding situation, a defect in the form of a 5-mm gap was articulated at the end of angle connections to column bottom and column. Loading is in form of a horizontal concentrated load at top of column so that the maximum bending is centered on a strong column. In this manner, the failure mechanisms of connection are checked with increasing load. Structural analysis will be conducted under the influence of the structure weight and concentrated load.

DISCUSSION AND CONCLUSION

After construction and analysis of models according to the process described in section 2 and 3, load changes as a response to tip load deformation are plotted for models 1 to 20 in Figures (6) and (7). Evaluation of failures models of 1 to 5 and 11 to 15 indicates that initial stiffness of the structure is increased by increasing the thickness of column bottom. This increase in the thickness of column from 20 to 25 millimeters is significantly considerable; then, increasing the thickness will not affect the stiffness of the structure. Evaluation of failures models of 1 to 5 and 11 to 15 indicates that no significant change will be observed after changing sheet thickness from 20 to 25 millimeters.

General comparison of models 1 to 20 indicates that increasing the thickness of the connection angles must be considered in order to increase the lateral stiffness in the design. The reason can be the control of column scaling up at the connection of angle to the column and its bottom. In order to evaluate the process of failure, as shown in Figure (8) to (10), the failures Model 1 is checked. The structural behavior is linear at the beginning of the load-displacement curve. With increasing load, arriving at point A, the first yielding point occurred in the connection angles; then, less nonlinear behavior is observed in the structures. However, with continuation of loading and reaching point B considerable nonlinear behavior is revealed. The reason for this phenomenon is simultaneous running off column bottom and expansion of plastic connections in angles. As seen, the behavior of elastic structures is controlled mostly by the behavior of connection angles. That is to say, it is recommended to increase thickness of angle and base plate to increase the initial stiffness of the structure. The one should increase thickness of angle and base plate to control the nonlinear behavior.

The most important results of this study can be summarized as follows:

The results show that in the same conditions, increasing the thickness of angles instead of increasing the thickness of the bottom of column would be an appropriate approach in order to increase the elastic stiffness of the structure. The reason can be the control of column scaling up at the connection of angle to the column and its bottom. Note that

increasing the thickness of the bottom of column after a certain depth will not lead to a change in structural behavior. Therefore, optimizations should be made in this regard.In the elastic range, the lateral behavior of structure is mostly controlled by the behavior of the connection angles while inelastic behavior of the structure is controlled by the combination behavior of angle and base plate.In order to evaluate the behavior of column bottom connection, it is recommended that the corner weld defects (lack of connection at the angle) in connection angles to base plate and column should be entered into the finite element models because the actions of the defect play important roles in the control of results.

REFERENCES

1. Federal Emergency Managment Agency, (2000). Prestandard and Commentary for the Seismic Rehabilitation of Buildings. Washington, D.C.: American Society of Civil Engineers. Available from: http: www.nehrp.gov/pdf/fema356.pdf
2. DeWolf, JT., and Sarisley, EF., (1980). Column base plates with axial loads and moments. J Struct Div, ASCE 1980, 106(11):2167–84. Available from: http://cedb.asce.org/cgi/WWWdisplay.cgi?9843
3. Thambiratnam, DP., and Paramasivam, P., (1986). Base plates under axial loads and moments. J Struct Eng ASCE 1986; 112(5):1166–81. Available from: http://dx.doi.org/10.1061/(ASCE)0733-9445(1986)112:5(1166)
4. Burda, J.J., Itani, A.M. 1999, Studies of seismic behavior of steel base plates. Report no CCEER 99-7. Reno, NV: Center of Civil Engineering Earthquake Research, Department of Civil and Environmental Engineering, University of Nevada. Available from: www.nehrp.gov/pdf/nistgcr11-917-13.pdf
5. Astaneh, A., Bergsma, G. 1993, Cyclic behavior and seismic design of steel base plates. Proceedings, structures congress. ASCE, 409–14.
6. Drake, R.M., Elkin, S.J. 1999, Beam–column base plate design—LRFD method. Eng J, AISC , 36(1):29–38. Doi:10.1016/j.advengsoft.2011.05.008
7. Gomez, I.R., Smith, C.H. 2009, Shear Transfer in Exposed Column Base Plates. Final report presented to the American Institute of Steel Construction. Report Presented to the American Institute of Steel Construction. Pp 1-134.
8. Fisher, J.M., Kloiber, L.A. 2006, Base plate and anchor rod design. AISC steel design guide one. 2nd ed. Chicago, IL: American Institute of Steel Construction. ISBN: 978-0-7844-7718-2.
9. Gomez, I.R., Kanvinde, A.M., Deierlein, G.G. 2010, Exposed column base connections subjected to axial compression andflexure. Final report presented to the American Institute of Steel Construction, Chicago, IL. Available from: http://nees.org/resources/839.
10. Ermopoulos, J., Stamatopoulos, G. 1996, Mathematical modeling of column base plate connections. Journal of constructional steel research, 36. Elsevier; 79–100. Available from: http://dx.doi.org/10.1590/S1679-78252014000800008
11. Salmon, C.G., Shaker, L., Johnston, B.G., 1957, Moment–rotation characteristics of column anchorages. Trans ASCE, 122:132–54.
12. Kanvinde, A.M., Grilli, D.A., Zareian, F. 2012, Rotational stiffness of exposed column base connections—experiments and analytical models. J Struct Eng ASCE, 138(5):549–60. Available from: http://dx.doi.org/10.1061/(ASCE)ST.1943-541X.0000495
13. ABAQUS v.6.10, Standard User's Manual. Hibbitt, Karlsson & Sorensen Inc., 2010.
14. Diaz J.J. et. al. 2006, Non-linear analysis of unbolted base plates by the FEM and experimental validation. thin-walled structures, 44, pp 529-541. DOI: 10.1016/j.tws.2006.04.008.
15. AASHTO LRFD Bridge Design Specifications, 2010, 5th Edition, American Association of State and Highway Transportation Officials, Washington, D.C. \

16. Hartmann, J. 2005, An-Experimental-Investigation-on the-Flexural-Resistance-of Horizontally Curved Steel I-Girder Systems, Ph.D.thesis, Department Of Civil and Environmental Engineering, University of Maryland.
17. Jung, S.K., White, D.W. 2006, Shear Strength of Horizontally Curved Steel I-Girders — Finite Element Analysis Studies. J. Constr. Steel Res. 62 (4), PP. 329-342. DOI: 10.1016/j.jcsr.2005.08.003

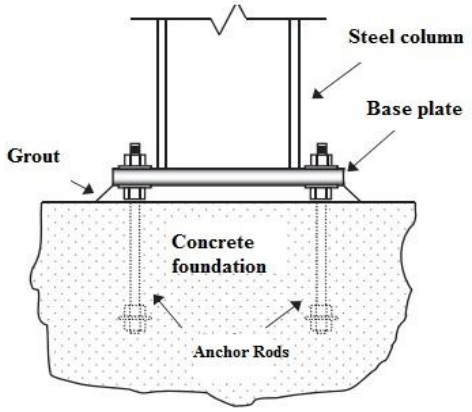

Figure 1 – A view from the the constituents of the column bottom connections in steel structures

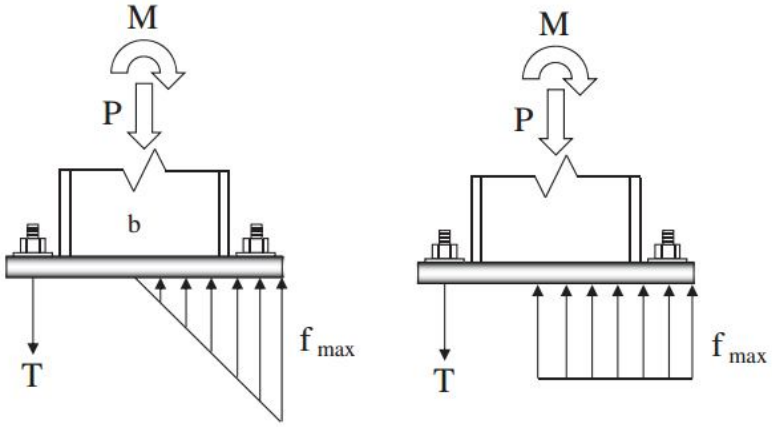

Figure 2: Linear and uniform stress distribution in the column's bottom

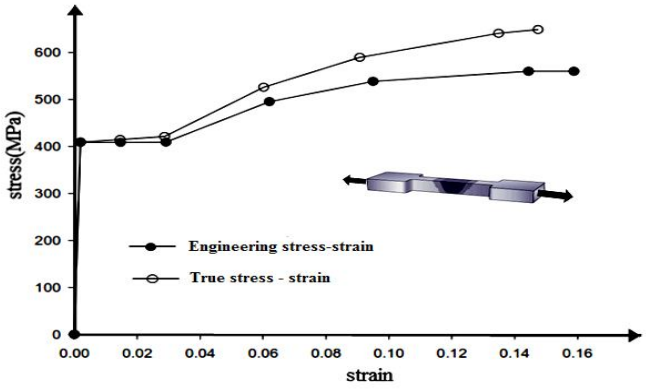

Figure 3 The stress-strain diagram for steel

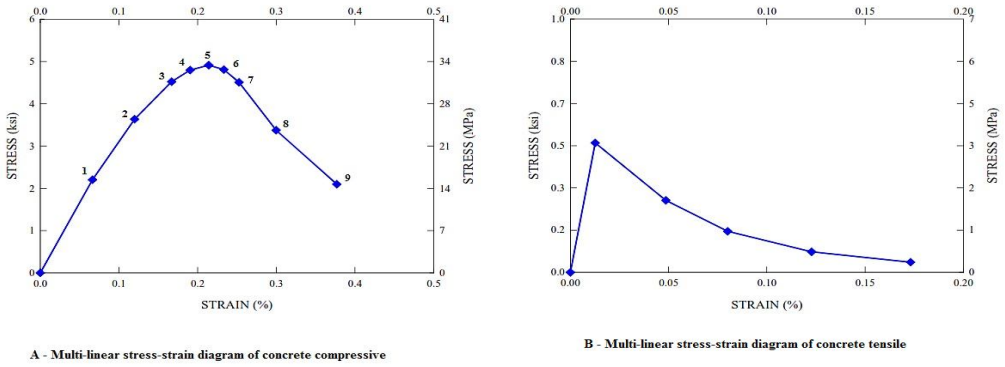

Figure 4 concrete compressive and tensile stress-strain curve - derived from experimental results

Table 1: Components geometry of parametric studies (dimensions are in millimeters)

Model	1	2	3	4	5	6	7	8	9	10
Column section	2IPE 140					2IPE 140				
Thickness of column bottom	20	25	30	35	40	20	25	30	35	40
Connection Angle	L 80x80x8					L 80x80x10				
Model	11	12	13	14	15	16	17	18	19	20
Column section	2IPE 180					2IPE 180				
Thickness of column bottom	20	25	30	35	40	20	25	30	35	40
Connection Angle	L 80x80x8					L 80x80x10				

Opening size of 5 mm
Due to lack of continuity of the weld

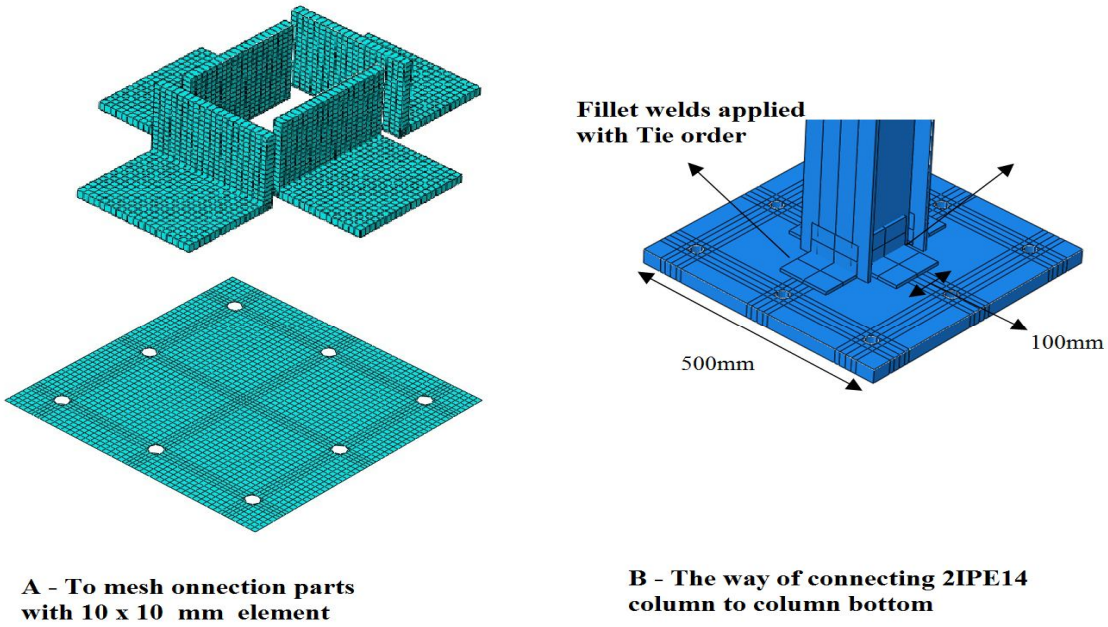

Figure 5: A view of meshing and connecting the components of column bottom

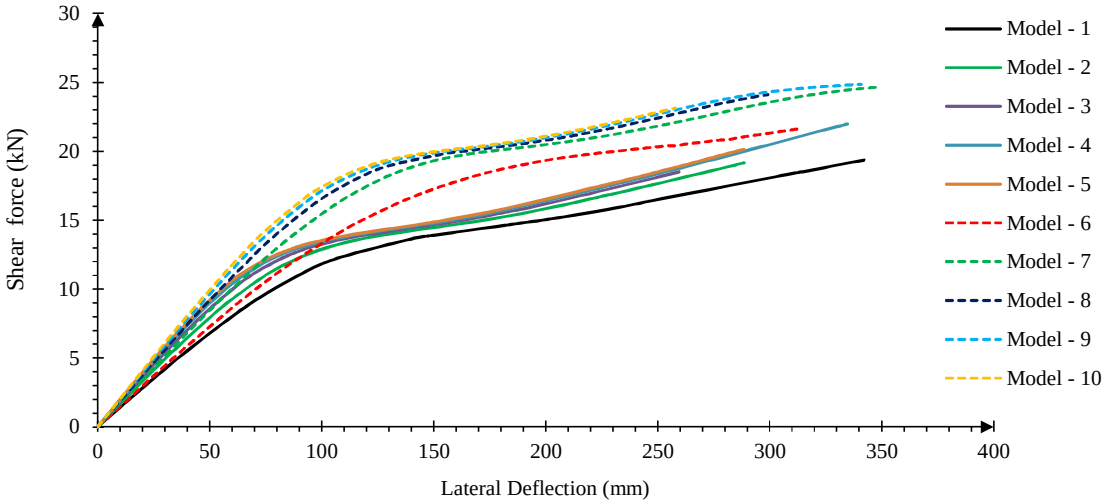

Figure 6 - Diagram of load-horizontal shift for models 1 to 10

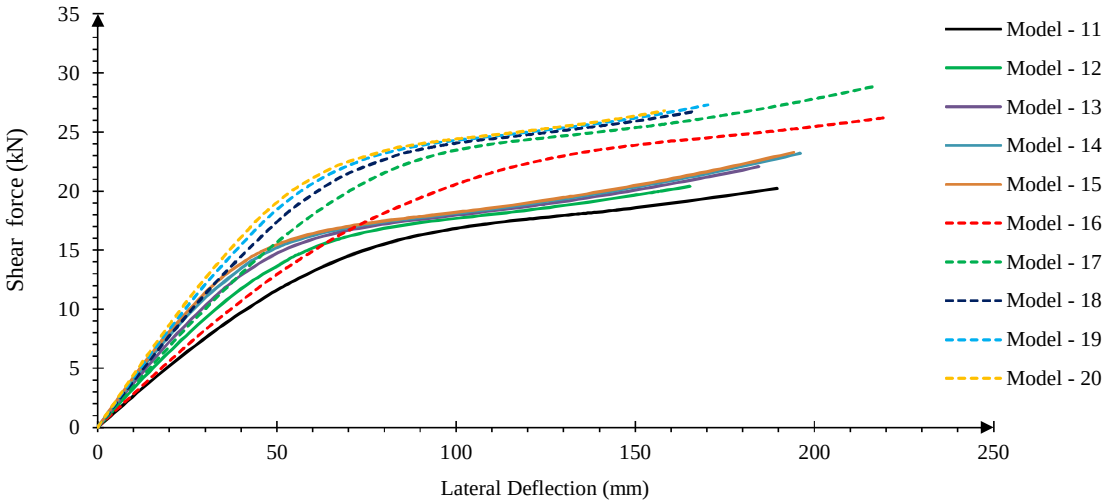

Figure 7 - Diagram of load-horizontal shift for models 1 to 10

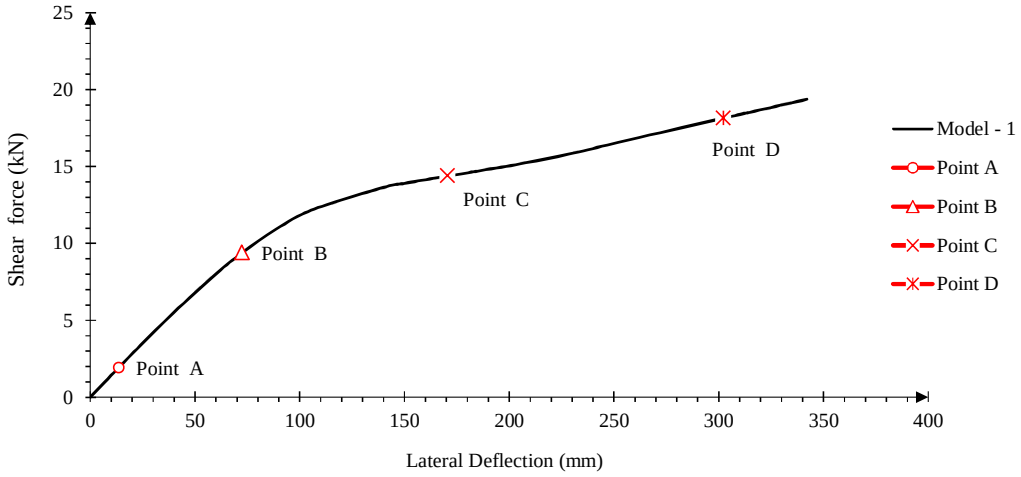

Figure 8 - Diagram of load-horizontal shift for models 1

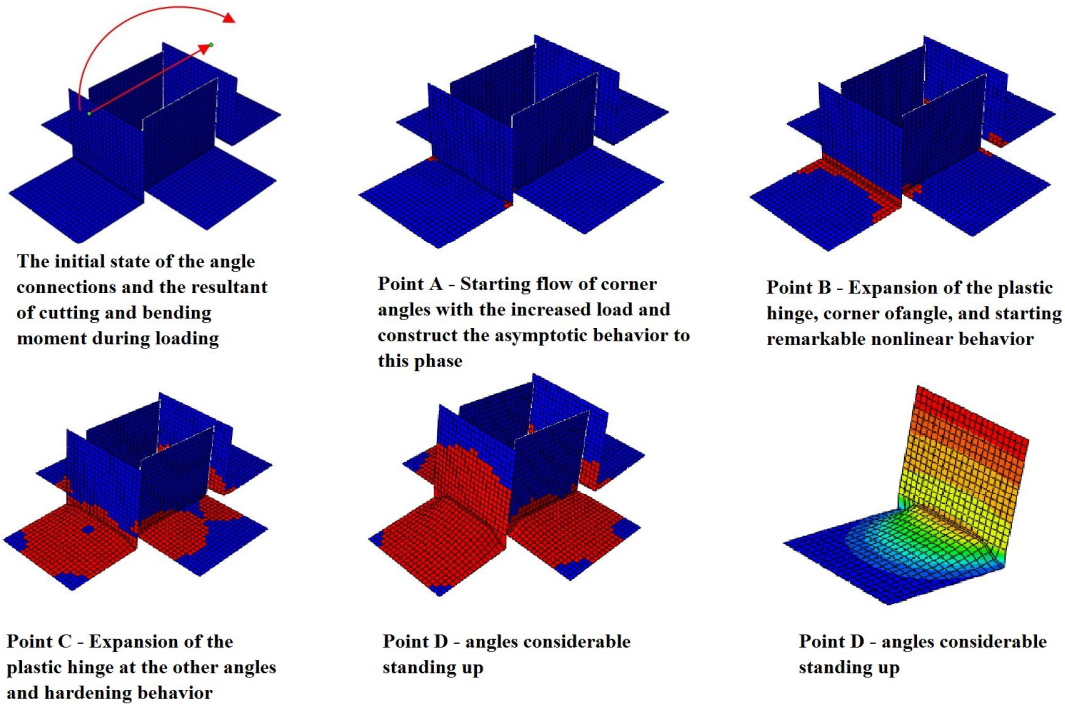

Figure 9 – The process of destruction of column bottom's connection - sample 1 - (zoom ratio: 2)

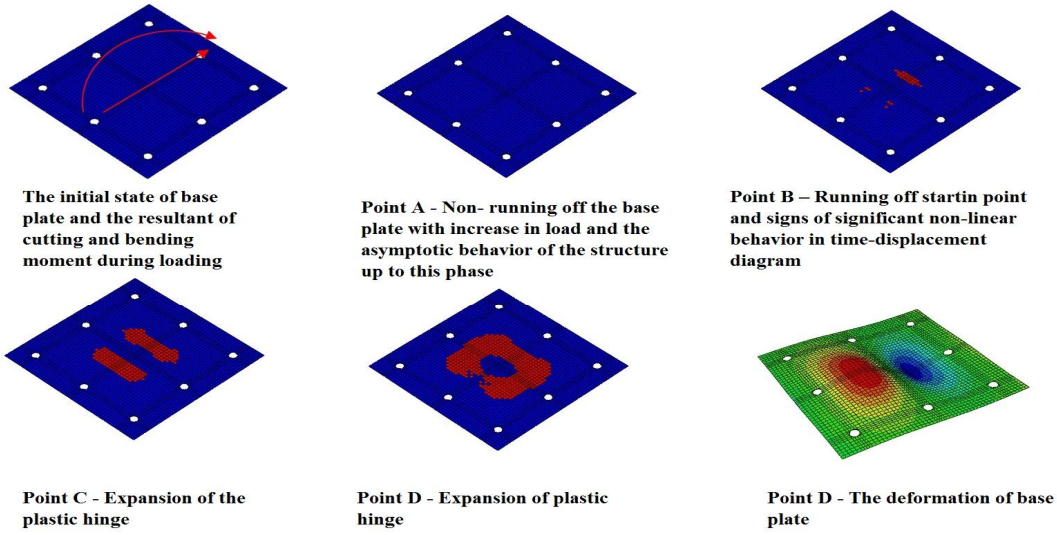

Figure 10 – The process of destruction of base plate connection - sample 1 - (zoom ratio: 2)

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Obsessive-Compulsive Disorder and Dysfunctional Attitudes

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Received:10 Dec 2014 Revised: 15 Dec 2014 Accepted: 2 Jan 2015

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ABSTRACT

The Aim of the present study was to examine the effect of Dysfunctional attitudes in the obsessive compulsive disorder (checker and washer). Participants were 90 individuals aged between 20-50, sixty (thirty checkers, thirty washers) drawn from a psychiatric and psychology clinic and thirty from the normal population. These three groups were assessed by measures of obsession and compulsion, Dysfunctional Attitudes.The present findings are in line with the existing research as not only the checker and washer groups scored significantly higher than the normal control group on the measures of obsession-compulsion, Dysfunctional attitudes , but in case of checker and washer groups, Dysfunctional attitudes was significant predictors of aspects related to obsessive-compulsive behavior.

Keywords: Dysfunctional Attitudes; Obsessive-compulsive disorder.

INTRODUCTION

In cognitive models of OCD, specific dysfunctional beliefs are understood to drive the negative appraisal of intrusive thoughts. Rachman (1997, 1998) emphasized beliefs about the significance and importance of one's thoughts. Jakes (1996), Swedo (2002), Szechtman and Woody (2004) and Taylor, McKay, and Abramowitz (2005) presented that other models of OCD do not regard dysfunctional beliefs as playing an important role. Taylor et al. (2006) showed that it was possible to identify two cognitive subtypes of OCD. The OC-high subtype was characterized by relatively high score (compared to the control groups) on measures of OC-related beliefs, including inflated responsibility, perfectionism, and the importance of thoughts. The OC-low subtype generally did not differ from most controls on these beliefs. In other word, the patients in the OC-low group were approximately normal in their scores on measures of dysfunctional beliefs. OC-high and OC-low subtypes did not differ in their severity of

contamination and grooming OC symptoms, although there were differences in terms of harming obsessions.In another research, Calamari et al. (2006) indicated a relationship between beliefs and OCD symptom severity, which could be interpreted as suggesting that their belief-based subgroups are simply reflective of overall variability in symptom severity. In this study all of participants met diagnostic criteria for OCD. Over half were classified as Low Beliefs in the two subgroup model, and these participants scored on beliefs measures equivalently to non-OCD comparison groups.

Julien et al. (2006) examined the specific OCD symptom subtypes associated with specific belief domains. They reported a high score on Importance/Control of Thoughts was more characteristic of the participants in the rumination symptom subtype than of the participants in the washing subtype when group was controlled for anxiety. When they were controlled for depression, the participants in the rumination symptom subtype showed a tendency to score higher on Importance/Control of thoughts than the participants in the washing symptom subtype.

METHODOLOGY

Participants

A sample of ninety individuals aged between 20-50. Sixty drawn from a psychiatric and psychology clinic and thirty from the normal population were the participants of this study. Out of sixty individuals selected from clinic, thirty patients had predominantly checking problems, and the other thirty patients had predominantly washing problems. The remaining thirty participants were without any known psychiatric problems. The participants with the checking problems constituted the checker group, those with the washing problems constituted the washer group and those with no known identified psychiatric problems constituted the normal control group in the present study.

Procedure

All participants in the OCD groups were outpatients at clinical psychology centers, namely the two centers of Shahid Beheshti University of Medical Sciences (SBUMS) in Tehran, Iran. They were diagnosed according to DSM-IV-TR criteria, using the Structured Clinical Interview (SCID-I: First et al., 1996; Persian Version Translation and Cultural Adaptation of Questionnaire, Sharifi et al., 2006). All participants completed self-report questionnaire given to them. Questionnaire was administered individually. A trained psychologist interviewed participants using the required clinical interview measures. Then, the DAS was carried out. Data collection concluded with filling out of report questionnaire by participants.

Instruments

Yale–Brown Obsessive Compulsive Scale (Y-BOCS)

A self-report version of the semi-structured interview Y-BOCS is designed to identify the severity of obsessive and compulsive behaviors. The self report version shows high parallel forms of validity with the interview version, r = .97 [13].all participants completed the Persian Translation and Cultural Adaptation of YBOCS by Malaqutie et.al [1]. This instrument showed high internal consistency α =.91 and with the Maudsley Obsessive Compulsive Inventory (correlations r =.77).

Dysfunctional Attitude Scale (DAS)

The DAS is a 40-item instrument that is designed to identify and measure cognitive distortions, particularly distortions, which may relate to or cause depression. The items contained on the DAS are based on Beck's cognitive therapy model and present seven major value systems, namely, Approval, Love, Achievement, Perfectionism,

Entitlement, Omnipotence, and Autonomy.Any items that are missing are assigned a zero. To obtain the overall score, the score on all items (ranging from 1 to 7) are added. When no items are omitted, scores on the DAS range from 40 to 280. Lower scores represent more adaptive beliefs and fewer cognitive distortions.The DAS is reported to have very good internal consistency, with alphas ranging from .84 to .92. The DAS also has excellent stability, with test-retest correlations of .80 to .84 over eight weeks. It has excellent concurrent validity, significantly correlating with several other measures of depression, including the Beck Depression Inventory (BDI). The DAS also significantly distinguishes between groups diagnosed as depressed or not depressed on the BDI. Furthermore, it was found to be sensitive to change following clinical intervention with depressed outpatients .All participants completed the Persian Translation and Cultural Adaptation of DAS by Bakhshaei(1372). This instrument showed internal consistency of α =.85, and test-retest correlations r =.84.

RESULTS

ANOVA was conducted to compare the three groups with respect to Obsession and Compulsion and Dysfunctional Attitude.

Obsession and Compulsion: Table 3.1 clearly indicates significant group differences on both obsessions and compulsions as measured by the Y-BOCS. With respect to obsessions, a significant main effect of group was noted, F (2, 87) = 214.30, p< .001. Post-hoc HSD tests were conducted to identify specific between-group differences. Results revealed that the washer group scored significantly higher than the checker group, which in turn scored significantly higher than the normal control group. Significant main effects of group were also observed with respect to compulsions, F (2, 87) = 152.95, p< .001. Post-hoc tests, however, revealed a different pattern of group differences, where the checker group scored significantly higher than the washer group, which in turn scored significantly higher than the normal control group.

Further, a significant main effect of group was noted with respect to total mean scores on Y-BOCS, F (2, 87) = 283.75, p< .001. Post-hoc HSD tests revealed that the washer group scored significantly higher than the checker group, which in turn scored significantly higher than the normal control group (Table 3.2).Overall, it can be seen from Tables 3.1 and 3.2 that with respect to obsessions, compulsions, and the total mean scores, both the washer and the checker groups scored significantly higher than the normal control group. However, with respect to obsessions and the total score on Y-BOCS, the washer group scored significantly higher than the checker group whereas considering compulsions, the checker group scored significantly higher than the washer group.

Dysfunctional Attitudes

The mean scores obtained on Dysfunctional Attitude Scale (DAS) by the three groups are shown in Table 3.3. The analysis showed a significant main effect of group with respect to dysfunctional attitudes, F (2, 87) = 16.31, p< .001. Post-hoc HSD tests were conducted to identify specific between-group differences. It was found that while both the washer and checker groups showed significantly greater dysfunctional attitudes than the normal control group, no significant difference was found between the two groups (checker, washer) on such attitudes.

DISCUSSION

In the present study, it was found that while both the washer and checker groups showed significantly greater dysfunctional attitudes than the normal control group, no significant difference was found between the two groups on such attitudes. In cognitive models of OCD, specific dysfunctional beliefs are understood to drive the negative appraisal of intrusive thoughts (Frost and Steketee, 2002).

Salkovskis (1985, 1989) emphasized responsibility beliefs in his cognitive model. Rachman (1997, 1998) emphasized beliefs about the significance and importance of one's thoughts. Rachman posited that over-importance of thought beliefs precipitate inflated responsibility.Obsessive Compulsive Cognitions Working Group (OCCWG, 2003) has identified three dimensions in OCD: (1) inflated personal responsibility and the tendency to overestimate threat (Responsibility/Threat), (2) perfectionism and intolerance of uncertainty (Perfectionism/Certainty) and (3) over-importance and over-control of thoughts (Importance/Control; OCCWG, 2005).

McKay et al. (2004) and Taylor (2005) have proposed various frameworks for subtyping OCD, including subtypes based on patterns of symptoms (e.g., washers vs. checkers), and subtypes based on etiological mechanisms (e.g., whether or not OCD is associated with pediatric streptococcal infection). Given the growing evidence that OCD is a heterogeneous disorder (or group of disorders) rather than a unitary syndrome, it is possible that different theoretical models apply to different subtypes of OCD. That is, models emphasizing the role of dysfunctional beliefs might apply to a subgroup of cases of OCD, or to particular symptom presentations.

Taylor et al. (2006) showed that it was possible to identify two cognitive subtypes of OCD. The OC-high subtype was characterized by relatively high score (compared to the control groups) on measures of OC-related beliefs, including inflated responsibility, perfectionism, and the importance of thoughts. The OC-low subtype generally did not differ from most controls on these beliefs. In other words, the patients in the OC-low group were approximately normal in their scores on measures of dysfunctional beliefs. OC-high and OC-low subtypes did not differ in their severity of contamination and grooming OC symptoms, although there were differences in terms of harming obsessions.Tolin, Worhunsky and Maltby (2006) in a study assessing the relationship among “obsessive” beliefs and OCD, suggested that OCD patients are characterized by a belief that thought control is both necessary and possible, a tendency to use maladaptive forms of thought control, and a high likelihood of failed thought control attempts.

In another research, Calamari et al. (2006) indicated a relationship between beliefs and OCD symptom severity, which could be interpreted as suggesting that their belief-based subgroups are simply reflective of overall variability in symptom severity. In this study all of participants met diagnostic criteria for OCD. Over half were classified as Low Beliefs in the two subgroup model, and these participants scored on beliefs measures equivalently to non-OCD comparison groups.According to, Julien et al. (2006), the specific OCD symptom subtypes are associated with specific belief domains. They reported that a high score on Importance/Control of Thoughts was more characteristic of the participants in the rumination symptom subtype than of the participants in the washing subtype when group was controlled for anxiety. When they were controlled for depression, the participants in the rumination symptom subtype showed a tendency to score higher on Importance/Control of thoughts than the participants in the washing symptom subtype.

The present findings are in line with the existing research evidence, which has shown over-importance and over-control of thoughts to be an important dimension of OCD (e.g., Rachman, 1998, Salkovskis, 1989, OCCWG, 2005).

ACKNOWLEDGMENTS

The authors would like to thank the psychiatry and clinical psychology departments of Shahid Behashti Medical University (Taleghani Hospital) in Tehran- Iran for enabling this field study. Furthermore, we thank the participants, for their cooperation and involvement with the study.

REFERENCES

1- Calamari, J. E., Cohen, R.J., Rector, N. A., Szacun-Shimizu, K., Riemann, B. C. and Norberg, M. M. (2006). Dysfunctional belief-based obsessive-compulsive disorder subgroups *Behavoiur Research and Therapy*, *44(9)*: 1347-1360

2- Frost, R. O. and Steketee, G. (2002). Cognitive approaches to obsessions and compulsions: *Theory, assessment.* New York: Oxford.

3- Jakes, I. (1996). *Theoretical approaches to obsessive-compulsive disorder.* Camberidge: Cambridge University Press.

4- Julien, D., O'Connor, K. P., Aardema, F. and Todorov, C. (2006). The specificity of belief domains in obsessive-compulsive symptom subtypes. *Personality and Individual Differences*, *41(7) :*1205-1216

5- McKay, D., Abramowitz, J. S., Calamari, J. E., Kyrios, M., Radomaky, A. S., sookman, D., et al. (2004) a critical evaluation of obsessive-compulsive disorder subtypes: Symptoms versus mechanisms. *Psychology Review, 24*: 283-313.

6- Obsessive Compulsive Cognitions Working Group (OCCWG). (2003). Psychometric validation of the obsessive belief questionnaire and the interpretation of intrusions inventory: Part I. *Behavior Research and Therapy, 41*: 863–878.

7- Obsessive Compulsive Cognitions Working Group (OCCWG). (2005). Psychometric validation of the Obsessive Belief Questionnaire and the Interpretation of Intrusions Inventory: Part 2. Factor analyses and testing of a brief version, *Behavior Research and Therapy, 43*:1527–1542.

8- Rachman, S. (1997). A cognitive theory of obsessions*, Behavior Research and Therapy, 36*: 385-401.

9- Rachman, S. (1998) A cognitive theory of obsessions: Elaborations, *Behavior Research and Therapy.* 36, 385-401.

10- Salkovskis, P.M. (1985). Obsessional-compulsive problems: A cognitive- behaviorsl analysis. *Behavior Research and Therapy,23*: 571-583.

11- Salkovskis, P. M. (1989). Cognitive-behavioral factors and the persistence of intrusive thoughts in obsessional problems, *Behavior Research and Therapy, 27*: 677–682.

12- Sharifi, V., Assadi, S. M., Mohammadi, M. R., et. al (2007). Structured Clinical Interview for DSM-IV (SCID): Persian Translation and Cultural Adaptation. Iranian J Psychiatry (2:1), 46-48.

13- Swedo, S. E. (2002). Pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS) *Molecular Psychiatry*, *7*: S24-S25

14- Szechtman, H. and Woody, E. (2004). Obssessive- compulsive disorder as a disturbance of security motivation, *Psychological Review 111*, 111-127

15- Taylor, S. (2005). Dimensional and categorical models of OCD: a critical analysis. In: J. S. Abramowitz and A. C. Houts (Eds.), *Handbook of OCD: Concepts and controversies* (pp. 27-41). New York: Kluwer Academic.

16- Taylor, S., Abramowitz, J. S., McKay, D., Calamari, J. E., Sookman, D., Kyrio1s, M., et al. (2006). Do dysfunctional beliefs play a role in all types of obsessive-compulsive disorder? *Journal of Anxiety Disorders*, *20 (1)*: 58-97.

17- Tolin, D. F., Worhunsky, P. and Maltby, N. (2006). Are "obsessive" beliefs specific to OCD? A Comparison across anxiety disorders, *Behavoiur Research and Therapy*, *44*: 469-480.

18- Taylor, S., McKay, D. and Abramowitz, J.S. (2005). Is obsessive-compulsive disorder a disturbance of security motivation? Comment on Szechtman and Woody (2004). *Psychological Review, 112*, 650-65

19- Woody, C. M., Vevea, J. L., Chambless, D. L. and Bayen, U. J. (2002). Are compulsive checke impaired in memory? A Meta–analytic review Clinical Psychology: *Science and Practice, 9*: 353-366

Table 3.1: Comparison of the checker, washer, and the normal control groups on obsessions and compulsions as measured by Y-BOCS

Variable	Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F (2,87)	Significant post hoc ($\alpha = 0.05$)
	M	SD	M	SD	M	SD		
Y-BOCS (Obsessions)	9.10	2.56	14.10	3.17	1.13	1.13	214.30***	Ng<Chg<Wag
Y-BOCS (Compulsions)	10.27	1.92	8.83	3.36	0.63	0.92	152.95***	Ng<Wag<Chg

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group ***p< 0.001

Table 3.2:Comparison of the checker, washer, and the normal control groups on total scores obtained on Y-BOCS

Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F(2,87)	Significant post hoc ($\alpha = 0.05$)
M	SD	M	SD	M	SD		
19.37	3.58	22.80	5.07	1.17	1.33	283.75***	Ng<Chg<Wag

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group
***p< 0.001

Table 3.3:Comparison of the checker, washer, and the normal control groups on Dysfunctional Attitudes Scale (DAS)

Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F(2,87)	Significant post hoc ($\alpha = 0.05$)
M	SD	M	SD	M	SD		
156.40	30.64	154.83	32.16	116.27	29.60	16.31***	Ng<Wag<Chg

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group
***p< 0.001

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Developing Erosion: The Experience of the Soldiers' Wives with PTST Arising from War

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Received: 22 Oct 2014 Revised: 21 Nov 2014 Accepted: 8 Dec 2014

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ABSTRACT

The effect of war can not be stopped by the remained contracted people with PTSD but can affect deeply to the families who take care of the veterans . Among this group , psychological veterans wives are the indirect victims of the war . These people have enormous problems in their social , profession and even in their families. This study has been done with the aim of exploring the experiences of the PTSD veterans in Iran.This study has been done by the qualitative approach along with the use of deep interview and semi structure and the method of taking samples based on proposal sampling and 12 veteran wives affected by PTSD.The major theme of this study was the developing erosion in living with the spouse and its subthemes are sleeping disorders, sexual disorder, disorder in the role of being a spouse and dissatisfaction with life.The effect of war can not be stopped by the remained contracted people with PTSD but can penetrate deeply to the watcher families. Among this group ,psychological veterans wives are the indirect victims of the war . These people have enormous problems in their social , professional and even in their families .Results show that their husband suffering from post traumatic stress disorder, causes a lot of pressure on their family mentally and emotionally. The appearance of these problems in a long term causes a variety of disorders such as an intensive mental stress to the veteran's wife.

Key words: Developing erosion , lived experiences , wives , PTSD

INTRODUCTION

Mental disorders in the soldiers presence in the Vietnam War is not a net discussion . The soldiers who were present in the Vietnam War became involved in a very serious mental and behavioral changes after returning from the war . It was after this war that the post traumatic stress disorder (PTSD) was defined (1) . PTSD is the set of reactions that a person shows when faces the stresses that are beyond his power and his endurance (2). PTSD is mostly observed in the soldiers who have experienced stresses and mental injuries in the war (3).

The prevalence of this disorder basically exists in the first 2 years after the stroke in the 9 to 25 percent of the war injuries (4) . PTSD prevalence in the soldiers who took part in the south eastern war of Asia in Vietnam was 19% -15% and its result became more serious one decade after the war (5) . Its prevalence in the soldiers taking part in Persian Gulf and in Iraq and Afghanistan was 8% and 35% respectively (6). This disorder has been reported in the military force of Iran as14.9% . According to the extant medical Iranian documents and evidences more than 80% of Iranian veterans have PTSD (5) .

Mental consequences such as violence , avoiding the society , social anxiety , matrimony and family dissatisfaction are the result of war events (7) . As the studies show the effect of war can not be stopped by the remained contracted people with PTSD but can affect deeply to the families who take care of the veterans (8). Among this group ,psychological veterans wives are the indirect victims of the war . These people have enormous problems in their social life , profession and even in their families , and the results their husbands stress has a high presser on the family . Having such problems in a long term causes a lot of disorders such as exerting a lot stress on the veterans wives (9,10) . The result of the studies show that not only the effect of veterans influences directly on the veterans themselves but also on the other factors such as the family connection , parental satisfaction , wife relationship , wife identification , exciting functions of the children and the quality of life in the whole ; and decreases wife satisfaction with life (11) . The result of a study in Croatia showed that the after 15 years time , wives whose husbands suffer PTSD , will suffer weakness because their husbands endure a very severe suffering (12) and these mental problems cause the behavioral problems and the result can be mental , fanatical , intellectual damage and also can cause harm to their moral believes and can be a threat to their own life (13) ; because being in close touch with these veterans for a long term causes psychological disorder, anxiety disorder , depression , disorder in concentration and also cause feel like sleeping and exhaustion (14) and the continuation these pressures can cause disorder in marriage relationship (15) . The full stress family places , high matrimony incompatibility, social isolation , anger ,lack of intimacy , depression , lack of support and lack of not having a close relationship with the member of the family is the specification of these families (11). Based on this , psychological veterans wives have high stress and anxiety (16). As some of these conditions can not be evaluated by quantitative study so it is difficult to show the spiritual matters and mood of human by numbers . it seems that to discover the people experiences , using phenomenon , and qualitative study will be more effective than quantitative study(17) . The obtained findings in a qualitative study lead to a precise understanding of a phenomenon in a specific situation but it can not be generalized to the other situations but in these studies some attitude are made that can be used widely (18).

Purpose

This study was done by the aim of the liveded experiences in veteran wives who have post traumatic stress disorder .

METHODOLOGY

This study is has been done through the phenomenological approach to understand the veteran's wives experiences , who have been suffering post traumatic stress disorder, better.

Setting

Participants in this study were chosen through Purposeful sampling. The participants were told that we are going to record what they say and they were also told that they can leave the interview any time they want and we assured them that their all their individual information will be kept as a secret .The study was performed in Abadan University of Medical Sciences after being approved by Research Council and Ethics Committee of the university. Voluntarily participation with informed consent (i.e. being aware of the study goals and being assured about keeping data and experiences confidentially) were among ethical considerations of this study).

Sample

The participants were 11 women age range 40-51 whose husbands became veterans during the years 1980 -1988 in the war with Iraq . They had become veterans because of the post traumatic stress disorder . The inclusion criteria of all their husbands were the post traumatic stress disorder veterans who were suffering the post traumatic stress disorder , they had no injuries and were not addicted to any kinds of drugs .

Data collection

Data collecting was done through semi-structured interviews .It was done through conversation with the participants . The interview was started by asking open questions such as " What is your experience of living with your husband? " What are the differences between living with an ordinary person and a veteran? " and these questions were continued along with probing questions .

Data analysis

Participants described and explained their own points of view comprehensively and after listening to the recorded interviews the interviewer was inspecting the vague parts of the interviews in the next sessions . The duration of the interviews depended on the participant situations and conditions but it normally took 70-90 minutes . All the interviews were coded and then the most important and most basic ones were identified . In the second stage the content analysis method was used to determine and combine the prior codes and in each issue the content of the explanations were distinguished . For verifying data and extracted codes, initial coding of each interview was returned to the interviewee and were validated or corrected if verified . For verifying data and extracted codes, initial coding of each interview was returned to the interviewee and were validated or corrected if verified .

RESULTS

The participants' individual specifications in this study have been analysed. The initial analysis of the interviews was saturated by 9 participants and to make sure that no other themes would appear , 2 more interviews were done with 2 other participants and then the final analysis was done . The themes obtained from these data were all based on the experience of PTSD wives and according to the purpose of the study that is lived experiences was gained in veteran PTSD wives .Themes were manifested from 630 expressions that were separated from the interviews and then appeared by combination of one of the similar codes to 5 subthemes .

Developing erosion

This theme has been formed by the subthemes of sleep disorder, sexual disorder , disorder in playing the role of a husband and life dissatisfaction .

Sleep disorder

Imagine at night, you are sleeping next to a person who springs up all of a sudden starts shouting and running . My husband can not sleep well at nights. He always dreams the scenes that his friends stepped on the ground mines and then thrown up into the air while they were cut into pieces. He has been unable to forget those sceneries, and he springs up while sleeping and becomes anxious because of this ; and for that reason I changed my sleeping place from the most first year .These problems have had affected me too , I sleep late at nights and I sometimes think that someone is flinging me off a height ; nights are somehow horrible to me , I scare the night sleeping . I am always awake during the nights and sleep in the day time when my husband and my children are out (participant 6).

Sexual disorder

We don't have a good marriage relationship. most the marital issues are meaningless to me and I don't enjoy sex, it is not important to me (participant 1). And now it has been about 2 years that we have a usual life, we both have no attraction to have sex, I am so entangled that I have forgotten that life must contain sex (participant 1).

Disorder in having the role of a husband

My husband is impatient most of the times and loses his temper in no time and says " I am tired of the children ; I can not bear having their responsibility anymore." and passes the duty and responsibility to me. (participant 3).

There are so much pressure in life that has caused me to feel vacant, awkward and senseless; I enjoy nothing, my husband existence is not important to me. He doesn't pay attention to me , i cannot express my feelings because he gets angry very quickly and starts quarreling , I have no motivation at all except my child (participant 4).

Life dissatisfaction

My youth was wasted, we are like repaired broken china . We have lots of money , gold , jewel but very fragile and vulnerable (participant 1).I sometimes feel exhausted and feel I am tired of this life where as I myself chose it . I sometimes wish if I can get rid of this life which is full of suffering , it seems like the hell to me . The ones who look at my life can not realize how I suffer , they think I have an affluent life but I have been destroyed from inside , I have been corrupted (the red apple is carious) (participant 6) .

DISCUSSION

By having a thoroughly look at the findings of this study , it can be said that the veterans' wife experience in life living with PTSD veterans is a unique and individual experience of their wives that begins living with a hero is full of ups and downs and has a complex challenge and this kind of cold life contains lots of hardships and this life is similar to a red apple which has been decayed from inside and veterans continue their lives without paying attention to their wife needs both socially and sexually . The veterans' , suffering PTSD , wives are the indirect victims of war and these women bear lots of difficulties in their social , professional and family life (21) . They have to tolerate more pressure because of being in touch with their husbands who are veterans so they are highly exposed to stress and marital disturbance (10,15) .

The result of the study which was done on the veteran's wives in Bosnia 12 years after the war showed that their wives are highly exposed to stress and have too much problems such as financial problems , social separation , lack of support , family incompatibility , family violence and deficiency in expressing themselves . These deficiencies lead to depression disorder, anxiety disorder such as generalized anxiety , panic , agoraphobia and physical problems such as myalgia , cardiovascular disorders and hormone disorder(10) .In another study which was done on Croatia

veteran's wives, it was found that those wives had disorders such as mental disorder ,sleeping disorder like decreasing in the amount of sleep such as sleeplessness during the night , irritation , chronic fatigue , lack of interest in life (14). It seems that the consequence of war has affected the veteran's wives and has prevented them from the normal process of life , they have gradually lost their hope and believe that the injured man will not improve and can not get rid of his injuries and constantly think that their family will never be same as before (11).Clinical experiences has shown that the veteran's family , especially the wives , suffer mental problems such as seclusion feeling ,loneliness , disability , feeling sin ,depression (22,23)because the PTSD veteran wives are in a close touch with the veterans so they are highly exposed to stresses and marital disorders (10,21) .

Studies show that veterans and their families basically have problems in the field of social relation , intimacy , disorder in having the family role accompanied with mental problems and have weakness in family compatibility (23). The suffered person doesn't feel like being loved and can not express and show the family members his feelings and his emotions . he feels solitary and the only excitement he usually shows is furiousness and the anger he shows to his wife causes an emotional gap between them (24). Veteran frequent mental strike on his wife causes her anxiety , and it may happen that the veteran frequent nightmares and springing up at nights cause them to have separated bed and not to sleep together and it will lead to lose their intimacy and causes lack o having sex and the general relationship will be affected then (7,23). The limitation signs in performing the occupation , precocious retirement , limitations and difficulties in the job type cause the financial consequences (20,24) ; the negative signs of this disorder leads to high stress and the result is tension in the family and society relationship (23).

Culture and social reasons have an important role in compatibility because religious and spiritual beliefs along with the interest in children can cause compatibility and save their lives(20) , spirituality can help the development of compatibility and flexibility in people via experience and create positive feelings , paying attention to the positive aspects of life and also can enhance the hope and satisfaction of life (25); therefore the spiritual tendencies can prevent the personal and social destroying methods and can cause satisfaction , integration and a directed life(26) .

Study limitations

The most important part of this study was the attitude of some of the participants to it . They scared to lose the privileges and supports given to them by the authorities and governmental organizations so it might have happened that they explain their experiences not so exact , and their mental conditions might have had some effects on the process of the interview and also the taking part participants so we tried to create a friendly atmosphere to be able to attract the participants trust and also being able to have a good control over the situation .

CONCLUSION

The findings of this study is a help to better understanding the life consequences of the PTSD veterans ; and the results show that the unpleasant effect of war still has influence on their families especially on their wives because their wives are the ones who are in close touch with the veterans and take care of them so they are under a lot of pressure and anxiety such as a high amount of incompatibility in marriage , cold relationship in family , social seclusion,lack of intimacy , fear of anxiety in her husband and her children , lack of social supports and lack of family connection but in analyzing the lived experiences of the veteran wives , because of the experiences due to their husbands illness, we should not ignore the half full of a glass though the half of the glass is empty ; because according to what they say they have a high tendency towards the educational values and by resorting to their religious beliefs ,and because of the existence of the motherhood affection , they have accepted all the hardships and adversities of living with a person who has a chronic illness as a reality and they try to be compatible with the situations and conditions .

ACKNOWLEDGMENTS

The authors sincerely acknowledge the participants of the study and financial support of University of Medical Sciences International Branch Arvand. This research project is extracted from the PhD thesis of Nursing at the University of Ahvaz Branch, International Arvand.

REFERENCES

1- Ahmadi Kh. , Reshdatjoo M. , Karami Gh. R. , Anisi J. . Vicarious PTSD in Sardasht chemical warfare victims' wives. Journal of Behavioral Sciences. 2009; 3 (3) :195-199

2- mandani B, fakhri A. Study of health related Quality of Life in Posttraumatic Stress Disorder War Veterans. IJWPH. 2013; 5 (2) :18-25

3- Braš M, Milunović V, Boban M, Brajković L, Benković V, Dorđević V, Polašek O. Quality of life in Croatian Homeland war (1991-1995) veterans who suffer from post-traumatic stress disorder and chronic pain. Health Qual Life Outcomes. 2011 Jul 29;9:56.

4- Sirati Nir M, Ebadi A, Fallahi Khoshknab M, Tavallaie A. Consequences of living with Posttraumatic Stress Disorder: A Qualitative Study. Journal of Qualitative Research in Health Sciences 2012; 1(2): 92-101

5-Vaccarino V, Goldberg J, Rooks C, Shah AJ, Veledar E, Faber TL, Votaw JR, Forsberg CW, Bremner JD. Post-traumatic stress disorder and incidence of coronary heart disease: a twin study. J Am Coll Cardiol. 2013 Sep 10;62(11):970-979

6-Zhou J, Nagarkatti P, Zhong Y, Ginsberg JP, Singh NP, Zhang J, Nagarkatti M. Dysregulation in microRNA expression is associated with alterations in immune functions in combat veterans with post-traumatic stress disorder. PLoS One. 2014 Apr 23;9(4):e94075.

7- Hojjat SK, Talebi M, Zamiri nejad S, Shakeri M. The effectiveness of training coping styles on combat veterans with PTSD's wives. *Journal of North Khorasan University of Medical Sciences 2012; 4(2):191*

8- Khdadadyan Zia M, Nir Sirati M., Khamse .F. Ebadi A. Comparison the effect of training of conflict resolution and management of emotional intelligence on Life satisfaction's spouses of war veterans affected psychological disorders. IJWPH. 2012; 4 (3) :52-61

9- Renshaw KD, Caska CM. Relationship distress in partners of combat veterans: the role of partners' perceptions of posttraumatic stress symptoms.BehavTher. 2012;43(2):416-26.

10-Klarić M, Frančišković T, Obrdalj EC, Petrić D, Britvić D, Zovko N. Psychiatric and health impact of primary and secondary traumatization in wives of veterans with posttraumatic stress disorder. PsychiatrDanub. 2012;24(3):280-6.

11- kamari A, najafi M, Rahimian Boogar I, sohrabi F, jafari N. The relation between family function and veterans' general health . IJWPH. 2012; 4 (3) :26-33

12- Zlotnick C, Capezza NM, Parker D. An interpersonally based intervention for low-income pregnant women with intimate partner violence: a pilot study.Arch WomensMent Health. 2011;14(1):55-65.

13- Nash WP, Litz BT. Moral injury: a mechanism for war-related psychological trauma in military family members. Clin Child Fam Psychol Rev. 2013 Dec;16(4):365-75.

14- Francisković T, Stevanović A, Jelusić I, Roganović B, Klarić M, Grković J. Secondary traumatization of wives of war veterans with posttraumatic stress disorder. Croat Med J. 2007;48(2):177-84.

15- Hayes J, Wakefield B, Andresen EM, Scherrer J, Traylor L, Wiegmann P, Demark T, Desouza C. Identification of domains and measures for assessment battery to examine well-being of spouses of OIF/OEF veterans with PTSD. J Rehabil Res Dev. 2010;47(9):825-40.

16-Frančišković T[1], Stevanović A, Blažić D, Petrić D, Suković Z, Tovilović Z, Moro IN. Croatian war veterans in print media in 1996 and in 2006. Psychiatr Danub. 2011 Jun;23(2):171-7.

17- Caska CM, Renshaw KD. Perceived burden in spouses of National Guard/Reserve service members deployed during Operations Enduring and Iraqi Freedom.J Anxiety Disord. 2011 Apr;25(3):346-51.

18- Streubert HJ, Carpenter DR. Qualitative Research in Nursing: Advancing the Humanistic I 19- Ebadi A, Ahmadi F, Ghanei M, Kazemnejad A. Coping resource in chemical victims with mustard gas: A qualitative study. Journal of Behavioral Sciences. 2008; 2 (2) :0-0 mperative. Philadelphia, PA: Lippincott Williams & Wilkins; 2007.35-36

20 Sirati Nir M, Ebadi A, Fallahi Khoshknab M, Tavallaie A. Experiences of Wives of Veterans Suffering from Combat-Related Post-Traumatic Stress Disorder: A Qualitative Content Analysis. IJCBNM. 2013;1(3):147-155.

21-Klarić M, Francisković T, Pernar M, Nembić Moro I, Milićević R, Cerni Obrdalj E, Salcin Satriano A. Caregiver burden and burnout in partners of war veterans with post-traumatic stress disorder. Coll Antropol. 2010 Mar;34 Suppl 1:15-21.

22- Delpisheh A, Mansourian M, Babakhani A, Bahamin G, Bidel Z, Behzadifar M, et al . Province Comparison of general health between veterans and their spouses in Ilam. IJWPH. 2013; 6 (1) :27-33

23-Najafy M, mohammadyfar M, dabiri S, erfani N, Kamary A. The Comparison of the quality of life of the war veterans families with/without Post traumatic Stress Disorder. IJWPH. 2011; 3 (3) :27-35

24- Ray SL, Vanstone M. The impact of PTSD on veterans' family relationships: An interpretative phenomenological inquiry. International Journal of Nursing Studies. 2009;46:838-47.

25- Hojjati H. , Taher N , Akhondzade G. , Heydari B. , Sharifnia S. H. . Resorting to pray rate in hemodialysis patients of Golestan province . IJCCN. 2010; 2 (3) :11-12

26-Haditabar H, navabinejad S, ahghar G. Effect of training spiritual intelligence on quality of life among veteran spouses. IJWPH. 2012; 4 (2) :1-11

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Obsessive-Compulsive Disorder and Responsibility Attitude: Survey of Cognitive Factors

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Received: 15 Nov 2014 Revised: 21 Dec 2014 Accepted: 3 Jan 2015

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ABSTRACT

The Aim of the present study was to examine the effect of Responsibility Attitude in the obsessive-compulsive disorder (checker and washer). Participants were 90 individuals aged between 20-50, sixty (thirty checkers, thirty washers) drawn from a psychiatric and psychology clinic and thirty from the normal population. These three groups were assessed by measures of obsession, compulsion and Memory. In the present study, the performance of the three groups did not differ significantly in case of memory as measured by Responsibility Attitude Scale (RAS).

Keywords: Responsibility Attitude; Obsessive-compulsive disorder.

INTRODUCTION

The idea that OCD is related to inflated responsibility and fear of guilt has early roots in psychodynamic thinking, in which OCD has been associated with problems with a too stringent superego by Freud (1926). There is indeed empirical evidence for the idea that responsibility plays a role in OCD.According to Rachman (1993), responsibility may be inflated in some OCD subtypes, such as checkers, but not in others. Foa, Sacks, Tolin, Prezworski, and Amir (2002) found evidence consistent with this hypothesis: responsibility was found to be elevated in OC checkers, but not in non-checking OCD patients, relative to non-clinical controls. However, Foa et al. (2002) used a measure of responsibility that included several scenarios related to the concerns of checkers (e.g., ‘‘you see the knob on a gas oven was left on in a church kitchen’’). Their findings may be a product of criterion contamination. Is responsibility relevant to other OCD

subtypes? Clinical reports suggest it is. Some In addition Salkovskis and Forrester (2002) found that patients with obsessions but no overt compulsions often report feeling of an exaggerated sense of responsibility for the occurrence of unwanted sexual, blasphemous, or aggressive thoughts; thought action fusion is a specific form of responsibility appraisal.Cougle, Lee and Salkovskis (2007) suggested some patients with washing or cleaning compulsions express concerns about their responsibility for ensuring that others (e.g., their children) are safe from germs. They argued, "Is responsibility relevant to other OCD subtypes?" Overall, the results were consistent with the hypothesis that beliefs concerning responsibility for harm may be specific to OCD.Arntz, Voncken and Goosen (2007) confirmed that high personal responsibility induces obsessive-compulsive phenomena in a specific group of vulnerable people. Also this research supported the hypothesized role of responsibility in the maintenance and expansion of OCD in people already having OCD. It is necessary to demonstrate that responsibility also plays this pivotal role in causing OCD in people not yet having OCD.

METHODOLOGY

Participants

A sample of ninety individuals aged between 20-50. Sixty drawn from a psychiatric and psychology clinic and thirty from the normal population were the participants of this study. Out of sixty individuals selected from clinic, thirty patients had predominantly checking problems, and the other thirty patients had predominantly washing problems. The remaining thirty participants were without any known psychiatric problems. The participants with the checking problems constituted the checker group, those with the washing problems constituted the washer group and those with no known identified psychiatric problems constituted the normal control group in the present study.

Procedure

All participants in the OCD groups were outpatients at clinical psychology centers, namely the two centers of Shahid Beheshti University of Medical Sciences (SBUMS) in Tehran, Iran. They were diagnosed according to DSM-IV-TR criteria, using the Structured Clinical Interview (SCID-I: First et al., 1996; Persian Version Translation and Cultural Adaptation of Questionnaire, Sharifi et al., 2007). All participants completed self-report questionnaire given to them. Questionnaire was administered individually. A trained psychologist interviewed participants using the required clinical interview measures. Then, the Responsibility Attitude Scale (RAS).was carried out. Data collection concluded with filling out of report RAS by participants.

Instruments:Responsibility Attitudes Scale (RAS)

The Responsibility Attitudes Scale was compiled by Salkovskis, Wroe, Gledhill, Morrison, Forrester, Richards, Reynolds, and Thorpe (2000). The Responsibility Attitudes Scale (RAS) is a 26-item self-report measure that the participants are exposed to during the first phase of the research study. RAS was created in order to assess beliefs about personal responsibility that Salkovskis (1998) had previously implicated in the maintenance of OC symptomatology. Participants are asked to respond to a series of statements regarding responsibility, such as "I often take responsibility for things which other people think are not my fault" and "Even if harm is a very unlikely possibility, I should try to prevent it at any cost". Respondents indicate their level of agreement with such statements on a 7-point Likert scale with responses ranging from "Totally Agree" to "Totally Disagree". Salkovskis and his colleagues (2000) administered the RAS to 49 individuals with OCD, 38 individuals with other anxiety disorders, and 144 normal control individuals. RAS scores reliably distinguished those with OCD from the anxious and normal control groups. The authors examined the associations between the RAS and OCI (Obsessive Compulsive Inventory) using Pearson product moment correlations (Foa, Kozak, Salkovskis, Coles and Amire, 1998). The correlation

between the RAS total score and the OCI total score was r = .54 (p<.01). Salkovskis and his colleagues also reported regression analyses, which revealed that scores on a measure of general anxiety were no longer a significant predictor of OCI scores after RAS scores were entered in to the model. All participants completed the Persian Translation and Cultural Adaptation of RAS by Salavati (1381). This instrument showed internal consistency (Cronbach's alpha) α =.67 and with test-retest correlations r =.85.Persian version of the RAS is supported by subsequent studies (Ghasemzadeh et al., 2005).

RESULTS

ANOVA was conducted to compare the three groups with respect to Obsession, Compulsion and Wechsler Memory Scale.

Obsession and Compulsion

Table 3.1 clearly indicates significant group differences on both obsessions and compulsions as measured by the Y-BOCS. With respect to obsessions, a significant main effect of group was noted, F (2, 87) = 214.30, p< .001. Post-hoc HSD tests were conducted to identify specific between-group differences. Results revealed that the washer group scored significantly higher than the checker group, which in turn scored significantly higher than the normal control group. Significant main effects of group were also observed with respect to compulsions, F (2, 87) = 152.95, p< .001. Post-hoc tests, however, revealed a different pattern of group differences, where the checker group scored significantly higher than the washer group, which in turn scored significantly higher than the normal control group.Further, a significant main effect of group was noted with respect to total mean scores on Y-BOCS, F (2, 87) = 283.75, p< .001. Post-hoc HSD tests revealed that the washer group scored significantly higher than the checker group, which in turn scored significantly higher than the normal control group (Table 3.2).

Overall, it can be seen from Tables 3.1 and 3.2 that with respect to obsessions, compulsions, and the total mean scores, both the washer and the checker groups scored significantly higher than the normal control group. However, with respect to obsessions and the total score on Y-BOCS, the washer group scored significantly higher than the checker group whereas considering compulsions, the checker group scored significantly higher than the washer group.

Responsibility Attitudes

With respect to responsibility beliefs, as measured by the Responsibility Attitude Scale (RAS), a significant main effect of group was noted, F (2, 87) = 7.16, p< .01. Post-hoc HSD tests were conducted to identify specific between-group differences. It was found that while both the washer and checker groups held significantly greater responsibility beliefs than the normal control group, no significant difference was found between the two groups on responsibility beliefs. The total mean scores obtained on RAS are represented in Table 3.3.

DISCUSSION

In the present research, it was found that while both the washer and checker groups held significantly greater responsibility beliefs than the normal control group, no significant difference was found between the two groups on responsibility beliefs. The idea that OCD is related to inflated responsibility and fear of guilt has early roots in psychodynamic thinking, in which OCD has been associated with problems with a too stringent super ego by Freud (1926). There is indeed empirical evidence for the idea that responsibility plays a role in OCD, as several researchers have pointed out that OCD patients and non-patients with OCD symptoms tend to score higher on measures of responsibility and guilt (e.g., Freeston, Ladouceur, Gagnon, and Thibodeau, 1993; Freeston, Ladouceur, Thibodeau, and Gagnon, 1992; Frost, Steketee, Cohn, and Griess, 1994; Menzies, Harris, Cumming, and Einstein, 2000; Rheaume,

Ladouceur, Freeston, and Letarte, 1994; Rhe´aume, Freeston, Dugas, Letarte, and Ladouceur, 1995; Salkovskis et al., 2000; Shafran, Watkins, and Charman, 1996; Steketee, Frost, and Cohen, 1998; Wilson and Chambless, 1999, Ladouceur et al., 1995; Rachman, Thordarson, Shafran and Woody, 1995; Wahl, Salkovskis and Cotter, 2008).

Lopatka and Rachman (1995) and Shafran (1997) found that when reassured that the experimenter takes all the responsibility, OCD patients report a reduced urge to execute their rituals. Several researchers have reported that induction of responsibility in non-patients leads to an increase in OCD-like behaviour compared to control conditions (e.g., Bouchard, Rhe´aume, and Ladouceur, 1999; Ladouceur et al., 1995; Ladouceur, Rhe´aume, and Aublet, 1997; Mancini, D'Olimpio, and Cieri, 2004). In yet another study, Foa, Sacks, Tolin, Prezworski, and Amir (2002) have reported higher score on measures of responsibility and guilt in case of OCD, especially for checkers.

According to Rachman (1993) responsibility may be inflated in some OCD subtypes, such as checkers, but not in others. Foa, Sacks, Tolin, Prezworski, and Amir (2002) found evidence consistent with this hypothesis: responsibility was found to be elevated in OC checkers, but not in non-checking OCD patients, relative to non-clinical controls. Clinical reports suggest that responsibility is relevant to other OCD subtypes. Salkovskis and Forrester (2002) found that patients with obsessions but no overt compulsions often report feeling of an exaggerated sense of responsibility for the occurrence of unwanted sexual, blasphemous, or aggressive thoughts. According to the researchers thought action fusion is a specific form of responsibility appraisal.

In another research, Ghassemzadeh et al. (2005) found that in Iranian sample obsessional patients are more likely to confirm responsibility beliefs and assumptions than non-obsessional patients. Obsessional patients are more likely to make responsibility related appraisals of intrusive thoughts about possible harm. Also, there was evidence of a correlation between responsibility cognitions and the occurrence of compulsive behaviour although, it is suggested that the responsibility cognitions are specific to obsessional patients and differentiate these patients from other anxious patients as well as normal control participants.Cougle, Lee and Salkovskis (2007) suggested that some patients with washing or cleaning compulsions express concerns about their responsibility for ensuring that others (e.g., their children) are safe from germs. Overall, their results were consistent with the hypothesis that beliefs concerning responsibility for harm may be specific to OCD.

Differentiating obsessional subtypes in cognitive (as opposed to symptomatic) terms will probably most fruitfully proceed according to two directions. Firstly, different types of responsibility appraisals are likely to have different behavioral consequences; the ''washing'' and ''checking'' subtypes of OCD may be better characterized by ''verification'' and ''restitution.'' Verification, in which the person fears that they may be in danger of causing harm, corresponds to checking and will be most strongly associated with anxiety. In restitution, on the other hand, the idea of perhaps already having caused harm corresponds to washing and other types of neutralizing and is more likely to be characterized by depression and discomfort as well as anxiety. Secondly, OCD relevant beliefs (such as perfectionism) may influence obsessional behavior as well as other types of psychopathology (Cougle et al., 2007).Arntz, Voncken and Goosen (2007) with their experimental study confirmed that high personal responsibility induces obsessive-compulsive phenomena in a specific group of vulnerable people. Also this research supported the hypothesized role of responsibility in the maintenance and expansion of OCD in people already having OCD. It is necessary to demonstrate that responsibility also plays this pivotal role in causing OCD in people not yet having OCD.Smari, Bouranel and Eiòsdóttir (2008) concluded that responsibility probably contribute to obsessive-compulsive symptoms in a normal population. Altin and Karanci (2008) found that lower perceived control over life events (i.e., external locus of control) may not be sufficient for obsessive-compulsive symptoms as long as the person did not have inflated sense of responsibility to prevent harm. If the person starts to feel responsible for the events that are not under his/her control, then he/she might tend to show higher level of symptoms as compared to a person who feels inflated responsibility for the events that are under his/her control.

Overall, the present findings agree with the previous research which suggests that OCD patients have a significantly higher level of responsibility attitudes which in turn may inflate the OCD symptoms more. This findings also agree with Ghassemzadeh et al. (2005) found that in Iranian sample obsessional patients are more likely to confirm responsibility beliefs and assumptions than non-obsessional patients.

ACKNOWLEDGMENTS

The authors would like to thank the psychiatry and clinical psychology departments of Shahid Behashti Medical University (Taleghani Hospital) in Tehran- Iran for enabling this field study. Furthermore, we thank the participants, for their cooperation and involvement with the study.

REFERENCES

1- Altin, M. and Karanci, A. N. (2008) How does locus of control and inflated sense of responsibility relat to obsessive-compulsive symptoms in Turkish adolescents? Journal of Anxiety Disorders, 22: 1303-1315.
2- Arntz, A., Voncken, M. and Goosen, A. C. A. (2007) Responsibility and obsessive-compulsive disorder, Behavior Research and Therapy, 45: 425-435.
3- Bouchard, C., Rhe´aume, J. and Ladouceur, R.(1999). Responsibility and Perfectionism in OCD: An experimental study. Behavior Research and Therapy, 37: 239-248.
4- Cougle, J. R., Lee, H. J. and Salkovskis, P. M. (2007). Are responsibility belief inflated in non-checking OCD patients? Journal of Anxiety Disorders, 21: 153-159
5- Foa, E. B., Sacks, M. B., Tolin, D. F., Prezworski, A. and Amir, N.(2002). Inflated perception of responsibility for harm in OCD patients with and without checking compulsions: A replication and extension. Journal of Anxiety Disorders, 16: 443-453.
6- Freud, S (1926). Hemmy, symptom und angst (inhibitions, symptoms and anxiety). London: Vintage Random House.
7- Freeston, M. H., Ladouceur, R., Thibodeau, N. and Gagnon, F. (1992).Cognitive intrusions in a non-clinical population. 2. Associations with depressive, anxious and compulsive sysptoms, Behavior Research and Therapy, 30:263-271.
8- Freeston, M. H., Ladouceur, R., Gagnon, F. and Thibodeau, N. (1993). Beliefs about obsessional thoughts. Journal of Psychopathology and Behavioral Assessment, 15(1): 1-21.
9- Frost, R. O., Steketee, G., Cohn, L. and Griess, K. (1994) , Personality traits in subclinical and non-obsessive-compulsive volunteers and their parents, Behavior Research and Therapy, 32(1): 47–56.
10- Ghassemzadeh, H., Bolhari, J., Birashk, B. and Salavati, M (2005) Responsibility attitude in a sample of Iranian obsessive-compulsive patients International Journal of Social Psychiatry, 51: 13-22.
11- Ladouceur, R., Rhe´aume, J. and Aublet, F. (1997), Excessive responsibility in obsessional concerns: A fine-grained experimental analysis. Behavior Research and Therapy, 35: 423-427.
12- Ladouceur, R., Rheaume, J., Freeston, M H., Aublet, F., Jean, K., Lachance, S.,et al. (1995). Experimental manipulation of responsibility: An analog test for models of obsessive-compulsive disorder. Behavior Research and Therapy, 33, 937-946.
13- Ladouceur, R., Rheaume, J., Freeston, M H., Aublet, F., Jean, K., Lachance, S.,et al. (1995). Experimental manipulation of responsibility: An analog test for models of obsessive-compulsive disorder. Behavior Research and Therapy, 33, 937-946.
14- Lopatka, C. and Rachman,, S. (1995). Perceived responsibility and compulsive checking: an experimental analysis. Behavior Research and Therapy, 33: 673-684
15- Mancini, F., D'Olimpio, F. and Cieri, L. (2004) Manipulation of responsibility in non-clinical subject: Does expectation of failure exacerbate obsessive-compulsive behaviors? Behavior Research and Therapy, 42: 449-457.

16- Menzies, R. G., Harris, L. M., Cumming, S. R. and Einstein, D. A.(2000) The relationship between inflated personal responsibility and exaggerated danger expectancies in obsessive compulsive concerns. Behavior Research and Therapy, 38: 1029-1037.
17- Rachman, S. J., Thordarson, D. S., Shafran, R. and Woody, S. (1995). Perceived responsibility: Structure and significance. Behavior Research and Therapy, 33: 779-784.
18- Rachman, S. (1993). Obsessions, responsibility and guilt, Behavior Research and Therapy, 31: 149-154.
19- Rhe´aume, J., Freeston, M. H., Dugas, M. J., Letarte, H. and Ladouceur, R. (1995). Perfectionism, responsibility and obsessive-compulsive symptoms, Behavior Research and Therapy, 33:785-794.
20- Rheaume, J., Ladouceur, R., Freeston, M. H. and Letarte, H. (1994). Inflated responsibility in obsessive-compulsive disorder: Psychometric studies of a semi idiographic measure, Journal of Psychopathology and Behavioral Assessment, 16: 265-276
21- Salkovskis, P. M. and Forrester, E. (2002). Responsibility In R. O. Frost and G. Steketee (Eds.), Cognitive approaches to obsessions and coumpulsions: Theory, assessment and treatment (pp. 45-61). Oxford: Pergamon.
22- Salkovskis, P.M. (1998). Psychological approaches to the understanding of obsessional problems. In RP Swinson, MM Antony, S Rachman and Ma Richter (Eds), Obsessive-Compulsive Disorder: theory, Research and treatment, New York, Guilford.
23- Salkovskis, P. M., Wroe, A. L., Gledhill, A., Morrison, N., Forrester, E., Richards, C., et al. (2000). Responsibility attitudes and interpretations are characteristic of obsessive-compulsive disorder. Behavior Research and Therapy, 38: 347-372
24- Smari, J., Bouranel, G. and Eiòsdóttir, S.P. (2008). Responsibility and their interaction in relation to obsessive-compulsive symptoms, Journal of Behavior Therapy and Experimental Psychiatry, 39: 228-233.
25- Shafran, R. (1997). The manipulation of responsibility in obsessive-compulsive disorder, British Journal of Clinical Psychology, 36: 397-407.
26- Sharifi, V., Assadi, S. M., Mohammadi, M. R., et. al (2007). Structured Clinical Interview for DSM-IV (SCID): Persian Translation and Cultural Adaptation. Iranian J Psychiatry (2:1),46-48.
27- Shafran, R., Watkins, E. and Charman, T. (1996). Guilt in obsessive-compulsive disorder Journal of Anxiety Disorders, 10, 509-516
28- Steketee, G., Frost, R. O. and Cohen, I. (1998). Beliefs in obsessive-compulsive disorder, Journal of Anxiety Disorders, 12: 525-537.
29- Salkovskis, P. M. and Forrester, E. (2002). Responsibility In R. O. Frost and G. Steketee (Eds.), Cognitive approaches to obsessions and coumpulsions: Theory, assessment and treatment (pp. 45-61). Oxford: Pergamon.
30- Wahl, K., Salkovskis, P. M. and Cotter, I. (2008). "I wash until it feels right" The phenomenology of stopping criteria in obsessive-compulsive washing. Journal of Anxiety Disorders, 22: 143-161
31- Wilson, K. A. and Chambless, D. L. (1999). Inflated perceptions of responsibility and obsessive-compulsive symptoms. Behavior Research and Therapy, 37: 325-335

Table3.1:Comparison of the checker, washer, and the normal control groups on obsessions and compulsions as measured by Y-BOCS

Variable	Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F (2,87)	Significant post hoc ($\alpha = 0.05$)
	M	SD	M	SD	M	SD		
Y-BOCS (Obsessions)	9.10	2.56	14.10	3.17	1.13	1.13	214.30***	Ng<Chg<Wag
Y-BOCS (Compulsions)	10.27	1.92	8.83	3.36	0.63	0.92	152.95***	Ng<Wag<Chg

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group ***p< 0.001

Table 3.2:Comparison of the checker, washer, and the normal control groups on total scores obtained on Y-BOCS

Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F(2,87)	Significant post hoc ($\alpha = 0.05$)
M	SD	M	SD	M	SD		
19.37	3.58	22.80	5.07	1.17	1.33	283.75***	Ng<Chg<Wag

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group
***p< 0.001

Table 3.3: Comparison of the checker, washer, and the normal control groups on Responsibility Attitudes Scale (RAS)

Checker (n = 30)		Washer (n = 30)		Normal control (n = 30)		F(2,87)	Significant post hoc ($\alpha = 0.05$)
M	SD	M	SD	M	SD		
107.40	27.57	112.07	29.46	88.13	19.23	7.16**	Ng<Chg<Wag

Note: Ng = Normal Group; Chg = Checker Group; Wag = Washer Group
**p< 0.01

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Using Normalized Difference Vegetation Index (NDVI) for Determination of Vegetation (Case Study: East of Fars Province, Iran)

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Received: 20 Dec 2014 Revised: 13 Jan 2015 Accepted: 31 Jan 2015

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ABSTRACT

Vegetation, as one part of the earth's surface cover ingredients, which is basis for the ecosystem exist. The vegetation coverage is the vertical projection area of vegetation percentage in unit area, also it is the very important parameters for many soil erosion models. This study using remote sensing technology, combined with GIS respectively used normalized difference vegetation index (NDVI) to analyze the vegetation coverage in east of Fars province, Iran. The results indicated that can use the NDVI to analyze the vegetation in the study area.

Keywords: Vegetation index, NDVI, GIS.

INTRODUCTION

The normalized difference vegetation index (NDVI) is a simple graphical indicator that can be used to analyze remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not.Atpresent, by remote sensing technique, there were many methods for using vegetation index to analyze the vegetation coverage, and also achieved good results, such aszhang etalusing MODIS/EVI data to analyze the vegetation coverage in Fujian provincefrom2001to2005years,Tang etal put forwardusingathree-bandgradientdifferencevegetation index to analyze vegetation coverage, Jing et al using the terrain adjusted vegetation index to analyze vegetation coverage, Zhang et al sing the SPOT/NDVI data to analyze

the vegetation coverage in northern north China, etc. about vegetation index many studies have been done such as Dymond et al., 1992; Shih, 1994; Gao and Wang,. 2012.In the study used the NDVI of Landsat ETM data, and combined with RS and GIS technology to study and extract the vegetation cover condition in east of Fars province,Iran.

Case study

The study area is located in the east of Fars province, Iran, between latitudes 29° 24' 00" N- 29° 26' 24"N and longitudes 54° 24' 00" E- 54° 31′ 12"E with an area of 281.78 km2 (Fig. 1).

MATERIALS AND METHODS

In ERDAS9.1/MODEL module, using Landsat ETM data to calculate the vegetation indices of NDVI, and the formula is as follow.

NDVI = (NIR − RED) / (NIR+RED) (1)

Where,NIR and RED representedthenear-infraredand RED bands ofETM respectively

RESULTS

NDVI map for the study area show in Figure 2.

As show in Figure 2, NDVI value is -0.58 to + 69.The NDVI value classified to ten class that show in Figure 3 and Table 1

As show in Table 1, classes of 1 to 6 witharea of105.05 (10%) Indicate the highest vegetation

CONCLUSION

NDVI was one of the most successful of many attempts to simply and quickly identify vegetated areas and their "condition," and it remains the most well-known and used index to detect live green plant canopies in multispectral remote sensing data. In the study used the NDVI of Landsat ETM data, and combined with RS and GIS technology to study and extract the vegetation cover condition in east of Fars province,Iran. By using the normalized difference vegetation index (NDVI) to extract the study area analysis, the results indicated that that can use the NDVI to analyze the vegetation in the study area. As show in Table 1, classes of 1 to 6 with area of 105.05 (10%) Indicate the highest vegetation

REFERENCES

1. ChunguiZHANG,WeihuaPAN,HuiCHEN,etal.Monitoring vegetation coveragechangeofFujianusingmulti-temporalremotesensing image. RemoteSensingTechnologyandApplication,2007,Vol.22(5):pp.613-617(InChinese)
2. Dymond J. R.; Stephens P. R.; Newsome P. F.; Wilke R. H. (1992): Percentagevegetation cover of a degrading rangeland from SPOT. International Journal ofRemote Sensing vol. 13, Iss. 11, pp. 1999-2007.
3. GuoLin GAO and ShiYing WANG. 2012. Compare Analysis of Vegetation Cover Change inJianyang City Based on RVI and NDVI. 978-1-4673-0875-5/12/$31.00 ©2012 IEEE.

4. Shih S. F. (1994): NOAA Polar-Orbiting satellite HRPT data and GIS in vegetation indexestimation for the everglades agricultural area. Soil and Crop Science Society ofFlorida Proceedings. Vol. 53, pp. 19-24.
5. YuecongZHANG,ZhiqiangZHAO,ShuangchengLI,etal.IndicatingvariationofsurfacevegetationcoverusingSPOTNDVIinthenorthern partofNorthChina.GeographicalResearch,2008,Vol.27(4):pp.745-755(InChinese)

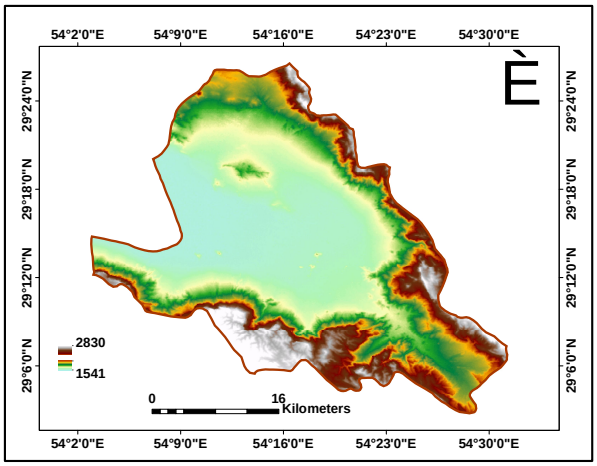

Fig.1. location of the study area

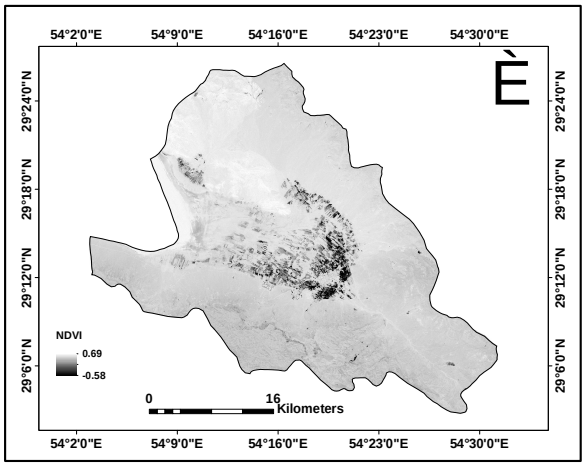

Fig.2. NDVI map of the study area

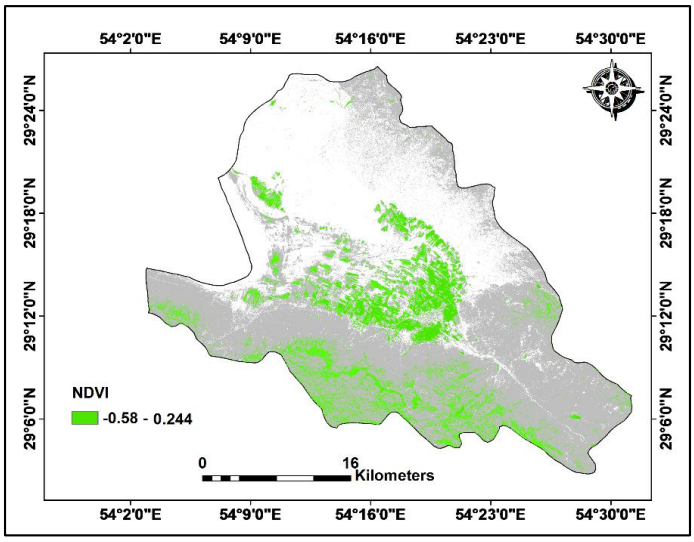

Figure 3. Different classes of NDVI of the study area

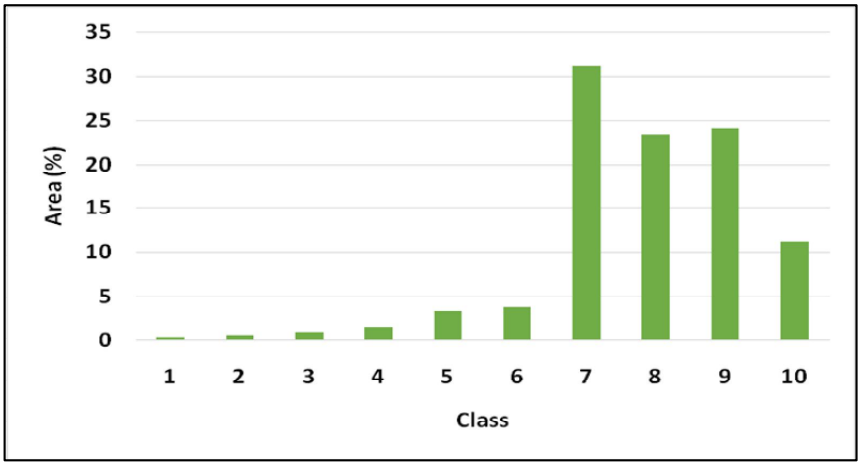

Fig. 4. Amounts of NDVI (%)

Table 1. Area of the different classes of NDVI of the study area

Class	Electromagnetic waves (µm)	Area (km2)	Area (%)
1	- 0.58 - -0.19	3.72	0.36
2	- 0.19--0.050	6.04	0.59
3	- 0.050 - 0.068	8.80	0.86
4	0.068 - 0.15	15.23	1.50
5	0.15 - 0.22	33.47	3.28
6	0.22 - 0.25	37.79	3.71
7	0.25 - 0.28	317.30	31.14
8	0.28 - 0.30	237.04	23.26
9	0.30 - 0.33	245.45	24.09
10	0.33- 0.57	114.14	11.20
Sum	-	1019	100

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

A Comparison of Fuzzy Membership Kriging and Indicator Kriging for Predicting Land Suitability

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Received: 2 Dec 2014 Revised: 21 Dec 2014 Accepted: 4 Jan 2015

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ABSTRACT

Land suitability evaluation makes the sustainable use of the land feasible. So predicting land suitability is an important prerequisite for estimating and mapping unknown land suitability values. Fuzzy spatial prediction techniques are suitable to determine areas where our observations are imprecise and vague. An example of this type of technique is fuzzy membership kriging with a semi-statistical membership function. The implementation of fuzzy membership kriging extracts semi-statistical membership functions from data, and applies these functions to an indicator kriging model. In this study, we use fuzzy membership kriging and indicator kriging, to predict land suitabilitybased on preprocessed data (at 53 samples whit eight characteristics (Groundwater depth, Chroma depth, EC,ESP, Texture, Soil depth, Topography, $CaCo_3$, pH and Gypsum)) from Shavur plain in Khuzestan province,in southwest of Iran.Results showed that fuzzy membership kriging reduces the estimated error compared to indicator kriging. This study indicates that using a fuzzy membership kriging can get higher estimated accuracy than indicator kriging for modeling uncertainty in the prediction process of land suitability data.

Keywords: land suitability, prediction, indicator kriging, fuzzy membership kriging.

INTRODUCTION

The process of land suitability is the evaluation and grouping of specific areas of land in terms of their suitability for a defined use.This suitability is a function of crop requirements and soil/land characteristics. Matching the land characteristics with the crop requirements gives the suitability. Hence, suitability is a measure of how well the qualities of a land unit match the requirements of a particular form of landuse (FAO, 1976). Planning and management of the land use suitability mapping and analysis is done by application of GIS (Geographic Information System) (McHarg, 1969; Brail and Klosterman, 2001; Collins et al. 2001; Chen et al. 2003, Liu et al. 2005, Mohammd et al. 2011; Zali Vargahan et al. 2011 and Wu et al. 2004). Land use suitability analysis has been applied in a wide variety of situations including ecological approaches for defining land suitability/habitant for animal and plant species (Store and Kangas, 2001),selecting the best site for the public and private sector facilities (Church, 2002) are also other examples.

Determinationof methods with higher accuracy for identifying land suitability for crops is important. Because determining the land suitable, farmer's investment on their land suitable and goes up return to work.Among existing methods for prediction of land suitable for cultivation of crops can be pointed Fuzzy Membership Kriging and Indicator Kriging (Sanchez Moreno, 2007).

Kriging method gives an unbiased estimation of unknown locations by minimizing the estimation variance (Steinet al.2001). In other words, kriging is a geostatistical technique to estimate the values of random fields at unobserved points from the observation of values at known locations. Indicator kriging, a variation on kriging, is usually used to approximate the conditional cumulative distribution function at each point of a grid,based on the correlation structure of indicator-transformed datapoints (Journel, 1983).Several studies have applied indicator kriging to various domains of application (e.g., Guo et al. 2007 and Linet al. 2010). Based on these studies, it is obvious that combining fuzzy mathematics with kriging under vague and imprecise conditions can make indicator kriging more efficient. Fuzzy kriging is derived from Zadeh's (1965, 1987) fuzzy theory. Zadeh (1965) defined a Fuzzy set as "a class of objects with a continuum of grades of memberships"; being the membership a function that assigns to each object a grade rangingbetween zero and one, the higher the grade of membership the closest the class value to one. Some authors have applied this idea to fuzzy kriging (Diamond, 1989; Lee, 2000 andShad et al. 2009). The main purpose of this study is predicted and compared land suitability with ordinary kriging and fuzzy membership kriging in Shavur plain, in Khuzestan province, in southwest of Iran.

The structure of this paper is as follows. In Section 2, the basic concepts of required kriging algorithms such as indicator, fuzzy membership are defined. In Section 3, we present a case study to demonstrate spatial properties. Then, we use the case study to evaluate the results of applying the different kriging methods discussed in Section 4. In Section 5, we discuss and compare the final results to show conclusions.

METHODS

Indicator kriging

Indicator kriging is a nonlinear indicator coding kriging technique that uses the istribution of grades at different thresholds (Journel, 1983). This method can overcome the limitations of conventional kriging analysis by transforming data into a set of binary variables (Goovaerts, 1997). In fact, indicator kriging transforms data values into crisp indicators as follows:

$$s\left(U(x_i,y_i)\right)=\begin{cases}1 & U(x_i,y_i)>T\\ 0 & otherwise\end{cases} \quad \text{Eq.1}$$

Where T is the threshold value and U(x_i, y_i) is a sampled value at the ith spatial location (x_i, y_i). The indicators are analyzed to determine spatial directional variability with a series of experimental variograms as follows (Shad et al. 2009):

$$\gamma(d,T) = \frac{1}{2N_d}\sum_{i=1}^{N_d}[\chi(U((x_i,y_i)+d)) - \chi(U(x_i,y_i))]^2 \qquad \text{Eq.2}$$

Where d is the distance between two spatial positions {(x_i, y_i), (x_i, y_i)+d}, T is the predefined threshold value, N_d is the number of pairs separated by lag distance d and U(x_i, y_i) is an observed sample datum at (x_i, y_i). Inspection of Eq. (2) allows us to select the orientation of greatest and least spatial distribution. Therefore, the indicator values are ordinarily kriged using the variograms to determine the probability of exceeding the threshold values by replacing Eq. (2) in Eq. (3) and estimating the coefficient W_i (Shad et al. 2009).

$$\sum_{i=1}^{n} W_i = 1$$

$$\gamma((x_i,y_i)-(x_j,y_j),T) = \sum_{i=1}^{n} W_i\,((x_i,y_i)-(x_j,y_j),T) + \varepsilon \quad i = 1,\dots,n \qquad \text{Eq.3}$$

$$\chi(U(x_i,y_i)) = \sum_{i=1}^{n} W_i\,\chi(U(x_i,y_i))$$

Where(x_i, y_i) is an unknown location, W_i is the desired coefficient value and e is a LaGrange multiplier to ensure that χ (x_i, y_i) is unbiased. Thus, the estimated indicator values are a linear function ofW_i at known positions. In Eq. (3), W_i is an unknown weight for a measured value at ith location. This parameter depends on the semivariogram, the distance to the prediction location and the spatial relationships among the measured values around the prediction location. The constraint $\sum W_i = 1$ assures us that the predictor is unbiased for unknown measurement. Using this constraint, the difference between the true value and predicated value will be as small as possible. The next two equations work together to measure an empirical semivariogram, fit a model to it, calculate W_is and predict unknown values (Shad et al. 2009).

Fuzzy membership kriging

Fuzzy logic was initially developed by Lotfi Zadeh in 1965 as a generalization of classic logic. In fuzzy set theory, the membership function $\mu_Z(x, y)$ can determine the degree to whichthe value (x, y) belongs to the fuzzy set Z on the universe set U.

$$\mu_z(x,y): U \rightarrow [0,1] \qquad \text{Eq.4}$$

The membership function can take any shape and can be symmetrical or asymmetrical. In this study, the calculation of the fuzzy memberships for the Soil depth water table depth and depth of chroma was evaluated using a linear function as given in Eq.5 (Sanchez Moreno, 2007).

$$\mu_T = {}_{\{T_1,T_2,T_3\}}(U(x_i,y_i)) = \begin{cases} 0 & U(x_i,y_i) \prec T_2 \\ U(x_i,y_i) - T_2 / T_1 - T_2 & T_2 \le U(x_i,y_i) \prec T_1 \\ 1 & U(x_i,y_i) \ge T_1 \end{cases} \qquad \text{Eq.5}$$

Where x is the input data and T_1, T_2 are the limit values according to Sys tables.

For Texture soil, EC, ESP, Gypsum, CaCO3, Topography, and pH values, uses a linear function as given in Eq.6 (Sanchez Moreno, 2007).

$$\mu_T = {}_{\{T_1,T_2,T_3\}}(U(x_i,y_i)) = \begin{cases} 1 & U(x_i,y_i) \le T_1 \\ T_2 - U(x_i,y_i)/T_2 - T_1 & T_1 \prec U(x_i,y_i) \le T_2 \\ 0 & U(x_i,y_i) \succ T_2 \end{cases} \quad \mu \qquad \text{Eq.6}$$

$_z(U(x_i, y_i))$ is the membership degree of $U(x_i, y_i)$, and $T = \{T_1, T_2, T_3\}$ is the set of predefined threshold values. Higher values of land suitability cause a higher rate of disease in a given location. Thus, the membership function is defined by Eqs. (5) and (6).For Given the above, Eqs. (2) and (3) can be made fuzzy (fuzzy membership function) as with Eqs. (7) and (8).

$$\gamma(d,T) = \frac{1}{2N_d}\sum_{j=1}^{n}[\mu_T(U(x_i,y_i)+d) - \mu_T(U(x_i,y_i))]^2 \qquad \text{Eq.7}$$

$$\sum_{i=1}^{n} W_i = 1$$

$$\gamma((x_i,y_i) - (x_j,y_j),T) = \sum_{j=1}^{n} W_{ij}\left((x_i,y_i) - (x_j,y_j),T\right) + \varepsilon \quad i = 1 \ldots n \qquad \text{Eq.8}$$

$$P(\mu_T, C) = \sum_{i=1}^{n} W_i \mu_T(u(x_i,y_i))$$

Where $T = \{T_1, T_2, T_3\}$ is the threshold set and $P(\mu_T, C)$ is a fuzzy set that determines fuzzy membership values for each unknown (x_i , y_i) crisp location. Eqs. (5)to (8) show that the definition of the fuzzy membership function can directly affect the prediction process of fuzzy membership kriging. Therefore, adjusting the thresholds of membership functions in an evolutionary procedure to find optimum grading is an essential requirement for validating predictions.

Study area

The study area, Shavur plain, is located in the Khuzestan province, in the southwest of Iran, betweenlatitudes 31° 00' 30" N- 32° 30' 00"N and longitudes 48° 15' 00" E- 48° 40′40" E with an area of 774 km² (Fig.1).Data used for the case study are consisting of: Topography (Primary slope, Secondly slope and Micro-relief), wetness (water table depth and Depth of chroma), Salinity and Alkalinity (EC and ESP), Texture, Soil depth, CaCo3, pH and Gypsum which are extracted from the report of the land classification study. The numbers of points used in this study are53locations as positive crisp value (Fig.1) (Khuzestan Soil and Water Research Institute, 2009).

RESULTS

OrdineryKriging

Ordinary kriging is a stochastic interpolation technique that considers two sources of information regarding the attribute: the variation and the distance between points(Alsamamra et al. 2009).This paper focuses on the simple ordinary kriging method for comparison with the proposed models. In this method, we assume{U(x, y)= μ(x, y)+ ε(x, y), (x, y) ϵ D}, where ‘‘(x, y)” is a spatial location, μ(x, y) is the simulation output mean over the experimentaldata and ε(x, y) is the additive noise with zero mean that represents the variation around the mean. Then, we can say that the expected difference (E) for two sample points (x, y) and (x, y)+ d iszero. Accordingly, at an unsampled location (x_0, y_0), ordinary kriging can estimate data values by expressing $U(x_0, y_0)$ as a linearcombination of $U(x_i, y_i)$ as follows (shad et al,. 2009):

$$U(x_0,y_0) = \sum_{i=1}^{n} W_i\, U(x_i,y_i) + \varepsilon(x_0,y_0) \sum_{i=1}^{n} W_i = 1 \qquad \text{Eq.9}$$

where $U(x_0, y_0)$ is the random variable to predict at location (x_0, y_0) and $\varepsilon(x_0, y_0)$ is the noise at position (x_0, y_0) such that $E[\varepsilon(x0, y0)] = 0$. Fig. 2 demonstrates the semivariogram obtained based on land suitability data for ordinary kriging. In this figure, γ is the semivariogram value plotted on the dependent axis, and h is the separation distance between a pair of points. Ordinary kriging makes use of the best-fit line in the semivariogram (the blue line in Fig. 2) to predict attribute values at locations where the attribute has not been measured. A spherical model (Burrough & McDonnell, 1998) has been used to fit the sample semivariogram in our study.The Pink text boxes present the predicted values of ordinary kriging in the control points examined. Ten control points, scattered all over the plain, are sorted in Table 1 for MSE calculation and residual checking.These points randomly were selected.

Fig. 3 indicates the result of applying ordinary kriging based on Eq. (9).The MSEs shows less accuracy when applying ordinary kriging for predicting land suitability concentrations in Shavur plain in Khuzestan. This may be a result of imprecision of information and insufficient hypothesis-testing issues for modeling nonlinear treatments. It is necessary to point out that modeling vagueness and imprecision in this prediction technique is difficult to implement in spatial environments because of complex mathematical operations.

Fuzzy membership kriging

To apply the algorithm of fuzzy membership kriging, it is essential to define a fuzzy membership function. For Cultivated irrigated Sugar beetbased on the works of Moreno (2007) and Givi (1997), threshold values for the linear membership function can be defined as follows:

In Eq.10, the land suitability membership values at $U(x_i, y_i) = T_2$ is designated as 0, and at $U(x_i, y_i) = T_1$ is designated as 1. Fig. 4 indicates the result of applying fuzzy linear membership kriging based on Eq. (10). According Fig. 4, the blue colored zones represent higher membership values and more suitable, and the lighter areas represent lower membership grades and more unsuitable. The predicted values were converted back to land suitability to calculate MSE based on control points using membership function (Table.2).The calculation of the total MSEs presents more accurate performance of fuzzy membership kriging than ordinary kriging algorithm.

Considering fuzzy membership kriging can get higher estimated accuracy than indicator kriging for modeling uncertainty in the prediction process of land suitability data, in this study the fuzzy method was used for land suitability maps.AHP method were used to overlay maps. AHP relies on Pair wise Comparison Matrices which are matrices relating different components and assigning values according to their relative importance. These values are given by a scale from 1 to 9, where 1 means that the two elements being compared have the same importance and 9 indicates that from the two elements one is extremely more important than the other (Saaty and Vargas 2001).The results of Pair wise Comparison Matrix in the AHP method for preparation of the weights used for the overly of the fuzzy membership kriging maps are given in Table 3.Land suitability based on the Fuzzy logic is shown in Fig. 5.

DISCUSSION AND CONCLUSION

From the total MSE shown in Table 1, we can argue that less accuracy of ordinary kriging corresponds to both indeterminate properties of information testing issues for modeling nonlinear relations. Therefore, modeling uncertainty in ordinary kriging is computationally demanding and difficult to implement using GIS. Table 2 shows the result of implementing fuzzy membership kriging with linear membership function on land suitability data. The final MSE in Table 2 presents lower rates of error than that in Table1. This subject indicates higher efficiency, compared to ordinary kriging methods, and suggests the potential of using the fuzzy membership kriging method to predict land suitability.

REFERENCES

1. Alsamamra H, Ruiz-Arias J, Pozo-Vazquez D, Tovar-Pescador J (2009) A comparative study of ordinary and residual kriging techniques for mapping global solar radiation over southern Spain. Agricultural and Forest Meteorology, 149, 1343–1357.
2. Brail RK, Klosterman RE (2001) Planning Support Systems, ESRI Press, Redlands, CA.
3. Burrough P, McDonnell R (1998) Principles of geographic information systems. New York: Oxford University Press.
4. Chen JZ, Chen J,Xie XJ,Zhang XL(2003) Soil pollution and its environmental impact. Soils (in Chinese), 35(4): 298-303.
5. Church RL(2002) Geographical information systems and location science. Computers and Operations Research 29 (6), 541–562.
6. Collins MG, Steiner FR, Rushman MJ(2001) Land-use suitability analysis in the United States: historical development and promising technological achievements. Environmental Management 28 (5), 611–621.
7. Diamond P (1989) Fuzzy kriging. Fuzzy Sets and Systems, 33, 315–332.
8. Food and Agriculture Organization of the United Nations FAO (1976) A framework for land suitability. Rome, FAO.
9. Givi J(1997)Qualitative Evaluation of Land Suitability for Field and Fruit Crops. 1st Edn., Iranian Soil and Water Research Institute, Tehran, Iran.
10. Goovaerts P (1997) Geostatistica for natural resources evaluation. New York: Oxford University Press.
11. Guo D, Guo R, Thiart C (2007) Predicting air pollution using fuzzy membership grade Kriging. Computers, Environment and Urban Systems, 31, 33–51.
12. Journel AG (1983) Nonparametric estimation of spatial distributions. Mathematical Geology, 15(3), 445–468.
13. Journel AG (1983) Nonparametric estimation of spatial distributions. Mathematical Geology, 15(3), 445–468.
14. Khuzestan Soil and Water Research Institute(2009) (Personal communication).
15. Lee ES (2000) Nero-fuzzy estimation in spatial statistics. Journal of Mathematical Analysis and Applications, 249, 221–231.
16. Lin YP, Chen BY, Shyu GS, Chang TK(2010) Combing a Finite Mixture Distribution Model whit Indicator Kriging to Delineate and Map the Spatial Patterns of Heavy Metal Pollution in Soil. Environmental Pollution 158, 235-244.
17. Liu M, Samal A(2002) A fuzzy clustering approach to delineate agroecozones. Ecological Modelling 149, 215–228.
18. McHarg IL(1969) Design With Nature, Wiley, New York.
19. Mohammd H, Mashreki Al, Juhari Bin MA, Sahibin AR, Kadderi Md, Tukimat L Haider AR(2011) Land suitability evaluation for sorghum crop in the Ibb governorate, republic of Yemen Using remote sensing and GIS techniques. Australian Journal of Basic and Applied Sciences, 5(3): 359-368, 2011. 10p.
20. Saaty TL, Vargas LG(2001) Models, methods, concepts, and applications of the analytic hierarchy process. Boston etc., Kluwer Academic.
21. SanchezMorenoJF(2007)Applicabilityofknowledge-basedandFuzzytheory-orientedapproachestolandsuitabilityforuplandriceand rubber,ascomparedtothefarmers' perception. International Institute for Geo-Information Science and EarthObservation,Enschede,the Netherlands. 133 pp.
22. Shad R, Mesgari MS, Abkar A, Shad A(2009) Predicting air pollution using fuzzy genetic linear membership kriging in GIS. Computers, Environment and Urban Systems 33 (2009) 472–481.
23. Stein A, Riley J, Halberg N (2001) Issues of scale for environmental indicators. Agriculture, Ecosystems and Environment, 87, 215–232.
24. Store R, Kangas J(2001) Integrating spatial multi-criteria suitability and expert knowledge for GIS-based habitat suitability modelling. Landscape and Urban Planning 55 (2), 79–93.
25. Wu LX, SunB, ZhouSL, HuangSE, ZhaoQG(2004) A new fusion technique of remote sensing images for land use/cover. Pedosphere, 14(2): 187-194.
26. Zadeh LA (1965) Fuzzy sets. Information and Control, 8, 338–353.

27. Zadeh LA (1987) Fuzzy sets and applications. New York: Wiley.
28. Zali Vargahan B, Shahbazi F,Hajrasouli M(2011) Quantitative and qualitative land suitability evaluation for maize cultivation in Ghobadlou region, Iran. Ozean Journal of Applied Sciences 4(1), 2011 91. 14p.

$$T=_{(0,20,50)}\ \mu_T(U(x_i,y_i))=\begin{cases}0 & U(x_i,y_i)\prec 20\\ U(x_i,y_i)-20/30 & 20\le U(x_i,y_i)\prec 50\\ 1 & U(x_i,y_i)\ge 50\end{cases}$$

Depth of choroma (cm)

$$T=_{(0,20,60)}\ \mu_T(U(x_i,y_i))=\begin{cases}0 & U(x_i,y_i)\prec 20\\ U(x,y_i)-20/40 & 20\le U(x_i,y_i)\prec 60\\ 1 & U(x_i,y_i)\ge 60\end{cases}$$

Soil depth (cm)

$$T=_{(0,25,45)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 25\\ 45-U(x_i,y_i)/20 & 25\prec U(x_i,y_i)\le 45\\ 0 & U(x_i,y_i)\succ 45\end{cases}$$

ESP (%)

$$T=_{(0,25,40)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 25\\ 40-U(x_i,y_i)/15 & 25\prec U(x_i,y_i)\le 40\\ 0 & U(x_i,y_i)\succ 40\end{cases}$$

Gypsum (%)

$$T=_{(0,30,60)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 30\\ 60-U(x_i,y_i)/30 & 30\prec U(x_i,y_i)\le 60\\ 0 & U(x_i,y_i)\succ 60\end{cases}$$

CaCO3 (%)

$$T=_{(0,6,9.5)}\ \mu_T(U(x_i,y_i))=\begin{cases}0 & U(x_i,y_i)\prec 6\\ U(x_i,y_i)-6/3.5 & 6\le U(x_i,y_i)\prec 9.5\\ 1 & U(x_i,y_i)\ge 9.5\end{cases}$$

Texture

$$T=_{(0,75,200)}\ \mu_T(U(x_i,y_i))=\begin{cases}0 & U(x_i,y_i)\prec 75\\ U(x_i,y_i)-75/125 & 75\le U(x_i,y_i)\prec 200\\ 1 & U(x_i,y_i)\ge 200\end{cases}$$

Water table depth (cm)

$$T=_{(0,10,18)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 10\\ 18-U(x_i,y_i)/8 & 10\prec U(x_i,y_i)\le 18\\ 0 & U(x_i,y_i)\succ 18\end{cases}$$

EC (ds/m)

$$T=_{(0,30,60)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 30\\ 60-U(x_i,y_i)/30 & 30\prec U(x_i,y_i)\le 60\\ 0 & U(x_i,y_i)\succ 60\end{cases}$$

Micro-relief intensity (cm)

$$T=_{(0,8,8.5)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 8\\ 8.5-U(x_i,y_i)/0.5 & 8\prec U(x_i,y_i)\le 8.5\\ 0 & U(x_i,y_i)\succ 8.5\end{cases}$$

pH (H2O)

$$T=_{(0,2,8)}\ \mu_T(U(x_i,y_i))=\begin{cases}1 & U(x_i,y_i)\le 2\\ 8-U(x_i,y_i)/6 & 2\prec U(x_i,y_i)\le 8\\ 0 & U(x_i,y_i)\succ 8\end{cases}$$

Primary and Secondly Slope (%)

Eq.10 (Refer Page 3391, Fuzzy membership kriging)

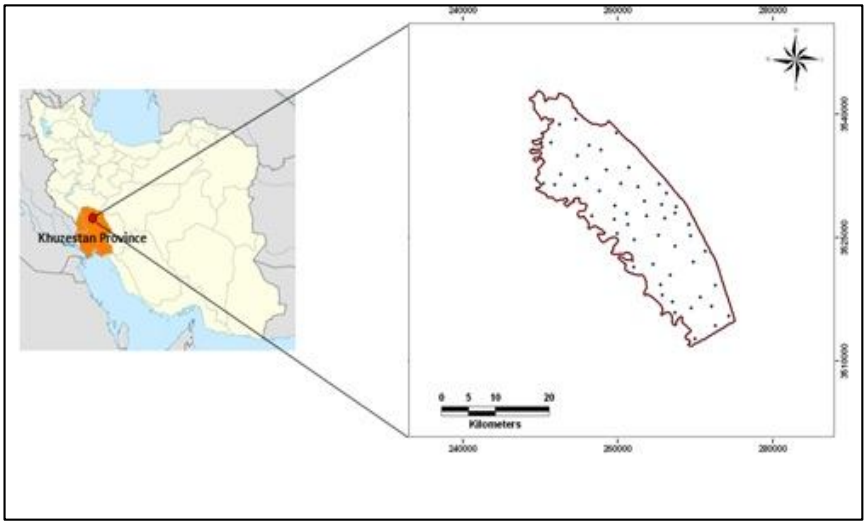

Fig.1. Land suitability data collected in Shavur plain.

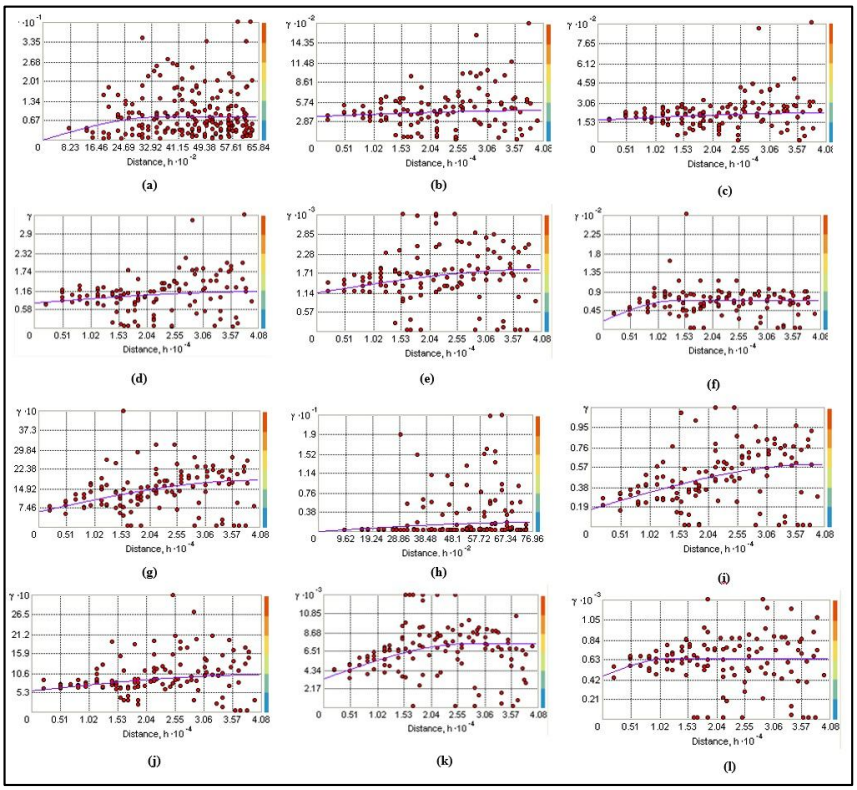

Fig.2. The semivariogram obtained based on land suitability data for sugar beet crop. (a) CaCO3, (b) EC, (c) ESP, (d) Gypsum , (e) Coroma depth, (f) Micro relief, (g) Primary slope, (h) pH , (i) Secondly slope, (j) Texture soil, (kGroundwater depth, (l) Soil depth

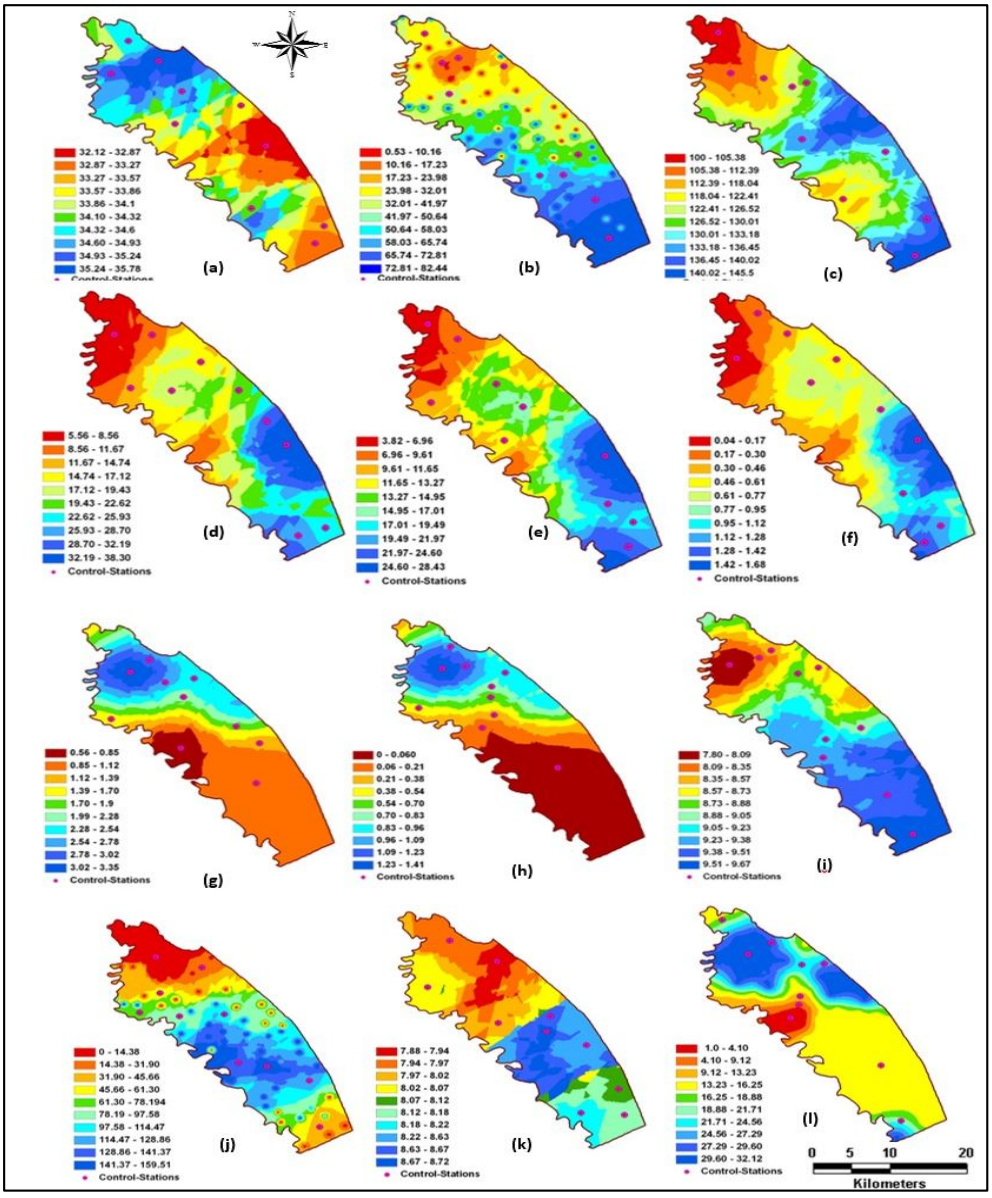

Fig. 3. Map of land suitability concentrations estimated by ordinary kriging for sugar beet crop.
(a) CaCO3, (b) Coroma depth, (c) Soil depth, (d) EC, (e) ESP, (f) Gypsum, (g) Primary slope, (h) Secondly slope, (i) Texture soil, (j) Groundwater depth, (k pH, (l) Micro relief.

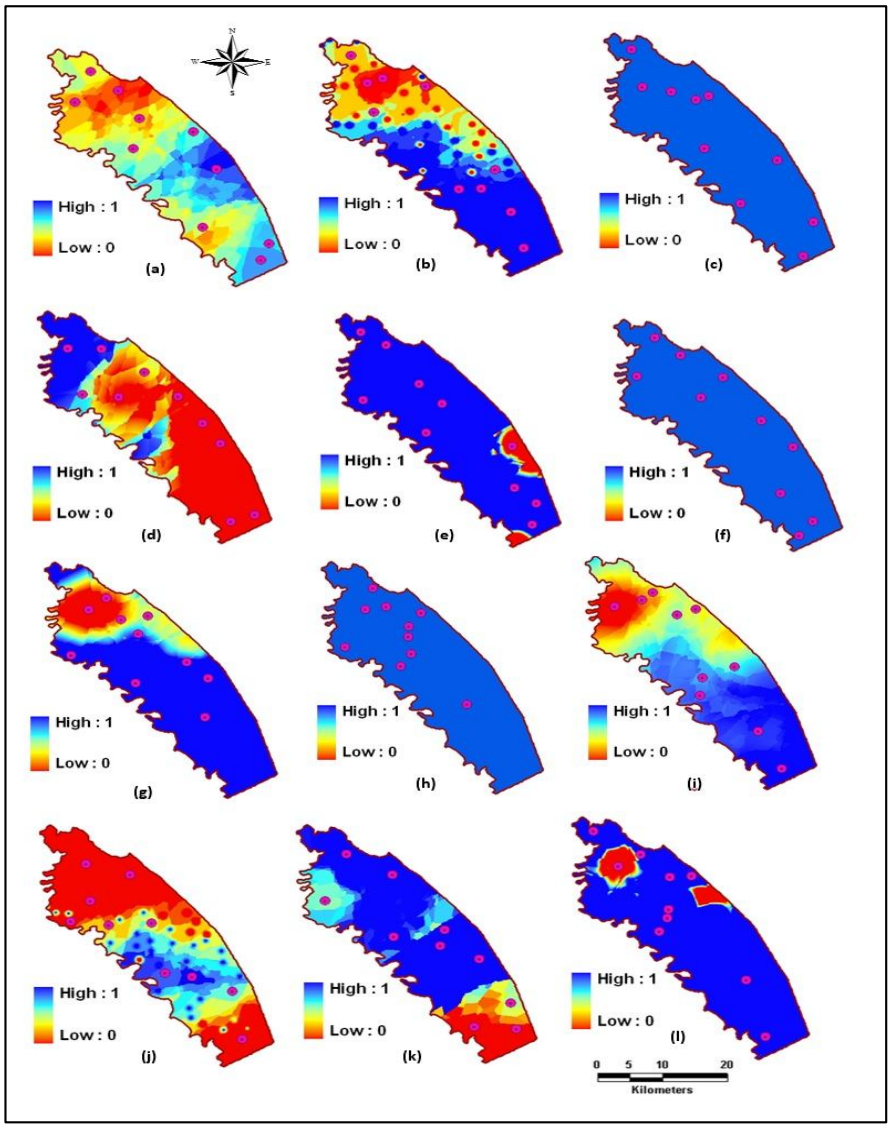

Fig.4. Map of land suitability estimated by fuzzy liner membership kriging for sugar beet crop.
(a) CaCO3, (b) Coroma depth, (c) Soil depth, (d) EC, (e) ESP, (f) Gypsum, (g) Primary slope, (h) Secondly slope, (i) Texture soil, (j) Groundwater depth, (k pH, (l) Micro relief.

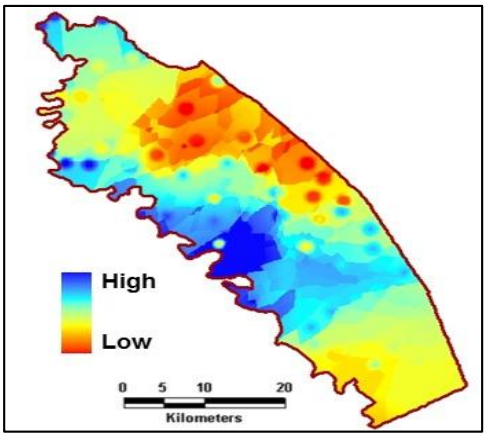

Fig.5. Land suitability map with using fuzzy membership kriging for sugar beet

Table1. MSEs obtained by applying classic ordinary kriging for sugar beet crop

IDI ($CaCo_3$)	Observed data	Predicted data	IDI (Depth of Chroma)	Observed data	Predicted data	IDI (Soil depth)	Observed data	Predicted data	IDI (Water table depth)	Observed data	Predicted data
6	39.17	34.44	3	5	6.87	4	100	101.91	4	0	0
8	33.85	35.31	4	28	27.5	8	110	113.63	9	50	53
10	31.85	35.03	8	4	6.88	10	106	108.74	10	35	33.16
11	28.42	33.62	14	24	20.62	14	125	123.07	14	0	0.15
31	32.8	32.37	17	38.1	34.37	16	130	137.65	22	60	70
32	31.8	34.24	20	71.5	70.83	29	135	132.69	26	62	66.66
38	30.47	34.74	27	64	60	34	123	127.84	27	133	139
47	31.32	34.03	28	81	76.66	40	133	135.35	34	103	106.6
46	30.4	33.9	29	51	56.04	49	122	120.62	41	84	80
52	30.79	33.09	33	54.5	49.16	52	141	143.3	50	83	80
MSE=11.09			MSE=12.65			MSE=12.80			MSE=20.80		
IDI (EC)	Observed data	Predicted data	IDI (ESP)	Observed data	Predicted data	IDI (Gypsum)	Observed data	Predicted data	IDI (pH)	Observed data	Predicted data
2	13.2	15.81	4	4.49	6.33	2	0.2	0.53	6	7.82	7.97
3	7.4	9.13	6	3.34	7.18	6	1.32	0.27	9	8.04	8.07
4	4.49	6.28	16	17.13	21.8	8	0	0.38	14	8.11	7.93
11	12.67	10.63	18	17	18.1	10	0.1	0.15	16	8	8.08
15	22.68	20.89	24	15.18	15	16	0.19	0.87	28	7.92	8.18
17	9.68	12.21	25	12.03	15.2	30	2.07	1.47	30	7.92	8.61
29	31	35.2	29	29.75	26.1	37	1.47	0.66	33	7.92	8.66

31	34.18	30.37	38	13.87	14.8	39	2.79	1.4	37	8.11	8.67
35	24.18	23.1	46	20.34	18	46	2.21	1.28	40	7.74	7.99
52	20.1	26.99	52	17.13	2.16	52	1.4	0.69	46	8.6	8.14
MSE=10.75			MSE=12.03			MSE=0.613			MSE=0.174		
IDI (Primary slope)	**Observed data**	**Predicted data**	**IDI (Secondly slope)**	**Observed data**	**Predicted data**	**IDI (Texture)**	**Observed data**	**Predicted data**	**IDI (Micro-relife)**	**Observed data**	**Predicted data**
5	4.1	2.7	2	3	0.75	2	8.1	5.02	2	31	28.52
6	3.5	2.97	6	3.5	1.02	8	3.5	2	3	30	30.1
10	2.7	3.4	8	1.2	0.8	10	5.3	6.1	6	33	28.9
14	1	2.44	10	3.5	1.16	11	7	8.49	8	19.1	23.05
26	1.1	1.67	14	1	0.87	14	2.1	4.1	21	20	19.1
31	1	1.29	26	1	0.47	20	4.2	6.8	30	6.9	8.1
38	1.2	2.08	35	1	0.29	28	9	8.7	35	15.11	11.28
40	1.8	1	38	1	0.65	32	9.75	9	42	0	0.07
42	0	0.7	40	0	0.16	34	9.52	8.91	50	13	15
48	1.2	1	44	0.7	0	35	9	9.18	51	14.2	16.48
MSE=0.722			MSE=1.828			MSE=2.64			MSE=6.46		

Table.2. MSEs obtained by applying fuzzy membership kriging for sugar beet crop

IDI($CaCo_3$)	**Observed data**	**Predicted data**	**IDI (Depth of Chroma**	**Observed data**	**Predicted data**	**IDI (Soil depth**	**Observ-ed data**	**Predicted data**	**IDI (Water table depth)**	**Observ-ed data**	**Predicted data**
6	39.17	36.44	3	5	6	4	100	101	4	0	0
8	33.85	34.11	4	28	27.7	8	110	112	9	50	52.7
10	31.85	32	8	4	6	10	106	108	10	35	33
11	28.42	30.16	14	24	21	14	125	123.87	14	0	0.09
31	32.8	32.4	17	38.1	35.37	16	130	136.2	22	60	68.2
32	31.8	33	20	71.5	70.9	29	135	132.8	26	62	64.2
38	30.47	33.1	27	64	61.02	34	123	127	27	133	137
42	31.32	34	28	81	77	40	133	135	34	103	106
46	30.4	33.6	29	51	55.9	49	122	120.6	41	84	80.9
52	30.79	33	33	54.5	51.1	52	141	142	50	83	80.05
MSE=4.13			MSE=8.23			MSE=7.65			MSE=12.66		
IDI (EC)	**Observed data**	**Predicted data**	**IDI (ESP)**	**Observed data**	**Predicted data**	**IDI (Gypsum)**	**Observed data**	**Predicted data**	**IDI (pH)**	**Observed data**	**Predicted data**

2	13.2	15	4	4.49	5.8	2	0.2	0.5	6	7.82	7.9
3	7.4	8.9	6	3.34	6.1	6	1.32	0.27	9	8.04	8.06
4	4.49	6.2	16	17.13	21	8	0	0.36	14	8.11	8
11	12.67	11	18	17	19.9	10	0.1	0.13	16	8	8.03
15	22.68	21.01	24	15.18	15	16	0.19	0.72	28	7.92	8
17	9.68	11	25	12.03	14.8	30	2.07	1.4	30	7.92	8.67
29	31	35	29	29.75	27	37	1.47	0.65	33	7.92	8.4
31	34.18	31	38	13.87	14	39	2.79	1.8	37	8.11	8.7
35	24.18	23.3	46	20.34	19	46	2.21	1.2	40	7.74	7.9
52	20.1	25.4	52	17.13	22.3	52	1.4	0.6	46	8.6	8.2
MSE=7.071			MSE=7.65			MSE=0.536			MSE=0.135		
IDI (Primary slope)	**Observed data**	**Predicted data**	**IDI (Secondly slope)**	**Observed data**	**Predicted data**	**IDI (Texture)**	**Observed data**	**Predicted data**	**IDI (Micro-relife)**	**Obser-ved data**	**Predicted data**
5	4.1	2.6	2	3	1	2	8.1	5	2	31	28.9
6	3.5	2.9	6	3.5	1.1	8	3.5	2.2	3	30	30
10	2.7	3.2	8	1.2	0.7	10	5.3	6	6	33	30.01
14	1	2	10	3.5	1.2	11	7	8.1	8	19.1	22.89
26	1.1	1.6	14	1	0.88	14	2.1	3.9	21	20	19.3
11	1	1.2	26	1	0.49	20	4.2	6	30	6.9	8
38	1.2	2	35	1	0.3	28	9	8.6	35	15.11	12
40	1.8	1	38	1	0.7	32	9.75	9	42	0	0.04
42	0	0.6	40	0	0.1	34	9.52	8.9	50	13	14.88
48	1.2	1.1	44	0.7	0.09	35	9	9.01	51	14.2	16
MSE=0.58			MSE=1.65			MSE=2.58			MSE=4.58		

Table .3. Pair wise Comparison Matrix for Sugar beet Suitabilityaccording to Saaty.

Parameters	CEC and ESP	Soil wetness	CaCO3	Gypsum	pH	Texture	Soil depth	Topogra-phy	Weight
CEC and ESP	1	2	3	4	5	6	7	8	0.3290
Soil wetness	1/2	1	2	3	4	5	6	7	0.2243
CaCO3	1/3	1/2	1	2	3	4	5	6	0.1526
Gypsum	1/4	1/3	1/2	1	2	3	4	5	0.1053
E	1/5	1/4	1/3	1/2	1	2	3	4	0.0750
Texture	1/6	1/5	1/4	1/3	1/2	1	2	3	0.0525
Soil depth	1/7	1/6	1/5	1/4	1/3	1/2	1	2	0.0359
Topography	1/8	1/7	1/6	1/5	1/4	1/3	1/2	1	0.0254

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

The Convexity Number of a Signed Graph

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Received: 14 Nov 2014 Revised: 22 Dec 2014 Accepted:31 Jan 2015

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ABSTRACT

Let G be a simple connected graph . The concept of signed graph was first introduced by Harary. A graph G = (V , E) is a signed graph if for every edge $e \in E$ there is a weight attached to it by giving a positive sign or a negative sign. A path is a sequence of signed edges and vertices. A path is positive (negative) if product of all signs on the edges of a path is positive (negative) .In network theory, a positive edge sends a message between the nodes of the edge without distortion and a negative edge distorts the message. Two consecutive negative edges will not a affect the message. Thus a message through a positive path will not be distorted while through a negative path it will get distorted. In this chapter we define a metric in a connected sigraph and make a study of convexity arising out of the metric. Such a study has a good application in social network theory and also in communication theory.

AMS Subject Code:05C12

Key words: Positive Path , Negative Path , Convex set.

INTRODUCTION

The concept of signed was first introduced by Harary. A graph G = (V , E) is a signed graph if for every edge $e \in E$ there is a weight attached to it by giving a positive sign or a negative sign. A path is a sequence of signed edges and vertices. A path is positive (negative). If product of all signs on the edges of a path is positive (negative). In network theory, a positive edge sends a message between the nodes of the edge without distortion and a negative

edge distorts the message. Two consecutive negative edges will not affect the message. Thus a message through a positive path will not be distorted while through a negative path it will get distorted.There are signed graphs in which there may not be a positive path between some vertices. Such situations arise from social networks where there are opposing groups. In such a case the signed graph may be decomposed into components where there exists a positive path between any two vertices in a component. Thus we may consider signed graphs in which there exists atleast one positive path between any two vertices. We also have the analogous situation where sigraphs are negatively connected.The study of metric properties in sigraphs may be made when the signed graphs are connected sigraph and make a study of convexity arising out of the metric. Such a study has a good application in social network theory and also in communication theory.

In figure 6.1, u is connected to v by $u - x - w - v$ positive path and v is connected to x by $v - y - x$ positive path but u is not connected to x. To avoid this we consider sigraphs for which transitive relation holds.

CONVEXITY NUMBER IN SIGRAPH

Definition

Let S = (V, E, σ) be a simple sigraph. A sigraph S is connected if and only if for any u,v in V (S) u , v contains a positive pathbetween them.

Remark

There are sigraphs which are neither positively connected nor negatively connected.

Remark

In the sequel, we restrict our attention to positively connected sigraphs. So by a sigraph we mean a positively connected sigraph.

Definition

Distance between any two vertices u , v denoted by ds(u; v) is de_ned as ds(u; v) = min:f number of edges on a positive path between u and vg. Clearly d_s is a metric satisfying

$(i)\ d_s(u,v) = 0\ if\ and\ only\ if\ u = v$

$(ii)\ d_s(u,v) = d_s(v,u)$

$(iii)\ d_s(u,w) \leq d_s(u,v) + d_s(v,w)\ for\ any\ v \in V(S).$

Then the concept of convexity can be extended ti signed graphs.

Definition

A subset C of V (S) is convex if for any u , v in C , C contains all the positive geodesics of u, v in S. The maximum cardinality of a proper convex set is the convexity number .

Remark

For any connected sigraph S, V (S) is a convex set.

Remark

A Tree is siconnected if and only if there is no negative edge. Thus con(Ts) = con(T) = n - 1 .

Definition

Any two vertices of a siconnected graph are adjacent if there is a positive edge and ds(u; v) = 1.

Remark

A siconnected graph is complete if and only if any two vertices are adjacent.

Definition

Let S = (V;E, σ) be a simple siconnected graph. A subset C of V (S) is sigeodetic if for any u in V -- C there exists u1 , u2 in C such that u lies on a positive geodesic between u1 and u2.

Theorem

Let S be a noncomplete connected sigraph of order n. Then con(S) = n -- 1 if and only if there exists a v in V (S) such that $\langle S-v\rangle$is siconnected and not a sigeodetic set.

Proof

Let con(S) = n--1 . Then there exists a v such that $\langle S-v\rangle$ is siconnected . If $\langle S-v\rangle$ is a sigoedetic set for any v then con(S) $\neq n$-- 1. Therefore there exists a v in V (S) such that $\langle S-v\rangle$is siconnected and not a sigeodetic set. converse follows.

REALIZATION THEOREMS

Theorem

For every pair l , $n \geq 3$ of integers with $2 \leq l \leq n-1$ there exists a noncomplete connected sigraph S of order n with $\omega(S) = l = con(S)$.

Proof

For $l = 2$, the graph K3 with a single negative edge has the desired property. If $\text{If } l = n-1$, then the graph obtained by joining a vertex to two vertices of a complete sigraph of order n -1 and signing one of the new edge as positive, the other as negative has $\omega(S) = con(S) = n-1.$

So we assume that $3 \leq l \leq n-2$. Let u and v be any two vertices of a clique on l +1 vertices. Sign all its edges as positive. Let $F = K_{l+1} - uv$.Let w be a vertex on F. The sigraph S obtained from adding $n-l-1$ new vertices $\{u_1, u_2 \cdots, u_{n-l-1}\}$ and joining u , v, w to each of the new vertices , signing new edges from w to new vertices as negative and rest of the new edges as positive has $\omega(S) = l = con(S) \text{ since } \omega(S) = l \text{ therefore } , con(S) \geq l.$

Let C be a convex set of S with $|C| = con(S).$ $\text{Since } I[u,v] = V(S)$, C, contains at most one of u and v. Also we observe that none of the new vertices $\{u_1, u_2 \cdots, u_{n-l-1}\}$ enter con(S) set as geodesic between any of the new

vertex and w contains both u and v. Therefore con(S) $\leq l$ and so con(S) = l.The sigraph S thus obtained is shown in the following figures1-6.

Theorem 2.15 For every triple l , k , n of integers with $2 \leq l \leq k \leq n-1$ there exists a noncomplete siconnected graph S of order n with $\omega(S) = l$, con(S) = k.

Proof

When l = k , the result folows by ??. So we assume $l <$ k. Let F = $(K_{l-1} + \overline{K_2})$.Let $V(\overline{K_2}) = \{u_1, u_2\}$, $V(K_{l-1}) = \{v_1, v_2, \cdots, v_{l-1}\}$.Order of F is l + 1.

For n = k+1,the sigraph S1 obtained from F by joining each vertex of $\overline{K_{k-l-1}}$ to u1 and u2 , adding a pendant edge at u1 say uu1 , signing uu1 as positive, every edge of K_{l-1} as positive , edges from u_1 to $V(K_{l-1})$ as positive and signing remaining edges that is edges from u_2 to $V(K_{l-1})$and edges from u1 , u_2 to $V(K_{k-l-1})$ such that it contains atleast one negative edge. order ofS_1 is $k+1$.Now $con(S_1) = |V(S_1 - u)| = k_s$ and $\omega(S_1) = l$.

For n = k + 2,the sigraph S2 obtained from S1 by joining a pendant edge at u say uv , new edge v_1v and signing uv , v_1v as positive.

For n = k + 3,the sigraph S3 obtained from S1 by adding new vertices v , w and new edges uv , vw , wu2 and signing all the new edges as positive.

For $n \geq k+4$, let $S_4 = K_{2,n-k-2}$ whose partite sets are $V_1 = \{x_1, x_2\}$ and V2 = $\{y_1, y_2, \cdots, y_{n-k-2}\}$. Then the sigraph obtained from S4 and $F = \overline{K_2} + (K_{l-1} \cup \overline{K_{k-l-1}})$ by adding edges

(i) x_iu_2 for $i = 1, 2$

(ii) y_ju_1 for $1 \leq j \leq (n-k-2)$, signing all edges of S4 as positive , edges of $(K_{l-1} + u_1)$as positive , x_iu_2 for i= y_ju_1 for $1 \leq j \leq (n-k-2)$as positive. Also edges of $(\overline{K_2} + \overline{K_{k-l-1}})$ are signed positive and edges from u2 to V $(K_{l-1})$are signed in such a way that some edges are positive while some other edges are negative.

REFERENCES

[1] Batten.L.M:Geodesic Subgraphs . J. Graph Theory(1983),pp.159-163.

[2] Buckley.F.,Harary.F:Distance in Graphs,Redwood City : Addison -Wesley (1990).

[3] Chartrand.G.,Curtiss.E.Wall.,Ping Zhang:The Convexity Number of a Graph.Graphs and combinatorics 18(2002),pp.209-217.

[4] Douglas B . West:Introduction to Graph Theory , Second Edition Prentice - Hall (2001).

[5] Duchet.P:Convex sets in Graphs II Minimal path convexity , J.Comb.Theory ser-B,44(1988).

[6] Duchet.P.,Meyniel.H:Ensemble convexes dans les graphes I , European J. Combin. 4(1983),pp.127-132.

[7] Farber.M:Bridged graphs and geodesic convexity , Discrete Mathematics 66(1987).

[8] Farber.M.,Jamison.R.E: Convexity in Graphs and Hypergraphs , SIAM J. Alg. Disc. Math.7(1986),pp.433-444.

[9] Farber.M.,Jamison.R.E: On Local Convexity in Graphs: Discrete Mathematics , 66(1987),pp.231-247.

[10] Gimbel.J:Some Remarks on the Convexity Number of a Graph.Graphs and Combinatorics 19(2003),pp.351-361.[11] Harary .F:Graph Theory Addison Wesley , reading Mass(1969).

[12] Harary.F.,Nieminen.J:Convexity in Graphs.J.Di_er,Geom.16(1981),pp.185-190.

[13] Hebbare.S.P.R:A Class of Distance Simple Graphs , Ars Combinatorics 7(1979),pp.19-26.

[14] Jamison.R.E: Partition numbers for Trees and Ordered sets , Pac.J.Math. 96(1981),pp.115-140.

[15] Mulder.H.M:The INterval Function of a Graph , Math.Centre Tracts 132, Amsterdam (1980).

[16] Ralph J.Faudree.,Zdenek Ryjacek.,Richard H.Schelp: On local and global independence numbers of a graph.Discrete Applied Mathematics 132(2004),pp.79-84.

[17] Soltan.V.P: d-convexity in graphs , Soviet Math.Dokl.28(1983),pp.419-421.

[18]Soltan.V.P.,Chepoi.V.D: Conditions for Invariance of set diameters under d-convexi_cation in a Graph , Cybernetics 19(1983),pp.750-756.

[19] Van de Vel.M:Theory of convex structures, North - Holland , Amsterdam, MA(1993).

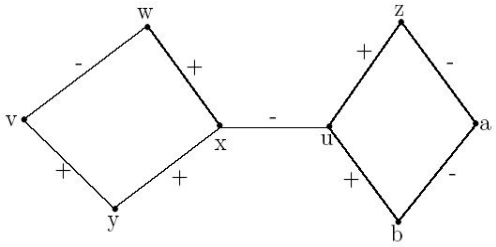

Fig 1.

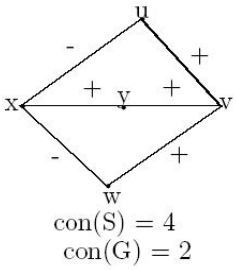

Fig 2.

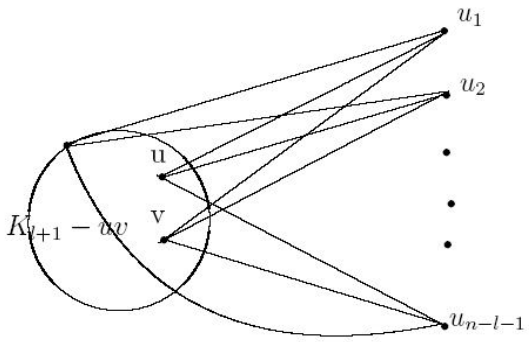

Fig.3.

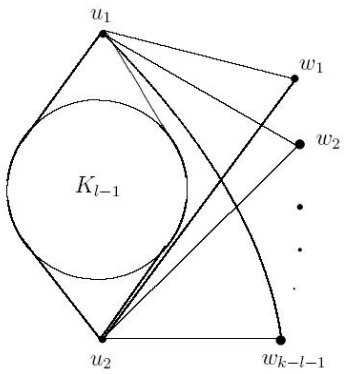

Fig.4.

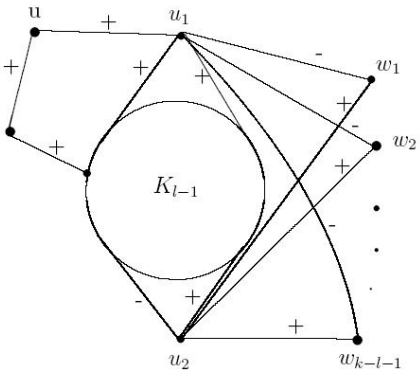

Fig.5.

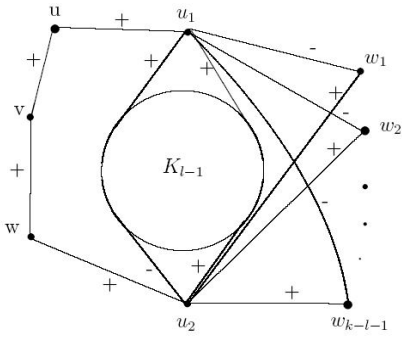

Fig.6.

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Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

The Effect of Financing and Human Resources on Operational Planning in Hospital

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Received: 20 Dec 2014 Revised: 5 Jan 2015 Accepted:19 Jan 2015

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ABSTRACT

The provision of financial and human resources is considered as one of the important aspects of operational planning. One of the problems in management of hospitals is the lack of financial and human resources for operational planning. This study has been conducted to evaluate the effect of providing financial and human resources on operational planning in hospitals in 2014 in Iran.In this cross-sectional study, the theoretical models of operational planning were examined through Library Studies and after determining the variables of different models of operational planning, a questionnaire was developed and a survey from 176 experts from academic and administrates of hospitals, the data was collected and Exploratory and confirmatory factor analysis was performed.The effect of the "provision of financial and human resources" on operational planning in hospitals based on factor analysis of regression coefficients were estimated to be 0.829. Also in the results obtained from the survey from the experts, the question of "forming an operational planning team and determining their duties" with the mean of 4.60 has been the highest score and the question of the "allocation of financial resources to implement programs" has received a mean score of 4.17.

The use of appropriate and adequate human and financial resources can improve the performance of operational planning in hospital.

Key words: operational planning, hospital, human and financial resources.

INTRODUCTION

Operational plan with a realistic vision, is just relying on certain and available features and is short-term, regulating administrative or operational plan is a stage in which the actual output of the programs is outlined and resources such as personnel, finance and budget, training, equipment, information and technology are allocated (1). Budgeting and financing is one of the most important aspects of the planning process in the organization or its subsidiaries in general. Budgeting is a continuous process of planning, implementing current budgets and evaluating incomes and performances. Budget as a written and purposeful financial plan is defined in controlling the resource allocation. Careful attention in writing or developing specific computerized form and changing a small amount in monetary figures, this program becomes a guiding framework for the activities of the organization.

Budget, at the level of organization, adjusts expected income and expenses to predict the amount of profit or loss. Preparing the budget, the future and the final impact of these trends and that what number of service units is needed to be provided, is predicted and estimated. And finally, the budget for management plans, plans of access to goals and controlling the expenses of the organization is regarded to be very important (2).

The main tasks of management in budgeting and forecasting is as the following: coordination of financial planning with the goals and objectives of time in strategic planning, planning for the budget, organizing and justifying the budget, implementing the budget process, assessing technology, determining resource requirements in terms of the constraints, organizing the required resources (2).

The budget of an organization or health system is mainly divided into budget revenues, budget expenditures and capital budget and a cash budget: components of revenue budget, is determined by the estimation of the measure of health care delivery and payment expected and the various services that are purchased by insurance. Basically, this type of funding is a complex process because demands of insurance, reimbursement rates, tariffs and insurance services under contractual services on the one hand and the frequent changes on the other affect the type of budgeting. Budgetary costs of an organization or health system may be divided into different views on the cost of operating personnel and non-personnel operating costs or fixed and variable costs. Among the operating costs of an organization or a health system, personnel operating costs are considerable. In accordance with international standards, personnel and operating costs allocates 60-55 percent of total operating costs to itself. This indicates the importance of human resources within an organization or a health system. Variety of Human resources in health organization exist in different units, and the wage rates paid by different personnel and productivity of employees in a unit (and even in comparison with other units) can vary considerably, so the items listed in the budget cost is of great importance (3).

Other costs included in the budget for non-personnel costs are discussed as operating costs, including the cost of medicines and medical consumables, supplies and consumables General Nutrition, Energy and on the basis of the International standards allocates 35-40 of the total operating costs in an organization or health system.Fixed costs having no relationship to the level of activity, however, must be paid, and allocate 70 % of the total costs to itself. Because of the fixed nature of the behavioral, increasing of the outcomes of health systems are considerably less than their share in the cost of services provided. In contrast, there are variable costs that has been affected by the amount of health activity organization and public change in the level of activity and performance of the health system, also changes. These costs make up about 30 percent of total spending cash. Cash budget includes

determination of inputs and outputs during the budget and estimated cash resources required to implement the program during the period (3). After that program objectives are decided, planning can be made by Kerry team. A working system consists of Administrative staff and operational programs in order to achieve its developmental goals. Involving all employees is important in operational plan. Executive staff are more aware of the processes and work more with professionals in the field of occupational work so they can play an important role in the success of the program by more accurate and better understanding of the problems and resources. To provide staff with effective and adequate support, They need to have a thorough understanding of the activities that are relevant to them and how to adapt to the conditions of their organization, When organizations do not have previous experience and success in operational planning , bringing a foreigner consultant may be necessary (4). removing human needs of the program (1) and skill training programs for them (sincere), limited resources, the need for coordination between various organizations, creating team spirit and commitment of key individuals to achieve their goals, increasing demand for services and Prevent tastes and avoid multiple work (2) will determine the need for research on the human and financial resources. This study aimed to investigate the effect of the financial and human resource management in hospitals operating in Iran.

MATERIALS AND METHODS

This study applied the analytical method and periodically done during the years 93-1392 in Iran. This study aimed to investigate the effect of the cause of Financial and human resources to the operational planning that was done in the hospital. The first phase of operational planning was collected by Library Studies and review of the literature, then the dimensions of the template was developed in a comparative table. In the second phase, a questionnaire survey was designed and validated. A questionnaire based on different component models have been studied in such a way that can be used to cover the effect of the program needed in planning for the hospitals especially the cause of financial and human resources. The questionnaire for the validation of 30 academic experts in operational planning was distributed in hospitals and data were analyzed using the spss22 software and eventually tool study questionnaire containing 44 questions was extracted. Questions were measured by Likert scale of five alternative options so that very low score was 1 and 5 was very high score option. At the end of the questionnaire a question or written questions about other factors affecting operational planning features, the hospitals, the experts were asked. In the third stage as a field of study, the final questionnaire was developed from the stage before the final model among 176 teachers in health care management, Members of the planning committee of medical universities, directors, managers, supervisors and officers of the Office of excellence in the design of hospitals and hospital programs that had sufficient knowledge and experience were distributed and collected the necessary data. In the fourth study, the factors affecting the operational planning of hospitals, based on the findings of field study were identified using exploratory factor analysis. For this purpose, principal component analysis was used to identify important factors. Therefore, factors having eigenvalues greater than one were extracted as the considered factors. The "human and financial resources" were identified among these factors. For a more detailed analysis of the rotation method "Varimax" was used. The value of close to one (0.907) of Kaiser - Meyer - Okin and significant Bartlett test, indicating the validity of factor analysis was conducted. In the fifth phase of study, confirmatory factor of the fourth stage validated and confirmed by the Amos$_{22}$ software. Model obtained based on confirmatory factor analysis using the parameters Index model were confirmed. The value of the test statistic divided by degrees of freedom CMIN / DF = 2.515, which is considered a good value. Due to the bigger CFI = 0.735 and smaller RMSEA = 0.096 and regression coefficient represents the studied effect.

RESULTS

The effect of the financial and human resources to operational planning in hospitals are calculated based on regression analysis estimated value of 0.829. Also the results of the experts' opinions on the question, organizing the

operational planning team and appointing their tasks with the highest mean score was 60/4 and the question of allocating the funds for the programs achieved a mean score of 4.17.

Table 1 shows the mean and standard deviation of the response to questions by experts that were arranged by mean scores. It was observed that the experts gave the most points 4.60 average to the question "organizing operational planning team and appointing their tasks" and Question, "according to the operational planning in hospitals was accepted as an organizational vision" has achieved the lowest score. As can be seen in the table, other questions related to the provision of financial and human resources as well as the mean scores are high.To determine the factors affecting the "operational planning in the hospital" Exploratory factor analysis on the 44-questions questionnaire or variable was used. For this purpose, a questionnaire by 176 teachers of Health Services Management, University of Medical Sciences planning committee members, experts, managers office, hospital development was completed and data mining and exploratory factor analysis was performed on them.Important factors were identified using the eigenvalues. So that the factors with eigenvalues greater than one were extracted as a factor.

Factor analysis can be done to continue the work on the contract must ensure its accuracy. Kaiser-Meyer-Okin was used for this index to examine the adequacy of the sample size. The Bartlett's test was also used to check the uniqueness of the correlation matrix. Close to an index value of Kaiser-Meyer-Okin and appropriateness of factor analysis that indicated significant Bartlett test was performed (Table 2).Table 3 indicates the questions or variables related to providing financing and human resources and their factor loadings which are arranged due to their importance (greater factor loadings). Due to important questions such as "Developing specific mechanisms for calculating the cost of programs" and "Evaluation of different methods of financing programs" and "the efficiency of personnel's performance due to the developed programs on their payments", this factor could be called "provision of human and financial resources".

Table 4 indicates the mean and standard deviation of the response to each of the questions about the "human and financial resources" which are arranged regarding the obtained mean score for each question. These scores have been calculated based on the responses of all participants in the study. It is noted that according to the participants' perspective, the question regarding "Meeting the needs of programs in terms of human resources and their expertise" is of a great importance and the question of "evaluating various strategies for financing the programs" is of the least importance in "providing financial and human resources".After the exploratory factor analysis was performed and "financing financial and human resources" were identified, it was necessary to confirm its authenticity. For this purpose, the confirmatory factor analysis was used.

The obtained results were examined using the known fit values based on the confirmatory factor analysis. The results of this study and the value of each indicator is specified in Table 5. P value or the significance of fit test is not appropriate because of being less than 0.05. The value of the test statistic divided by the degrees of freedom is 2.515 which is considered a good value. The largeness of CFI and smallness of RMSEA indicate the relative suitability of the investigation.Standardized and non-standardized path coefficients or regression coefficients of factor analysis are provided along with standard errors and the critical ratio and significance test in Table 6.It can be seen that all the coefficients are significant at the level of 5%. According to standardized path coefficient estimates, the effect of the "human and financial resources" factor is 0.829.

DISCUSSION

The effect of "providing financial and human resources" which is considered as one of the findings of the present study is consistent with the effect of the necessary resources to implement the planned activities in Asefzadeh (3) and the factor indicating the programs in the form of numbers through budgeting in Kuntz and Vayhrikh

model (5) and the budgeting factor in Office of Community Planning and Center for Disease Control and Prevention (6). The WHO model of operational planning (1) also suggests meeting the "human needs of program" and "allocation of finances" which is consistent with the findings of the present study. A key factor in operational planning in Hasanabadi's model (7) is training to acquire skills for planners, which is similar to the results of the present study. Also, Tofig (8) has emphasized the use of professional consultants in his study by the Planning Team. Nasiri Poor (9) has also emphasized the participation of all levels in the preparation of programs. Girigya et al (10) have also emphasized the presence of specific objectives and expected results in their operational program, and stated that after the notification of the general policies along with the guidelines and deadlines for the compilation of programs, the operational managers must held several training sessions for their employees and justify the purpose of their participation in their development programs. In the recent study, holding educational program for the hospital staff in the field of designing and implementing operational programs are considered as the research results.

According to the findings of the research it is suggest that in order to improve the process of operational planning in hospitals and achieving good results in designing and implementing programs, in the field of organizing the planning team and training the staff, creating the culture of planning and providing the necessary financial sources is necessary.

REFERENCES

1.Tabibi SJ, Maleki MR. Strategic Planning. Tehran;Ter meh,2003.[Persian].

2.Amiri m. Designing on OperationalPlanning Model for Primary Health Care 1.2008

3.Asefzadeh S. Rezapour A. Health Management. Ghazvin,2012.[Persian].

4.Shapiro J. Action Planning Toolkit.Civicus.Email: tookits@civicus.org.20/7/2008.

5.besharat A. Seire andishehayeh edari va mabani elmeh edareh;1973.p 18-21.[Persian].

6-Centes for Disease Control and prevention (CDC). Healthy Plan-it:A Toot for Planning and Managing Public Health Programs. Sustainable Management Development Program. Atlanta,GA:Author.2000.

7.Hassan Abadi SA. Introduction to Public Health. Rasht:Gap,2013.[Persian].

8.Towfigh F.Negahe be ayandeh barnamehrizi dar iran.Procceding of Congress on growthing Policity and Management in Iran.2004 March 10; Tehran;hran:2006.p163-174.

9.Raeissi P. Nasiripour AA. Management Development in Health Care Setting:A Training model for Hospital Managers. J Health Sci 2008;7(2):42-55.

10.Kirigia JM. Sambo LG. Agu VU. Lambo E How to Develop an Operational Plan for

Health East Afr Med J 2001;78(3 suppl):p 14-19.

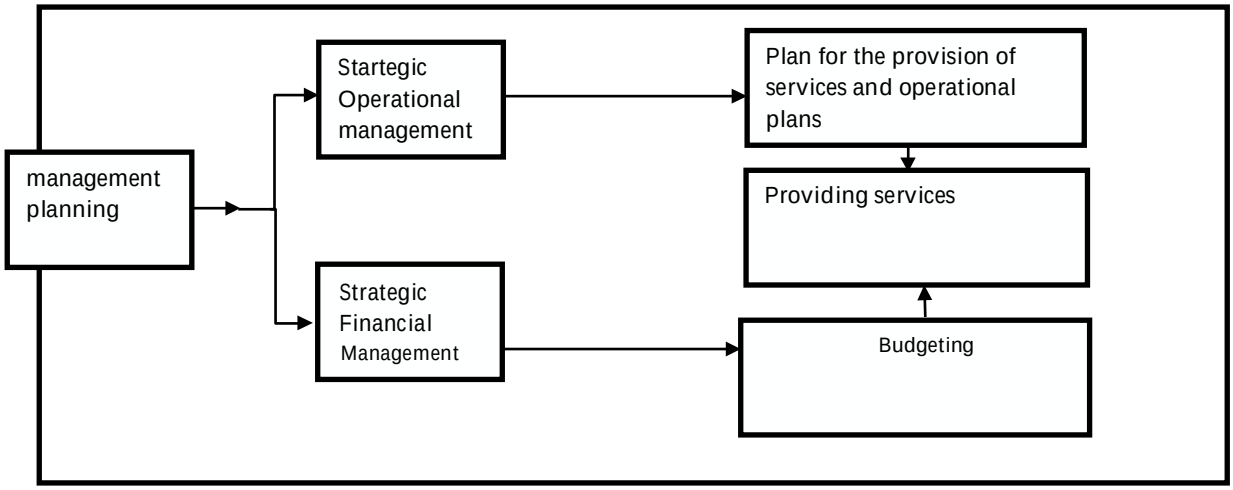

Figure 1. The relationship between budgeting and planning of the organization

Table 1. Mean and standard deviation of the experts' responses to questions

Code	Question	Mean	SD
2	Forming an operational planning team and determining their tasks	4/60	0/62
3	Forming a team that guide the process of conducting programs and monitor them.	4/53	0/68
31	Meeting the needs of the programs regarding human resources and their expertise	4/47	0/90
1	Establishing clear mechanisms for operational planning in hospitals.	4/43	0/77
5	Completing and continuing planning team and staff's activity for operational planning and its' implementation.	4/43	0/86
27	Guiding units in developing operating programs based on determined objectives.	4/33	0/61
37	Provision and proper analysis of data for designing operational programs and proper use in developing strategies.	4/33	0/84
22	Identifying strategic issues and prioritizing them.	4/31	0/79
4	Assigning responsibilities and powers of the organization to implement operating programs	4/30	0/88
39	Existence of a system for reporting about the planning and ensuring the implementation of programs	4/27	1/01
26	Take the necessary proceedings to coordinate the implementation units	4/24	0/82
29	Developing operational programs for the purpose of the hospital's strategic plan	4/23	0/73
36	Considering the potential facilities and sources	4/23	0/97

40	Effectiveness of the performance of the staff according to the developed programs on their payments	4/23	0/94
20	Identifying target groups of programs and collecting data related to customers	4/20	0/80
10	Getting the support and approval and agreement and involvement of individuals and key organizations and high managers for planning.	4/18	1/09
8	Considering health policies of the country for planning	4/17	0/70
32	Allocation of financial resources to implement programs	4/17	1/05
34	Developing specific mechanisms for calculating the cost of programs	4/17	0/99
38	Setting standards for evaluating the performance of employees and programs	4/17	0/87
16	Evaluating the ability of hospitals to solve the target problems	4/14	0/63
19	Identifying the factors that are directly or indirectly associated with the problem.	4/14	0/82
24	Using scientific methods of operational planning and its' implementation	4/14	0/78

code	**Question**	**Mean**	**SD**
25	Existence of a documented process for managing the operational planning	4/14	0/94
6	Implementation of educational programs for hospital staff about the design and operational programs	4/13	0/90
28	Predicting and evaluating the activities and preparing detailed programs	4/13	0/73
41	Designing a mechanism for evaluating implementation, evaluating processes, impacts and outcomes of operational programs to improve the quality	4/13	0/90
14	Collecting, preserving and analyzing related data to operational planning.	4/11	0/80
	Existence of criteria for evaluating the performance of employees who participate in the formulation and implementation of operational programs.	4/10	1/03
44	Evaluating all components of the program by professionals and approving the design and the final plans	4/10	0/92
18	Detailed description of each problem	4/07	0/83
21	A thorough understanding of market variables (service, price, place of delivery) that affect customers.	4/07	0/87
23	Setting qualitative and quantitative statistical reports for operational planning	4/07	0/91

9	Considering the legal, administrative and technological needs in development and implementation of programs	4/04	0/72
7	Promoting enterprise policy to fulfill the operational planning of hospital	4/03	1/00
30	considering the duration of every program	4/03	0/85
15	Determining the perspectives of difficulties in the hospital	4/01	0/83
17	Investigation the reason of the hospital to address the target problem	4/00	0/83
42	Evaluating interventions and programs before the final delivery and receiving proper feedback before implementing	4/00	0/98
12	The placement of the performance of hospitals in planning on their ranking	3/97	0/96
35	Evaluating various means of securing financing programs	3/97	1/00
43	Making changes in the components of operational programs based on feedback	3/97	1/00
33	Informing the planning team members of the costs of each program	3/93	1/14
13	Considering the operational planning in hospitals as an organizational perspective should be adopted.	3/83	0/99

Table 2. Evaluation of the adequacy of the sample size and the correlation matrix using the index of Kaiser-Meyer-Okin and Bartlett's test

Kaiser-Meyer-Okin index	0
Bartlett test statistic	54
Degree of freedom	9
Significance	<

Table 3. Factor loadings of the variables related to the provision of finance and human factor analysis obtained by the matrix of factor analysis in the rotated space

Code	Question	Factor loading
34	Developing specific mechanisms for calculating the cost of programs	0/771
35	Evaluating various means of financing programs	0/743
40	Effectiveness of the performance of the staff regarding the developed	0/743
	programs on their payments	
43	Making changes in the components of operational programs based on feedback	0/728
42	Evaluating interventions and programs before the final delivery and receiving proper feedback before implementing	0/686
36	Considering the possibility and potential sources	0/680
41	Designing a mechanism for evaluating implementation, evaluating processes, impacts and outcomes of operational programs to improve the quality	0/661
37	Providing proper analysis of data for designing operational programs and the proper application in developing strategies	0/648
38	Setting standards for evaluating the performance of employees and programs	0/648
31	Meeting the needs of the programs regarding human resources and their expertise	0/619
39	Existence of a system for reporting on the planning and ensuring the implementation of programs	0/614
44	Evaluating all components of the program by professionals and approving the final plans	0/569
32	Allocation of financial resources to implement programs	0/556
33	Planning team members informed of the costs of each program	0/556
10	Support , approval and involvement of key individuals, organizations and supreme management for planning	0/415

Table 4. Mean and standard deviation of the responses to the questions, "financing financial and human resources"

Code	Question	Mean	SD
31	Meeting the needs of the programs regarding human resources and	4/34	0/89
	their expertise		
10	Support, approval and involvement of key individuals, organizations and supreme management for planning	4/29	0/82
38	Setting standards for evaluating the performance of employees and programs	4/26	0/80
32	Allocation of financial resources to implement programs	4/20	0/98
39	Existence of a system for reporting on the planning and ensuring the implementation of programs	4/20	0/83
40	Effectiveness of the performance of the staff regarding the developed programs on their payments	4/20	0/85
41	Designing a mechanism for evaluating implementation, evaluating processes, impacts and outcomes of operational programs to improve the quality	4/20	0/80
44	Evaluating all components of the programs by professionals and approving the design and the final plans	4/20	0/81
36	Considering the facilities and potential sources	4/17	0/82
37	Provision and proper analysis of data for designing operational programs and proper use of them in developing the strategies	4/17	0/80
43	Making changes in the components of operational programs based on feedback	4/13	0/86
34	Developing specific mechanisms for calculating the cost of programs	4/08	0/90
42	Evaluating interventions and programs before the final delivery and receiving proper feedback before implementing	4/07	0/84
33	Planning team members informed of the costs of each program	4/03	0/97
35	Evaluating various means of financing programs	4/03	0/89

Table 5. The fit indices of confirmatory factor analysis

P	<0/001
DF	894
CMIN	2248/042
CMIN/DF	2/515
IFI	0/737
NFI	0/628
CFI	0/735
PNFI	0/594
RMSEA	0/096
GFI	0/614

Table 6. The estimation of path coefficients of confirmatory factor analysis

Significa-nce P	C.R.	S.E.	Standard estimation	Non-standard estimation	Direction		
***	5/878	0/131	0/846	0/767	f	→	f5
***	7/302	0/129	0/761	0/942	f	→	f4
***	7/009	0/124	0/830	0/868	f	→	f2
***	7/119	0/126	0/916	0/896	f	→	f3
			0/912	1/000	f	→	f6
***	6/797	0/137	0/878	0/934	f	→	f7
***	6/160	0/126	0/829	0/774	f	→	f1
***	6/974	0/156	0/837	1/090	f	→	f8
***	6/615	0/169	0/639	1/116	f1	→	Q44
***	7/633	0/193	0/802	1/476	f1	→	Q43
***	7/706	0/192	0/815	1/477	f1	→	Q42
***	7/409	0/176	0/762	1/307	f1	→	Q41
***	7/383	0/188	0/757	1/391	f1	→	Q40
***	7/488	0/184	0/776	1/381	f1	→	Q39

***	7/269	0/175	0/738	1/272	f1	→	Q38
***	7/350	0/176	0/752	1/291	f1	→	Q37
***	7/502	0/183	0/778	1/374	f1	→	Q36
***	7/537	0/199	0/784	1/502	f1	→	Q35
***	7/589	0/203	0/794	1/538	f1	→	Q34
***	6/519	0/201	0/625	1/311	f1	→	Q33
***	6/775	0/206	0/662	1/397	f1	→	Q32
***	7/084	0/192	0/709	1/358	f1	→	Q31
			0/565	1/000	f1	→	Q10
			0/692	1/000	f2	→	Q15
***	8/357	0/121	0/708	1/011	f2	→	Q16
***	8/335	0/137	0/706	1/142	f2	→	Q17
***	8/287	0/139	0/702	1/149	f2	→	Q18
***	9/084	0/136	0/775	1/232	f2	→	Q19
***	9/048	0/130	0/772	1/177	f2	→	Q20
***	7/741	0/134	0/652	1/041	f2	→	Q21
***	8/605	0/145	0/772	1/246	f3	→	Q26
***	7/944	0/134	0/702	1/061	f3	→	Q25
***	8/468	0/137	0/757	1/161	f3	→	Q24
***	7/643	0/139	0/671	1/064	f3	→	Q22
			0/666	1/000	f3	→	Q14
			0/822	1/000	f4	→	Q1
***	9/657	0/082	0/722	0/792	f4	→	Q2
***	9/957	0/094	0/741	0/939	f4	→	Q3
***	10/114	0/093	0/750	0/944	f4	→	Q5
			0/565	1/000	f5	→	Q4
***	5/861	0/192	0/609	1/124	f5	→	Q6
***	6/250	0/166	0/674	1/036	f5	→	Q9

***	6/559	0/203	0/734	1/331	f5	→	Q11
***	8/293	0/142	0/719	1/174	f6	→	Q30
***	8/145	0/115	0/704	0/938	f6	→	Q29
***	8/986	0/113	0/788	1/019	f6	→	Q27
			0/689	1/000	f6	→	Q12
***	8/604	0/133	0/839	1/148	f7	→	Q28
***	6/519	0/114	0/582	0/746	f7	→	Q8
			0/664	1/000	f7	→	Q7
			0/731	1/000	f8	→	Q13
***	6/725	0/108	0/635	0/725	f8	→	Q23

Indian Journal Of Natural Sciences *www.tnsroindia.org. © IJONS*

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Direction of Causality between Energy Carriers' Consumption and Economic Growth in Iran using Hsiao's Causality

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Received: 22 Nov 2014 Revised: 8 Dec 2014 Accepted: 18 Dec 2014

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ABSTRACT

Disregarding need of Iranian economic sectors for energy can impose an irreversible damage on the country's development process. Accepting the sovereign role of energy in the current and future state of the economy and the urgent need of foreign exchange incomes and using it for domestic consumption have proven the need to preserve and utilize energy precisely and economical. Using series data for 1971-2011, this paper is going to test the causality relationship between the consumption of energy carriers (oil, gas and electricity) and the growth of economy sectors (industry, agriculture, transportation and services) in Iran through Hsiao's causality method that is much efficient in the determination of lag numbers. The results show there is a two-way causality relationship between the consumption of energy carriers and the growth of economy sectors in Iran. Thus, one may observe more value added in each sector with more consumption of energy carriers. Moreover, growth in value added of each sector requires more consumption of energy carriers.

Keywords: energy carriers, economical growth, Hsiao's causality method, time series.

INTRODUCTION

Iran has many rich energy resources. Huge deposits of oil, massive underground mines and potential energy brings Iran a prominent positionin this regards compared to many other countries. In the case of optimum use of the resources, the resources can be considered as an important factorin economic development. In the case of non-optimal and non-efficient use, energy sector may be come an unbalanced and inconsistent sector with other economic sectors; it causes irrational growth in some sectors and ultimately leads to economic imbalances.

Since a large share of energy is consumed by energy carriers of oil, gas and electricity, this article tries to study the relationship between the consumption of the carrier and the growth of economy sectors. This can be an effective aid in defining energy policies.The relationship between energy consumption and economic growth has been seriously investigated after the oil crisis of 1973. Whats till is unclear and controversial in the field of energy economics relates to the causal relationship between energy carriers (oil, gas, electricity) and the growth of economic sectors (industry, agriculture, services and transport). The question is whether the consumption of energy carriers is a motivator of economic growth or vice versa.

Review of Literature

Many researches have been done in the context of the present study, both domestically and abroad. This section recalls the most relevant and most cited researches.

Cheng and Lai (1997) examined the causal relationship between energy consumption and gross national product and energy consumption and employment through Hsiao Cointegration and Granger causality methods using annual data for the period 1955 to1993 in Taiwan. The results show that there is a one-sided causality from economic growth to energy consumption and energy consumption to employment in this country. Because Taiwan is an industrialized country, the country's energy demand for economic development is high. Thus, the energy for industrial countries is an important component of economic development. Production in the manufacturing and transportation industries requires large amounts of energy. In Taiwan, a newly industrialized country that has be enrelatively well in terms of economic progress, a little increase in production has affected energy consumption; therefore, employment rate has enhanced. Then, in addition to the direct influence of energy consumption on employment, production also indirectly influences on employment.

Soytas and Sari (2003) uncover a two-sided causality between energy consumption and GDP in Argentina by examining seven countries: Argentina, Italy, Korea, Turkey, France, Germany and Japan using cointegration approach and error correction model. Causality was from GDP to energy consumption in Italy and Korea; it was from energy consumption to GDP in Turkey, France, Germany and Japan. They concluded that energy storage at 4 latter countries may hurt their economic growth.Menegaki (2011) used method of vector error correction to investigate the causal relationship between energy consumption and GDP for 27 European countries. This study did not confirm Granger causality from renewable energy consumption to economic growth in the short-term or the long-term. Results of Menegaki (2011) reveal the insignificant consumption of renewable energies in gross domestic product.

Sherzehai and Vahidi (2006) studied causality relationship among variables of energy consumption, prices and GDP of some OPEC countries (Indonesia, Iran, Kuwait, Saudi Arabia and Venezuela) during 1965 to 1995.This research investigates the cointegration relationship (long-term relationship) between the above variables based on Johansen Cointegration tests for these countries. Then, it determines Granger causality between variables, endogeneity or exogeneity of variables using vector error correction and examines relative intensity according to variance analysis and causality-based methods.

METHODOLOGY

Although regression analysis can be used to investigate the dependence of one variable to another variable, it can not imply causality.

Statistical tests

All econometric analyses need statistical tests. Statistical tests before the estimates are as follows:

Stationarity Tests

The simplest method for determining the stationarity of a variable is to look at the variable's graph. As this method is not sufficiently accurate, time series variables'stationarity should be tested. Unit root test is one of the most common tests used to detect the stationarity of time series process. For more details, look at the following vector first order process:

$\varphi y_{t-1} + \varepsilon t y t$

If the amount of φ coefficient is estimated one using Ordinary Least Squares (OLS), one can examine the stationary and non-stationary status of a time series process. So that if $|\phi| \geq 1$, then **Y**is a non-stationary time series and its variance is increased over time and tends to infinity.If $|\phi| < 1$, then **Y** is a stationary time series (or difference stationary). Therefore, the time series' stationary (difference stationary) status can be evaluated through testing the amount of $|\phi| < 1$. The overall test is the null hypothesis H_0: $\varphi = 1$against the hypothesis H_1: $\phi < 1$.

Cointegration test

It was mentioned that if one makes a difference **d** times to achieve stationary status for a time series, the time series have **d** unit root. Now if we have two-time series $x_t$andy_t that both are$I(d)$, normally, any linear combination of $x_t$andy_t is also $I(d)$. Never the less, if there are constant coefficients such as α and β that cause disruption of regression related to $x_t$andy_t, or $xt - \beta ut = yt - \alpha$

To be less than **d**, for example $I(d - b)$ with the assumption $(b > 0)$, according to Engle and Granger (1987), $x_t$andy_t are co integration of order (d, b). Therefore, two-time series of $x_t$andy_t are called Cointegration of order **b**and **d**, or $CI(d, b)$, if both cointegration ranks equal to $I(d)$ where **(b> 0)**. According to the above definition, if both $x_t$andy_t of a mass order are similar to $I(1)$and$I(0)ut$, then the two-time series will be cointegration of orderCI (1,1); this definition also applies to more than two-time series (Engle & Granger, 1987). If the error related to regression equation, or**,** is stationary, econometric techniques can be used to estimate the parameters through time series data and to indicate t and F statistics. Co-integration test of Engle and Granger (1987) is used in this paper.

Causality

Now we consider the casein which two variables x_t and y_t are affecting each other as distributed interrupts. The question is whether changes in x_t cause changes in, x_t, $(y_t \rightarrow x_t)$.Or on the contrary, changes in x_t cause changes in, y_t, $(x_t \rightarrow y_t)$,or there is a feed back between both of them. It means that it aims to uncover causation (causal relationship) between two variables when there is a transposition relationship between two variables.

Hsiao's Causality

Hsiao's Causality test is in fact the modified or amended version of Granger causality test. Granger causality test is valid when time series variables are not cointegrated. However, it should be noted that Granger causality test is very sensitive to the choice of the optimal lag length. If the chosen lag length is less than optimal lag length (actual) is conducting the test, results will be biased (Hsiao, 1981).Tore solve this problem, Hsiao (1981) has presented an auto regresivesy stematic method to select the optimal lag length. This is actually a combination of two methods: Granger Causality and the Akaike's final prediction error (AFPE) that is called mean square prediction error (MSPE).

Given that the present study uses the new approach of causality test (Hsiao's) to determine causal relationships between economic growth and consumption of energy carriers, Hsiao's causality tests is described below.

Many studies like Thornton & Batten (1985) and DBK & Gum (1991) point to strong and valid results for selecting the optimal lag length using modified Granger's causality (Hsiao's) during the 80's.

Modified Granger's causality (Hsiao's) method has two stages. First, the models of auto regressive dependent variable are estimated, so that the dependent variable is regressed on the same variable with a lag. Then, the regression is fitted using two lags of the dependent variable, and continues. In fact, at this stage, M-regression is estimated as follows:

$$(1-L)y_t = \alpha_\circ + \sum_{i=1}^{m} \alpha_i (1-L)y_{t-i} + U_{1t}$$

Where is from 1 to m and represent the lag length. Selecting length of the lag depends on the sample sizeas well as the variable's economic structure. In order to determine optimal m, It is helpful to consider a great number for length lag, then, FPE value for each of the regressors are calculated after each estimate proportional to (m = 1,2, ..., m) m as follows:

$$FPE(m) = \frac{T+m+1}{T-m-1} \frac{SSE(m)}{T}$$

So where, T is the number of samples and FPE and SSE are respectively the final prediction error and the sum of squared error.

Optimal value of m (m*) is the lag length created by FPE. Thus, m* should be determined. Then, the proper regression should be estimated according to the chosen m*; in this manner, the repeated lag (n) for the new variable will be carried out. In other words, the process of selecting optimal lag length for the variable will be repeated the same as first time. Therefore, repetitive regressions are as follows:

$$(1-L)y_t = \alpha_\circ + \sum_{i=1}^{m^*} \alpha_i (1-L)y_{t-i} + \sum_{j=1}^{N} (1-L)X_{t-j} + U_{2t}$$

So that j varies from 1 to n and represents the lag length for the variable Yt. Therefore, then optimal lag length (n*) is where the below PFE is minimized:

$$FPE(m^*, n) = \frac{T+m^*+n+1}{T-m^*-n-1} \frac{SSE(m^*, n)}{T}$$

So that m* is the optimal lag length for the variable Xt and n is lag length for the variable Yt. T is the number of samples. As it was explained, so that the numerical value of Equation (9) is minimized, then optimal lag length (n*) will be determined.

Now, if

$$FPE(m^*) > FPE(m^*, n^*) \Rightarrow X_t \text{ is the cause of } Y_t$$

$$FPE(m^*) < FPE(m^*, n^*) \Rightarrow X_t \text{ is not the cause of } Y_t$$

It should be noted that in this test, no matter which variable is to be used as the dependent variable.

ModelVariables

It is necessary to introduce applied variables before reviewing a model for the economy of Iran. In this study, 13 variables have been usedas follows:

Lagri: Logarithm of agriculture value added to constant prices in 1369 (billions of dollars).

Lind: Logarithm of industry value added to constant prices in 1369 (billions of dollars).

Ltran: Logarithm of transportation value added to constant prices in 1369 (billions of dollars).
Lserv: Logarithm of value added of service sector to constant prices in 1369 (billions of dollars).
Lcso: Logarithm of oil products consumption in service sector (million barrels of crude oil equivalent).
Lcio: Logarithm of oil products consumption in industry (million barrels of crude oil equivalent).
Lcao: Logarithm of oil products consumption in agriculture (million barrels of crude oil equivalent).
Lcto: Logarithm of oil products consumption in transportation (million barrels of crude oil equivalent).
Lcsg: Logarithm of consumption of natural gas in service sector (million barrels of crude oil equivalent).
Lcig: Logarithm of consumption of natural gas in industry (million barrels of crude oil equivalent).
Lcse: Logarithm of electricity consumption in service sector (million barrels of crude oil equivalent).
Lcie: Logarithm of electricity consumption in industry (million barrels of crude oil equivalent).
Lcae: Logarithm of electricity consumption in agriculture (million barrels of crude oil equivalent).

The Results ofEconometricAnalysis

Econometric analysis results are displayed in this section.

Results of Cointegration and Stationarity Tests

The following table summarizes the results of generalized Dickey-Fuller test.

As observed, all variables are I (1) or cointegration of unit degree. In order to pass the non-stationary of time series in our model, one can use the first difference of data instead of the data because all variables become stationary after first difference making.

Another method at the data level that has not the bugs of previous method is cointegration method. It was introduced at first by Engle and Granger in 1987 and completed by Johansen and Juselius in 1990.
Now, the cointegration between variables is studied by using Engle and Granger's two-step model. In this regard, the following equations are estimated:

1. $Lagri = \alpha_{\circ} + \beta_{\circ} Lcao + U_{\circ}$
2. $Lagri = \alpha_1 + \beta_1 Lcae + U_1$
3. $Lind = \alpha_2 + \beta_2 Lcio + U_2$
4. $Lind = \alpha_3 + \beta_3 Lcig + U_3$
5. $Lind = \alpha_4 + \beta_4 Lcie + U_4$
6. $Ltran = \alpha_5 + \beta_5 Lcto + U_5$
7. $Lserv = \alpha_6 + \beta_6 Lcso + U_6$
8. $Lserv = \alpha_7 + \beta_7 Lcsg + U_7$
9. $Lserv = \alpha_8 + \beta_8 Lcse + U_8$
10. $Lcao = \alpha_9 + \beta_9 Lagri + U_9$
11. $Lcae = \alpha_{10} + \beta_{10} Lagri + U_{10}$
12. $Lcio = \alpha_{11} + \beta_{11} Lind + U_{11}$
13. $Lcig = \alpha_{12} + \beta_{12} Lind + U_{12}$
14. $Lcie = \alpha_{13} + \beta_{13} Lind + U_{13}$
15. $Lcto = \alpha_{14} + \beta_{14} Ltran + U_{14}$
16. $Lcso = \alpha_{15} + \beta_{15} Lserv + U_{15}$
17. $Lcsg = \alpha_{16} + \beta_{16} Lserv + U_{16}$
18. $Lcse = \alpha_{17} + \beta_{17} Lserv + U_{17}$

Since all the variables in the above equations are I (1), or cointegration of unit degree; if the residual statements of these cointegrated equations are zero degree, the above equations are also cointegrated. According to table 2, none of the above equations has rejected the non-cointegration assumption, thus, there is no long-run relationship between these variables at al and these variables are not cointegrated*. Inconclusion, the results of the Hsiao's causality using analysis of time series data are reliable.

The Results of Hsiao's test

Hsiao's method, which is in fact a combination of Granger's causality test and condition of Akaike final prediction error (FPE), minimizes the mean of total prediction error and eliminates ambiguity in the choice of significance level of lags; then it uncovers the direction of causality between variables after some processes.The results are summarized in Table3.

CONCLUSION

Tables presented in this paper have expressed the results of estimation n mathematics and econometrics. In this section, a simple statement of results will be discussed.

1) While increase in the consumption of oil products influence on value added in agriculture, one could say that value added also influence on the consumption of oil products. It means the causality is bi directional.
2) It is not true about electricity consumption in agriculture. Only value added of agriculture influence on electricity consumption. It means the causality is one-sided.
3) The results obtained from industry indicate the same direction as agriculture between value added and oil products consumption in industry and electricity consumption in industry.
4) Causality between industrial value added and gas consumption in the industrial sector is two-sided.
5) Value added in transportation influences on the consumption of oil products in service sectors and the opposite direction of this relation is true, too.
6) In service sector, in spite of two-sided causality between value added of service sector and electricity consumption in service sector, it is not true about the relationship between value added of service sector and gas consumption in service sector. The consumption of natural gas in service sector is the cause of value added in this field and there is no inverse relationship.
7) In summary, Hsiao proves that all of the possible relationships mentioned above are positive relationships. It means all explained relations in the previous six items are positive.

REFERENCES

1. Cheng, B. S., & Lai, T. W. (1997).An investigation of co-integration and causality between energy consumption and economic activity in Taiwan.Energy Economics, 19(4), 435-444.
2. Soytas, U., & Sari, R. (2003). Energy consumption and GDP: causality relationship in G-7 countries and emerging markets. Energy economics, 25(1), 33-37.
3. Menegaki, A. N. (2011). Growth and renewable energy in Europe: A random effect model with evidence for neutrality hypothesis. Energy Economics, 33(2), 257-263.
4. Sherzehai Q. &Vahidi M. (2006).The relationship between energy consumption and true income and general level of pricesinOPEC countries.ThirdNational Conference onEnergy.
5. Hsiao, C. (1981). Autoregressive modelling and money-income causality detection.Journal of Monetary economics, 7(1), 85-106.
6. Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 251-276.
7. Granger, C. W., &Newbold, P. (1974).Spurious regressions in econometrics.Journal of econometrics, 2(2), 111-120.
8. Johansen, S., &Juselius, K. (1990).Maximum likelihood estimation and inference on cointegration—with applications to the demand for money.Oxford Bulletin of Economics and statistics, 52(2), 169-210.
9. Thornton, D. L., & Batten, D. S. (1985).Lag-length selection and tests of Granger causality between money and income.Journal of Money, credit and Banking, 164-178.

10. DBK, H., & Gum, B. (1991). The Causal Relationship between Energy and GNP: The Case of Taiwan Province of China. Journal of Energy and Development, 16, 219-226.

Table 1: The Results of stationarity test

Variable	Stationarity level			Stationarity after once difference making		
	Lag	ADF	Result	Lag	ADF	Result
Lserv	1	-2.21	Non-stationary	3	-3.47	Stationary
Lcso	4	-2.78	Non-stationary	2	-4.46	Stationary
Lcsg	4	-1.94	Non-stationary	4	-2.72	Stationary
Lcse	2	0.85	Non-stationary	0	-5.96	Stationary
Lcto	0	-2.85	Non-stationary	2	-3.72	Stationary
Ltran	3	0.98	Non-stationary	2	-3.20	Stationary
Lcie	2	-1.99	Non-stationary	0	-2.97	Stationary
Lcig	2	0.91	Non-stationary	1	-4.05	Stationary
Lcio	4	-2.62	Non-stationary	0	-4.68	Stationary
Lind	0	-3.05	Non-stationary	1	-3.34	Stationary
Lcae	3	0.39	Non-stationary	1	-6.43	Stationary
Lcao	4	-0.27	Non-stationary	4	-4.65	Stationary
Lagri	0	-2.32	Non-stationary	1	-4.28	Stationary

Table 2: Results of cointegration test

Residuals	Lag	ADF values	MacKin non critical values			Result
			%10	%5	%1	
U_0	2	-3.78	-3.23	-3.59	-4.34	No cointegration
U_1	2	-3.69	-3.23	-3.59	-4.34	No cointegration
U_2	2	-2.47	-2.63	-2.97	-3.69	No cointegration
U_3	2	-3.12	-2.63	-2.97	-3.69	No cointegration
U_4	2	-3.93	-3.23	-3.59	-4.34	No cointegration
U_5	2	-3.11	-2.63	-2.97	-3.69	No cointegration
U_6	3	-2.95	-2.62	-2.97	-3.68	No cointegration
U_7	3	-2.51	-2.63	-2.97	-3.68	No cointegration
U_8	3	-2.53	-3.22	-3.57	-4.20	No cointegration
U_9	1	-2.96	-2.62	-2.97	-3.68	No cointegration
U_{10}	2	-2.12	-1.62	-1.95	-2.65	No cointegration
U_{11}	1	-4.11	-3.22	-3.58	-4.32	No cointegration
U_{12}	2	-2.96	-2.63	-2.97	-3.69	No cointegration
U_{13}	4	-2-62	-2.62	-2.97	-3.67	No cointegration
U_{14}	1	-3.61	-3.22	-3.57	-4.31	No cointegration
U_{15}	2	-1.221	-2.62	-2.97	-3.69	No cointegration
U_{16}	2	-1.41	-3.23	-3.59	-4.34	No cointegration
U_{17}	1	-2.16	-1.62	-1.95	-2.64	No cointegration

Table 3 : Results of Hsiao's test

	FPE(m*) FPE(m*,n*)	Result
Lagri	$0.10302 \times 10^{-2} > 0.23097 \times 10^{-3}$ (13) (2)	Increase inconsumption of oil productsin agriculture causes the growth in value added in this field.
Lcao	$0.21771 \times 10^{-2} > 0.68667 \times 10^{-4}$ (12) (4)	Increase in value added in agriculture causes the growth in consumption ofoil products in this field.
Lagri	$0.10302 \times 10^{-2} > 0.13739 \times 10^{-3}$ (13) (2)	Increase inelectricity consumption in agriculture causes the growth invalue addedin this field.
Lcae	$0.65735 \times 10^{-2} > 0.37534 \times 10^{-2}$ (13) (2)	Increase invalue addedin agriculture causes the growth in electricity consumption in this field.
Lind	$0.36229 \times 10^{-3} > 0.23757 \times 10^{-4}$ (13) (2)	Increase in gas consumption in industry causes the growth in value addedin this field.
Lcig	$0.48308 \times 10^{-1} > 0.47471 \times 10^{-2}$ (13) (2)	Increase in value added in industry causes the growth in gas consumption in this field.
Lind	$0.36229 \times 10^{-3} > 0.11188 \times 10^{-3}$ (13) (2)	Increase in consumption of oil productsin industry causes the growth in value addedin this field.
Lcio	$0.90305 \times 10^{-2} > 0.37796 \times 10^{-4}$ (6) (11)	Increase in value added in industry causes the growth in consumption of oil productsin this field.
Lserv	$0.95523 \times 10^{-4} > 0.25992 \times 10^{-4}$ (13) (2)	Increase in electricity consumption in service sector causes the growth invalue addedin this field.
Lcse	$0.18997 \times 10^{-3} > 0.62730 \times 10^{-6}$ (13) (2)	Increase invalue addedin service sector causes the growth in electricity consumption in this field.
Lind	$0.36229 \times 10^{-3} > 0.36979 \times 10^{-3}$ (13) (1)	Increase in electricity consumption in industry causes the growth invalue added in this field.
Lcie	$0.50223 \times 10^{-2} > 0.48093 \times 10^{-5}$ (2) (13)	Increase in value added in industry causes the growth in electricity consumption in this field.
Ltran	$0.15294 \times 10^{-2} > 0.24793 \times 10^{-4}$ (13) (2)	Increase inconsumption of oil productsin transportation causes the growth in value added in this field.
Lcto	$0.65010 \times 10^{-3} > 0.31920 \times 10^{-3}$ (13) (2)	Increase in value added in transportation causes the growth in consumption of oil products in this field.
Lserv	$0.95523 \times 10^{-4} > 0.56352 \times 10^{-4}$ (13) (2)	Increase inconsumption of oil productsin service sector causes the growth in value added in this field.
Lcso	$0.23566 \times 10^{-2} > 0.77948 \times 10^{-5}$ (13) (2)	Increase in value added in service sector causes the growth in consumption of oil productsin this field.

*Note : Test results were confirmed using Johansen-Juselius test. In this part,the amount of optimallag for VAR system is selected by Akaike and Schwartz'systematic criteria; this lag is used in the determination of cointegration vectors. In this model, second lag amount will minimize Akaike and Schwartz'systematic criteria, therefore, it is selected as optimal lag.

Indian Journal Of Natural Sciences *www.tnsroindia.org. © IJONS*

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

A New Approach for Unit Commitment Problem Considering Wind Generation

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Received: 22 Nov 2014 Revised: 21 Dec 2014 Accepted: 6 Jan 2015

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ABSTRACT

A new approach for Unit Commitment (UC) problem which also considers wind generations is proposed in this paper. This algorithm is called Cuckoo Search Algorithm and has been used for solving optimized generation planning. Test results show that this algorithm not only properly includes all constraints of the problem, but also has some benefits such as very good convergence in its response, high speed calculation and high accuracy. A 10-unit test power system has been applied in this work to evaluate the new proposed algorithm. Optimized generation planning of system's plants will also be included in the test results, which according to the satisfied constraints of the objective function will be inferable. Numerical results will show that performance of cuckoo genetic algorithm is superior in respect to the algorithms and at least, results in reduction of generation cost.

Keywords: Cuckoo Optimization Algorithm, Unit Commitment, Optimized Generation Planning, System Constraints and Limits.

INTRODUCTION

Economic planning of units aims to achieve an optimal combination of grid-connected units in order to supply network demand. Economic dispatch will be divided into two sub-problems: i) Unit commitment problem, and ii) online economic dispatch (optimal power flow). Unit commitment sub-problem deals with the choose of forecasted demand among the supplying units in a minimized generation cost, which also considers spinning reserve conditions during a specified time interval. Economic power flow (economic dispatch) sub-problem deals with distribution of forecasted load among the selected units in such a way that the total generation cost is minimized. If all units of a power system are committed to simultaneously contribute in supplying the demand, it will not be economical, and that is the reason an optimal combination of units should be chosen for supplying the demand (in a specified time interval). By doing so, a considerable amount of cost is reserved. Unit commitment sub-problem can be formulated in such a way that operating cost function is minimized and minimizing startup/shutdown time, minimizing power limitation constraints, generation and spinning reserve limitations and so on are satisfied [1].

An accurate solution of unit commitment problem is achievable through complete numerical methods such as integer or dynamic programming. One disadvantage of these methods is their higher calculation burden and as a result an increase in their computing time, which increase exponentially with the number of units and requires higher memory. Improvement of the above traditional methods can enhance solution accuracy in a reasonable and proper time [2]. Unit commitment pattern can also be considered for large-scale power systems and at the same time result in a reasonable computation time. Various numerical optimization techniques can be used for unit commitment problem, including Priority List [3]-[4], Integer Programming [5]-[6], Dynamic Programming [7]-[8], Mixed-Integer Programming [9], Branch-and-Bound (B & B) [10] and Lagrange coefficients method [11]-[12]. Among the above mentioned methods, Priority List method is simple and fast, but it does not ensure quality and convergence of the output solution.

Dynamic Programming solutions, which are based on Priority List, are flexible but costly in the view of time. B & B method applies linear function for presenting fuel consumption and startup costs (time dependence), but one disadvantage of this method is its exponential growth during the program run which is proportional to the system dimensions. Integer and Mixed-Integer Programming methods have followed linear programming techniques to find a correct solution.These methods are applied for small-scale unit commitment and need more assumptions, which limit the solution space. Lagrange coefficients method will be fast in finding a solution but it may face some difficulties in solution convergence. Besides the aforementioned methods, there are other numerical techniques that can be efficient in solving unit commitment problem.

Some of these methods include: Artificial Neural Networks (ANNs) [13]-[14], Simulated-Annealing (SA) [15] and Genetic Algorithm (GA). These methods can adopt themselves to complicated system constraints and it is claimed that they propose a solution with better quality [16,17,18]. SA is a powerful method based on estimated optimization techniques, which theoretically will have an acceptable convergence (convergence probability coefficient is 1). One of disadvantage of SA is great CPU time in finding the optimal point.[19,20] GA methods are estimating techniques based on natural selection and natural genetics, and work based on parallel search. [21,22,23,24]

In unit commitment with wind energy, traditional steam plants must be quickly committed, in order to consider output wind energy and load variations. In this paper, by using a new optimization method called Cuckoo algorithm, we will deal with solving of entrance and exit of plant units.

Objective Function

It has been assumed in this paper that planning time interval is 24 hours and is divided into 24 one-hour time intervals. Total cost 92is equal to current (fuel) costs and startup costs of all units in all planning time intervals. According to this point, objective function of unit commitment problem is defined as follows:

$$MinF(U_{it},P_{it})=\sum_{t=1}^{24}\sum_{i=1}^{G}[U_{it}F_{it}(P_{it})+U_{it}(1-U_{it-1})S_i] \quad (1)$$

In general, current costs (fuel costs) function which is given in perunit at every time interval is a function of output power of plant units and is as follow:

$$F_i(P_{it})=a_iP_{it}^{\ 2}+b_iP_{it}+c_i \quad (2)$$

Unit startup cost is dependent on shutdown time before the startup. This time-dependence startup cost can be formulated as:

$$S_i=S_{0i}+S_{1i}(1-e^{-T/\tau_i}) \quad (3)$$

System Constraints

A lot of constraint can be applied in UC problem. Every network and power system can apply different conditions and constraints in planning of units. These constraints depend on array of generators, load curve characteristics and so on. Spinning reserve is also defined as total generation power of all generators minus available load in the system and exigent loss of the system. Spinning reserve must be supplied in such a way that loss on one or more units provides security of system frequency. It must be capable of compensating losses during a very high load of units (in a specified time interval). Spinning reserve requirements is presented as a function of probability of inadequate generation for supplying consumers demand.

Power balance constraint

$$\sum_{i=1}^{G}U_{it}P_{it}=P_{Dt},t=1,2,3,... \quad (4)$$

P_{it} is given from power flow calculations in t time interval which is coincident with increased rate of equal loss (λ):

$$\frac{dF_{1t}}{dP_{1t}}=\frac{dF_{2t}}{dP_{2t}}=...=\frac{dF_{it}}{dP_{it}}=\lambda \quad (5)$$

$$t=1,2,...,24,i=1,2,...,G$$

Spinning reserve

If it is required for spinning reserve to be more than 7% of the total load in each time interval, then:

$$\sum_{i=1}^{G}U_{it}P_{i\max}\geq 1.07P_{Dt},t=1,2,3,...24 \quad (6)$$

Limitation of output power of plant units

$$P_{i\min} \le P_i \le P_{i\max} \qquad t = 1,2,...,24, i = 1,2,...,G \tag{7}$$

Limitation of startup and shutdown time

$$\sum_{t=1}^{24} \left| U_{it} - U_{it-1} \right| \le M_i \tag{8}$$

Constraints of startup and shutdown minimum time

$$TO_i \ge \underline{TO_i} \tag{9}$$

$$TS_i \ge \underline{TS_i} \tag{10}$$

Wind power penetration

When the uncertainty is ignored, wind power output can be integrated into electricity load.

$$\mathbf{P}_{Dnew} = -\mathbf{P}_W + \mathbf{P}_D \tag{11}$$

Where $\mathbf{P}_W$ is the predicted value of wind power output; $\mathbf{P}_{Dnew}$ is equivalent electricity load. Eq. (11) include wind power into load, and UC including wind power is transferred into routine UC.

An overview of Cuckoo Search Algorithm

Cuckoo Optimization algorithm (COA) flowchart is shown in the following figure. Like other evolutionary algorithms, the COA begins with an initial population which consists of Cuckoos. This population of cuckoos has eggs which lay them into the host birds' nests. Some of these eggs, which are more similar to the host bird's eggs, have more chance to grow and become the young cuckoos. Other eggs are recognized and disappeared by the host bird. The rate of grown nest eggs shows the suitability of the nests in that area. The more eggs in the environment are able to be survived and saved, the more profit (tendency) is assigned to that area. Therefore, a situation, in which the greatest numbers of eggs are saved, is the parameter which the COA intends to optimize it. (Fig. 1)

Cuckoos search for the best place for maximizing the survival of their own eggs. The communities and groups are created after the cuckoos' chicks get out from the eggs and change into the adult cuckoos. Each group has its own habitat. The best habitat for all groups will be the cuckoos' next destination in other groups. All groups migrate to the best existing region. Each group resides in an area close to the current position. Several egg laying radii will be calculated and created by considering the number of egg, which each cuckoo will lay, in addition to the distance of cuckoos from the current optimal area for habitat.

Then, the cuckoos start laying the eggs in the nests within their own egg laying radius. This process continues until reaching the best place for laying the egg (The region with the highest income). This optimal location is where the greatest numbers of cuckoos are gathered.

Building the cuckoos' primary habitat (initial population of candidate solutions): For solving an optimal issue, it is necessary to form the variables of issue in the array form. These arrays are determined with the names "chromosome" and "particle position" in the GA and PSO, but this array is called the "habitat" in Cuckoo Optimization Algorithm (COA). In an optimization problem, the next N_{var} of a habitat will be a $1xN_{var}$ array which shows the current position of cuckoos. This array is defined as follows:

Habitat = [x1, x2, ..., x_{Nvar}]

The suitability amount (or benefit rate) in current habitat is calculated by evaluating the profit function (f_p) in habitat. Thus:

Profit = f_p (habitat) = f_p (x1, x2,..., x_{Nvar})

As it can be seen, the COA is an algorithm which maximizes the profit function. For applying the COA in minimization problems, we should just multiply a negative sign by the cost function.

A habitat matrix with the size N_{pop}*N_{var} is built in order o start an optimization algorithm. A random numbers of eggs are assigned for each of these habitats. In the nature, each cuckoo lays 5 to 20 eggs. These numbers are used as the higher and lower limit for assignment of egg to each cuckoo in different iterations. Each cuckoo's another habit is that they are lay their eggs in a specific domain.

Hereinafter, the maximum egg-laying domain is called the Egg Laying Radius (ELR).

In an optimization problem, the higher limit of variable is shown by var_{hi} and the lowest limit is shown by var_{low}. Each cuckoo has ELR which is proportional to the total number of eggs, number of current eggs as well as the higher and lower limits of issue variables.

Therefore, ELR Is defined as follows:

$$ELR = \alpha \times \frac{Number\ of\ current\ cuckoo's\ eggs}{Total\ number\ of\ eggs} \times (\mathrm{var}_{hi} - \mathrm{var}_{low})$$

Alpha is the variable by which we adjust the maximum value of ELR.

Cuckoos' method for laying the eggs

Each cuckoo lays randomly the eggs in the host birds' nests which are in the ELR. (Fig 2)When all cuckoos lay their eggs, some of the eggs, which are less similar to the host bird's eggs, are identified and thrown out of the nest. Thus, after each egg-laying, p% of all eggs (usually 10%), which their profit function is lower, are eliminated. Remaining chicks feed and grow in the host nests.

Another interesting point about the cuckoo chicks is that only an egg can grow in each nest because when the cuckoo chicks get out of the eggs, they throw out the host bird's eggs from the nests and if the host chicks get out of the eggs sooner, the cuckoo chick eats the largest amount of food which the host bird brings (the chick pushes the others over with its 3 times larger body) and after a few days the host bird's chicks will die of starvation and only the cuckoo's chick survives.

Cuckoos' Immigration

When the cuckoos' chicks are grown up and become young, they live in their own groups and environments, but when the time of laying the eggs becomes close, they will migrate to better habitats where the chance of eggs' survival is higher. After forming the cuckoo groups in different geographical areas (searching space of issue) the group with the best position is selected for other cuckoos as the target location for migration.

When the mature cuckoos live in all parts of environment, it is difficult to determine which cuckoo belongs to which group. For solving this problem, the cuckoos' grouping is performed by classification method K-means (a k from 3 to 5 is usually sufficient).When the cuckoos' groups are made, the average profit of group is calculated in order to obtain the relative optimality of group habitat. Then, the group with the highest average profit (optimality) is selected as the target group and other groups migrate to it.

During the migration to the target point, the cuckoos do not pass all the way to the target point. They just pass a part of path in which they also have the deviation. Such this movement is clearly shown in the following figure. (Fig. 3)As shown in the above figure, each cuckoo only passes λ% of the whole path towards the current ideal goal and it has also a deviation of ϕ Radian. These two parameters help the cuckoo to seek further environment. λ is a random number from 0 and 1, and ϕ is a number from $-\pi/6$ to $\pi/6$.

When all cuckoos migrated to the target location and the new residential areas of each one is determined, each cuckoo owns a large number of eggs. Given the number of each cuckoo's egg, an ELR is determined for it and then the egg-laying starts.

Eliminating the cuckoos in inappropriate areas

Given this fact that there is always a balance for the population of birds in the nature, the number like N_{max} controls and limits the maximum number of cuckoos who can live in an environment. This balance is established due to the dietary restrictions, hunted by the hunters and the inability to find the suitable nests for eggs.

Convergence of the algorithm

After a few iterations, the whole cuckoo population reaches an optimal point with the maximal similarity of eggs to the host birds' eggs as well as the location of largest amount of food sources. This place will have the highest overall profit and the lowest number of eggs will be destroyed there. The convergence more than 95% for all cuckoos towards a point causes that the Cuckoo Optimization Algorithm (COA) to be ended.[25]

Problem Solving Procedure with Cuckoo Algorithm

Part 1: Unit Commitment and its related constraints

Unit commitment problem is determination of generators to be on/off for a specified time interval (24 hours here) in such a way that utility cost of system generators is minimized. Available constraints of this problem include:Turn on/off minimum time: a generator should not be turned off for a specified time after it turned on, and it also should not be turned on for a specified time after it turned off. These constraints are considered as T_{on} and T_{off} for generators, respectively.

Another constraint of the system is spinning capacity in order to allow the remaining generator to supply demand when one generator outages. This constraint is modeled as spinning reserve and expresses that the total maximum capacity of on units must be greater than present load plus an extra capacity. Other aspects which should be considered in this problem include:Extra capacity available in the system should not be more than a specified amount, and in the case of extra capacity and possibility of turning the generator off, these extra capacities must be removed.

Programming procedure

First, an initial population is generated which include five suggestions for random turning generators on/off. This initial population is presented by PO_{INI}.

When an initial population is generated in units, following constraints should be corrected: Units must be on for duration of minimum on time, and be off for duration of minimum off time (mdt). Hence, numbers have been corrected in such a way that these constraints are satisfied.As by performing above correction total on/off hours must be greater than 24 hours, it is done in a way that this duration reaches to 24 hours with respect to the aforementioned constraint. After that, these integer numbers are turned into binary one for each hour in such a way that 1 and 0 represent on and off statues, respectively.

Then, according to spinning reserve constraint, in hours when units do not supply the spinning reserve, units turn on in respect to their priority. As by doing this step it might be occur some extra capacity in the system, with considering the related constraint of minimum turn on/off, supernumerary units are turned off if possible.Next, an economic dispatch is performed from initial population in order to determine populations with minimum cost.

Note: Initial population has been considered as 6 populations and 6th direction is a suggestion for the hypothetical optimum point.After generating initial population, we enter to Cuckoo algorithm. In this part, cellular array of CUCKOO POP is used to product population of number of eggs and situation and place of each egg.

In this case, first a number of 2 to 4 eggs are generated for each population which is presented by cellular array of Cuckoo Pop .Number of Eggs. Next, according to the number of eggs generated for this initial population, egg's drop radius is calculated and laying is done (i.e. for each population by addition of random numbers, a new population (egg) is generated). After that, the same constraints observed for the initial population are also observed for the new populations. By performing this step, eggs and populations are constructed. Populations are turned into binary numbers. Cost of population and eggs are calculated through performing Lambda iteration load flow dispatch.Given that warm and cold startup costs must be considered, these costs are also added to operating cost.

Then, as a maximum of 10 populations can remain in each iteration, populations are ranked according to their costs and units with great costs are removed. Afterward, populations are grouped (k-means clustering) and populations with minimum costs are selected. Next, a population with minimum cost is selected as goal point, and random populations are generated based on this population. After that, related information of powers and constraints are also performed on this population and it is transferred to the next step. Then, random populations are generated according to this population and optimization continues until the maximum number of iterations is reached.

Simulation results

In this paper, MATLAB software is used for simulation. A system of 10 generating units (24) has been chosen to verify accuracy of the abovementioned results and the results are compared with those of other algorithms. Figure 4 show the Prediction of wind power output and load in 24 h. [26] Table 1 illustrate the Ten Unit Power System Parameter [26]. Comparison of solution Results without considering wind power is shown in Table 2. Results of Table 2 accurately present the verification of this algorithm with respect to the others. Tables 3 illustrate the solution of 10 thermal generation units without a wind farm uses the COA method. The solution of 10 thermal generation units with a wind farm uses the proposed method is shown in Table 4. Comparison of solution result by cuckoo optimization algorithm is shown in Table 5. UC 0-1 scheduling results of units without & with wind power are shown in Table 6&7 respectively.

CONCLUSION

In this paper, Cuckoo Optimization Algorithm (COA) has been used to solve UC problem considering wind power generation. Calculated final cost for planning in a time horizon of this algorithm is considerably lower than that of other algorithms. The proposed algorithm easily coincides with the constraints, has a very acceptable solution convergence and benefits from a high accuracy.

REFERENCES

1. F. Wood and B. F. Wollenberg, Power generation operation and control. 2nd ed. New York: Wiley; 1966.
2. Ran Quan, Jinbao Jian, Linfeng Yang, "An improved priority list and neighborhood search method for unit commitment," International Journal of Electrical Power & Energy Systems, Volume 67, Pages 278-285, May 2015.
3. G. B. Sheble, "Solution of the unit commitment problem by the method of unit periods," IEEE Trans. Power Syst., Vol. 5, No. 1, pp. 257–260,Feb. 1990.
4. Mohammad Reza Norouzi, Abdollah Ahmadi, Ali Esmaeel Nezhad, Amir Ghaedi, "Mixed integer programming of multi-objective security-constrained hydro/thermal unit commitment," Renewable and Sustainable Energy Reviews, Volume 29, Pages 911-923, January 2014.
5. J. Alemany, F. Magnago, D. Moitre, H. Pinto, "Symmetry issues in mixed integer programming based Unit Commitment" International Journal of Electrical Power & Energy Systems, Volume 54, Pages 86-90, January 2014.
6. Aiying Rong, Henri Hakonen, Risto Lahdelma, "A dynamic regrouping based sequential dynamic programming algorithm for unit commitment of combined heat and power" Energy Conversion and Management, Volume 50, Issue 4, April 2009, Pages 1108-1115.
7. S. Senthil Kumar, V. Palanisamy, "A dynamic programming based fast computation Hopfield neural network for unit commitment and economic dispatch" Electric Power Systems Research, Volume 77, Issue 8, June 2007, Pages 917-925.
8. J. Alemany, F. Magnago, D. Moitre, H. Pinto, "Symmetry issues in mixed integer programming based Unit Commitment" International Journal of Electrical Power & Energy Systems, Volume 54, January 2014, Pages 86-90.
9. Chakroun, N. Melab, "Towards a heterogeneous and adaptive parallel Branch-and-Bound algorithm" Journal of Computer and System Sciences, Volume 81, Issue 1, February 2015, Pages 72-84.
10. Merlin and P. Sandrin, "A new method for unit commitment at Electricite de France," IEEE Trans. Power App. Syst., vol. PAS-102, pp.1218–1255, May 1983.
11. Xiang Yu, Xueqing Zhang, "Unit commitment using Lagrangian relaxation and particle swarm optimization" International Journal of Electrical Power & Energy Systems, Volume 61, October 2014, Pages 510-522.
12. Xiaohui Yuan, Hao Tian, Shuangquan Zhang, Bin Ji, Yanhong Hou, "Second-order cone programming for solving unit commitment strategy of thermal generators" ◎ Energy Conversion and Management, Volume 76, December 2013, Pages 20-25.
13. Musoke H. Sendaula, Saroj K. Biswas, Ahmed Eltom, Cliff Parten, Wilson Kazibwe," Simultaneous solution of unit commitment and dispatch problems using artificial neural networks" International Journal of Electrical Power & Energy Systems, Volume 15, Issue 3, June 1993, Pages 193-199.
14. Bohumír Garlík, Miloš Křivan, "Renewable energy unit commitment, with different acceptance of balanced power, solved by simulated annealing" Energy and Buildings, Volume 67, December 2013, Pages 392-402.
15. Grzegorz Dudek, "Genetic algorithm with binary representation of generating unit start-up and shut-down times for the unit commitment" Expert Systems with Applications, Volume 40, Issue 15, 1 November 2013, Pages 6080-6086.

16. Dilip Datta, "Unit commitment problem with ramp rate constraint using a binary-real-coded genetic algorithm" Applied Soft Computing, Volume 13, Issue 9, September 2013, Pages 3873-3883.
17. Goldberg, D. E.; Korb,B.; and Deb, K. 1989. Messy genetic algorithms: Motivation, analysis, and first result. Technical report, University of Alabama.
18. Antonio Frangioni, Claudio Gentile, Fabrizio Lacalandra, "Solving unit commitment problems with general ramp constraints" International Journal of Electrical Power & Energy Systems, Volume 30, Issue 5, June 2008, Pages 316-326
19. S. Senthil Kumar, V. Palanisamy, "A dynamic programming based fast computation Hopfield neural network for unit commitment and economic dispatch" ◎ Electric Power Systems Research, Volume 77, Issue 8, June 2007, Pages 917-925.
20. Christober Asir Rajan, M.R. Mohan, "An evolutionary programming based simulated annealing method for solving the unit commitment problem" International Journal of Electrical Power & Energy Systems, Volume 29, Issue 7, September 2007, Pages 540-550.
21. K. Vaisakh, L.R. Srinivas, "Evolving ant colony optimization based unit commitment," ◎ Applied Soft Computing, Volume 11, Issue 2, March 2011, Pages 2863-2870.
22. Xiaohui Yuan, Hao Nie, Anjun Su, Liang Wang, Yanbin Yuan, "An improved binary particle swarm optimization for unit commitment problem" Expert Systems with Applications, Volume 36, Issue 4, May 2009, Pages 8049-8055.
23. Thillainathan Logenthiran, Wai Lok Woo, Van Tung Phan, "Lagrangian relaxation hybrid with evolutionary algorithm for short-term generation scheduling," International Journal of Electrical Power & Energy Systems, Volume 64, January 2015.
24. H. Cai and Y. Y. Cai, "Optimization of unit commitment by genetic algorithm," Power System Technology, Vol.21, pp. 44–47, January 1997.
25. R. Rajabioun, "Cuckoo Optimization Algorithm", Applied Soft Computing Journal, Vol. 11, pp. 5508–5518, 2011.
26. Z. Ming et al. "Study on Unit Commitment problem considering wind power and pumped hydro energy storage", Electrical Power and Energy Systems, Vol. 63, pp. 91-96, 2014.

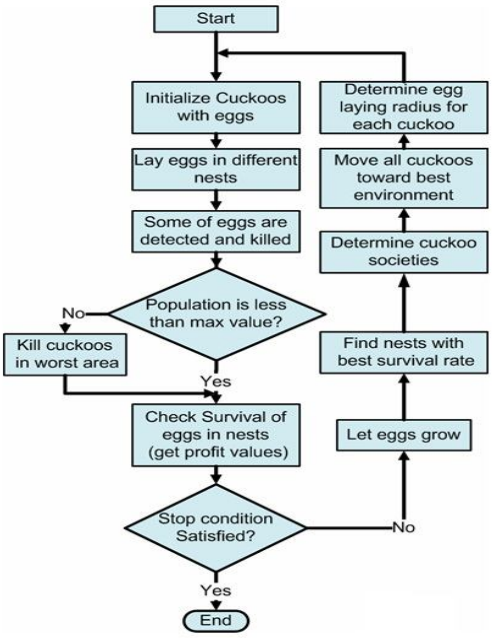

Fig. 1

Figure 1: Diagram of Cuckoo Optimization Algorithm

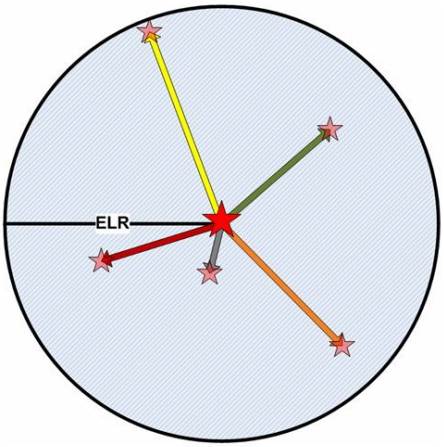

Fig. 2

Figure 2: Showing The ELR

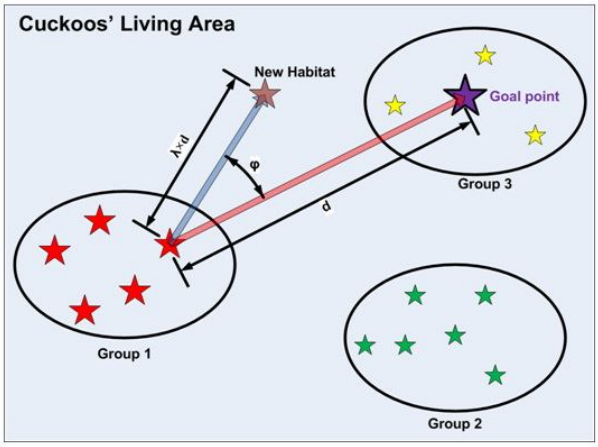

Fig. 3

Figure 3: Cuckoos' Living Area

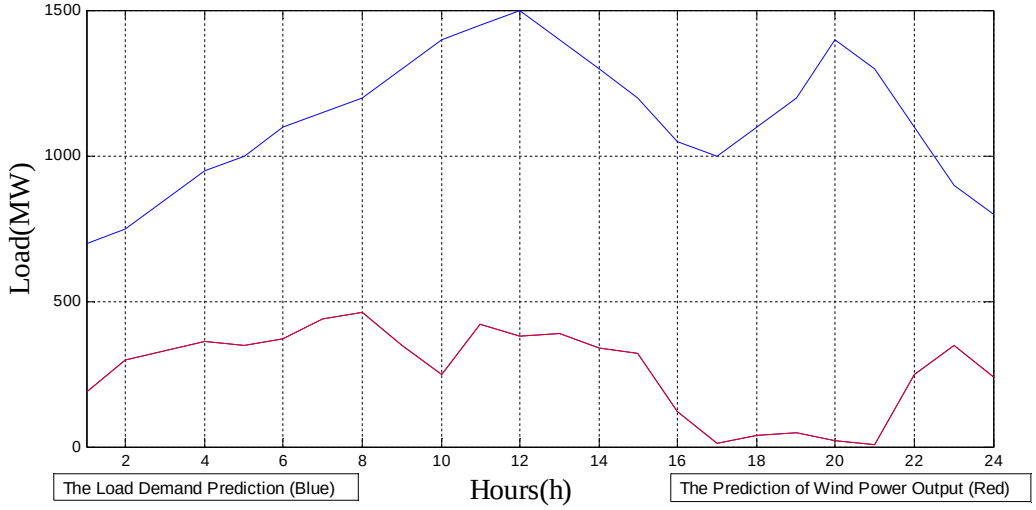

Fig. 4. Prediction of wind power output and load in 24 h.

Table 1. Ten Unit system Parameter

Units	$\overline{P}$ (MW)	$\underline{P}$ (MW)	P_{ramp} (MW)	T_{on} (h)	T_{off} (h)	a ($/MW^2 h)	b ($/MW^2 h)	c ($/MW^2 h)	HST ($/h)	CST ($/h)	T (h)
1	455	150	130	8	8	0.00048	16.19	1000	4500	9000	5
2	455	150	130	8	8	0.00031	17.26	970	5000	10,000	5
3	130	20	60	5	5	0.00200	16.60	700	550	1100	4
4	130	20	60	5	5	0.00211	16.50	680	560	1120	4
5	162	25	90	6	6	0.00398	19.70	450	900	1800	4
6	80	20	40	3	3	0.00712	22.26	370	170	340	2
7	85	25	40	3	3	0.00079	27.74	480	260	520	2
8	55	10	40	1	1	0.00413	25.92	660	30	60	0
9	55	10	40	1	1	0.00222	27.27	665	30	60	0
10	55	10	40	1	1	0.00173	27.79	670	30	60	0

Table 2: Comparison of Solution Results Without considering wind power

Methods	Number of units		
	Best	Worst	Average
MA	565827.0	566861.0	566453.0
BGSA	564379.4	568157.6	565953.4
BPSO	564280.1	566360.6	565504.4
B.SMP	564017.7	564401.1	564121.5
IPSO	563954.0	564579.0	564162.0
BCPSO	563947.0	565002.5	564284.7
OBGSA	563937.3	564390.0	564065.3
COA	**563200.0**	**563987.2**	**563842.5**

Table 3: Solution of 10 thermal generation units without a wind farm uses the proposed method.

Hour	Load	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
1	700	455.00	220.00	0	0	25.00	0	0	0	0	0
2	750	455.00	270.00	0	0	25.00	0	0	0	0	0
3	850	455.00	370.00	0	0	25.00	0	0	0	0	0
4	950	455.00	455.00	0	0	40.00	0	0	0	0	0
5	1000	455.00	455.00	0	0	90.00	0	0	0	0	0
6	1100	455.00	455.00	0	130.00	60.00	0	0	0	0	0
7	1150	455.00	410.00	130.00	130.00	25.00	0	0	0	0	0
8	1200	455.00	415.00	130.00	130.00	25.00	20.00	25.00	0	0	0
9	1300	455.00	455.00	130.00	130.00	85.00	20.00	25.00	0	0	0
10	1400	455.00	455.00	130.00	130.00	162.00	33.00	25.00	0	10.00	0
11	1450	455.00	455.00	130.00	130.00	162.00	80.00	25.00	0	13.00	0

12	1500	455.00	455.00	130.00	130.00	162.00	80.00	25.00	53.00	10.00	0
13	1400	455.00	455.00	130.00	130.00	162.00	33.00	25.00	10.00	0	0
14	1300	455.00	455.00	130.00	130.00	110.00	20.00	0	0	0	0
15	1200	455.00	455.00	130.00	130.00	30.00	0	0	0	0	0
16	1050	455.00	310.00	130.00	130.00	25.00	0	0	0	0	0
17	1000	455.00	260.00	130.00	130.00	25.00	0	0	0	0	0
18	1100	455.00	360.00	130.00	130.00	25.00	0	0	0	0	0
19	1200	455.00	435.00	130.00	130.00	25.00	0	25.00	0	0	0
20	1400	455.00	455.00	130.00	130.00	162.00	0	25.00	33.00	0	10.00
21	1300	455.00	455.00	130.00	130.00	105.00	0	25.00	0	0	0
22	1100	455.00	455.00	130.00	0	60.00	0	0	0	0	0
23	900	455.00	425.00	0	0	0	20.00	0	0	0	0
24	800	455.00	325.00	0	0	0	20.00	0	0	0	0

Table 4: Solution of 10 thermal generation units with a wind farm uses the proposed method.

Hour	Load	Wind Unit Power Output	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
1	700	190	360	150	0	0	0	0	0	0	0	0
2	750	300	300	150	0	0	0	0	0	0	0	0
3	850	330	370	150	0	0	0	0	0	0	0	0
4	950	360	440	150	0	0	0	0	0	0	0	0
5	1000	350	455	195	0	0	0	0	0	0	0	0
6	1100	370	455	275	0	0	0	0	0	0	0	0
7	1150	440	455	255	0	0	0	0	0	0	0	0
8	1200	460	455	285	0	0	0	0	0	0	0	0
9	1300	350	455	455	0	0	40	0	0	0	0	0
10	1400	250	455	455	130	0	85	0	25	0	0	0
11	1450	420	455	395	130	0	25	0	25	0	0	0
12	1500	380	455	455	130	0	55	0	25	0	0	0
13	1400	390	455	400	130	0	25	0	0	0	0	0
14	1300	340	455	350	130	0	25	0	0	0	0	0
15	1200	320	455	270	130	0	25	0	0	0	0	0
16	1050	120	455	320	130	0	25	0	0	0	0	0
17	1000	10	455	250	130	130	25	0	0	0	0	0
18	1100	40	455	355	130	130	25	20	25	0	0	0
19	1200	50	455	355	130	130	25	20	25	10	0	0
20	1400	20	455	455	130	130	162	23	25	0	0	10
21	1300	5	455	455	0	130	162	58	25	0	0	10
22	1100	250	455	395	0	0	0	0	0	0	0	0
23	900	350	400	150	0	0	0	0	0	0	0	0
24	800	240	410	150	0	0	0	0	0	0	0	0

Table 5. Comparison of solution result By Cuckoo Optimization Algorithm

Cost of thermal generation units without a wind farm	**563200**
Cost of thermal generation units with a wind farm	**427160**

Table 6: UC 0-1 scheduling results of units without wind power

Hour	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
1	1	1	0	0	1	0	0	0	0	0
2	1	1	0	0	1	0	0	0	0	0
3	1	1	0	0	1	0	0	0	0	0
4	1	1	0	0	1	0	0	0	0	0
5	1	1	0	0	1	0	0	0	0	0
6	1	1	0	1	1	0	0	0	0	0
7	1	1	1	1	1	0	0	0	0	0
8	1	1	1	1	1	1	1	0	0	0
9	1	1	1	1	1	1	1	0	0	0
10	1	1	1	1	1	1	1	0	1	0
11	1	1	1	1	1	1	1	0	1	0
12	1	1	1	1	1	1	1	1	1	0
13	1	1	1	1	1	1	1	1	0	0
14	1	1	1	1	1	1	0	0	0	0
15	1	1	1	1	1	0	0	0	0	0
16	1	1	1	1	1	0	0	0	0	0
17	1	1	1	1	1	0	0	0	0	0
18	1	1	1	1	1	0	0	0	0	0
19	1	1	1	1	1	0	1	0	0	0
20	1	1	1	1	1	0	1	1	0	1
21	1	1	1	1	1	0	1	0	0	0
22	1	1	1	0	1	0	0	0	0	0
23	1	1	0	0	0	1	0	0	0	0
24	1	1	0	0	0	1	0	0	0	0

Table 7: UC 0-1 scheduling results of units with wind power

Hour	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
1	1	1	0	0	0	0	0	0	0	0
2	1	1	0	0	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0	0	0
4	1	1	0	0	0	0	0	0	0	0
5	1	1	0	0	0	0	0	0	0	0
6	1	1	0	0	0	0	0	0	0	0
7	1	1	0	0	0	0	0	0	0	0
8	1	1	0	0	0	0	0	0	0	0
9	1	1	0	0	1	0	0	0	0	0
10	1	1	1	0	1	0	1	0	0	0
11	1	1	1	0	1	0	1	0	0	0
12	1	1	1	0	1	0	1	0	0	0
13	1	1	1	0	1	0	0	0	0	0
14	1	1	1	0	1	0	0	0	0	0
15	1	1	1	0	1	0	0	0	0	0
16	1	1	1	0	1	0	0	0	0	0
17	1	1	1	1	1	0	0	0	0	0
18	1	1	1	1	1	1	1	0	0	0
19	1	1	1	1	1	1	1	1	0	0
20	1	1	1	1	1	1	1	0	0	1
21	1	1	0	1	1	1	1	0	0	1
22	1	1	0	0	0	0	0	0	0	1
23	1	1	0	0	0	0	0	0	0	0
24	1	1	0	0	0	0	0	0	0	0

Indian Journal Of Natural Sciences www.tnsroindia.org. © IJONS

Vol.5 / Issue 28/ February 2015 *International Bimonthly* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Imperialistic Competitive Algorithm for Economic Load Dispatch with Generator Constraints

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Received: 12 Dec 2014 Revised: 20 Dec 2014 Accepted: 10 Jan 2015

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ABSTRACT

Electrical energy generation for power systems aiming at minimizing total generation cost of available active units in the power system is one of the most important issues of the present advanced power systems. In other words, the aim of economic dispatch is an optimal and appropriate scheduling for generating units, considering nonlinear factors and limitations of power system and generating units. Imperialistic Competitive Algorithm (ICA) with consideration of generator's various constraints is presented in this paper for solving economic dispatch problem. Many of nonlinear constraints, e.g. generation limits, increasing and decreasing rates, transmission system loss, prohibited operating zone and nonlinear objective function have been considered in this paper.

Keyword: Economic load dispatch, Prohibited operating zone, Imperialistic Competitive Algorithm (ICA)

INTRODUCTION

In today's world, the most important aim is to distribute energy at the generating centers. In industry, when generator is combined with different loads, generation capacity is often greater than consumption, though unit commitment in generators could be various, because cost reduction of power generation is important. So, economic dispatching is in the center of consideration. The most costly part of the generation corresponds to the fuel cost.

Other costs including operation, maintenance and so on are economical factors. Finally, energy distribution experts must control the power plants generations based on the lowest cost strategy.

What is examined in this paper is presenting a new optimization algorithm based on mathematical modeling of social- political process of imperialism phenomena. Various methods have been introduced for solving optimization problems. Some of these methods find the optimal solution of the cost function based on a gradient and in an iterative manner. These methods have often high speeds, but they may trap in local optima. Such as: Bundle method [1], nonlinear programming [2], mixed integer linear programming [3–4], dynamic programming [5], quadratic programming [6], Lagrange relaxation method [7], network flow method [8], direct search method [9] In contrast, there are some methods which seek for absolute optimal solution of the function. Such as: evolutionary programming [10], genetic algorithm [11], simulated annealing [12], ant colony optimization [13], Tabu search [14], neural network [15], particle swarm optimization [16].

The presented algorithm for optimizing objectives, which is an inspiration of mathematical model of imperialistic competitive, is introduced and its various elements are illustrated here.

This algorithm starts with some initial countries. These countries are divided into two groups; colonies and imperialists, which form some initial empires together. Competition among empires for possessing more colonies is the cone of this algorithm and leads to converge of the countries to absolute minimum of the cost function. This imperialistic competition progressively causes a decrease in the power of weaker empires. The weak emperors lose their colonies, which cause increase in the power of powerful ones. Finally, it remains only an emperor who controls the whole world. Testing algorithm with standard cost function shows its efficiency in solving various optimization problems, e.g. in economic dispatch problem.Two 6 and 15 units sample systems have been used to compare the presented algorithm in this paper with other optimization methods related to this subject. Numerical results show that accuracy and speed of the presented algorithm is superior than other methods.

A considerable point about most of the evolutionary optimization methods is that they are usually extracted from biologic evolution and natural phenomenon modeling, and often aspects of evolution which there is not a known model of them, are outside of the investigations. In fact, the basic motivation of publishing the thesis is to fulfilling this gap and evaluating aspects of the negative responses given to the follow question:

“Does the evolution of creatures, and in particular human being, is limited only to biological evolution?”

And what was posed in the following path, was to find out an answer to the question: “Could other aspects of the human being evolution be used as a source of inspiring an optimization algorithm?”

The presented algorithm in this literature, “imperialism competitive algorithm”, was one of those answers to the above question. In introducing this algorithm, a special process was investigated. Social-political-historical imperialism process was the phenomenon used for the presented algorithm.

ELD problem formulation considering generator constraints

In ELD problem, cost function of each generator is approximately modeled by use of a quadratic function. The primary aim in an ELD problem is to find out optimal combination of all generating units in such a way that while maintaining the network ability in meeting the forecasted load with minimum cost, all other objectives and constraints are satisfied. So, we could present the ELD problem as a minimization problem of objective function as below: [19]

$$\min F = \sum_{i=1}^{N_G} F_i(P_{Gi}) = \sum_{i=1}^{N_G} (a_i P_{Gi}^2 + b_i P_{Gi} + c_i) \quad (1)$$

Where

F is total generation cost in **($/hr)**, **Fi** is fuel cost function of i-th unit, **NG** is total number of generators connected to the network, **PGi** is output active power of i-th generator. On the other hand, the required equality constraint of satisfying load demand is given as:

$$\sum_{i=1}^{N_G}(P_{Gi}) = P_{load} + P_{loss} \quad (2)$$

where P_{loss} is obtained using B-coefficients, given by:

$$P_{loss} = \sum_{i=1}^{m}\sum_{j=1}^{m} P_i B_{ij} P_j + \sum_{j=1}^{m} B_{0i} P_i + B_{00} \quad (3)$$

In practice, due to presence of some constraints such as generator's power production rate (generators' slope variations), banned operational areas for generating units and variety of fuels used in power plants, the actual ELD problem turns into a constrained optimization problem with non-convex functions, non-convex extensive search space, and with some minima which is hard to find its local minima. Constraints in the ELD problem are as below:

Generator's slope variations limitation: in practice, due to thermodynamic and mechanical limitations of boiler and turbine, each generator can have specific increase or reduction in its generation at a given time. This can be expressed using the following relationships:

If increased generation is required:

$$P_i(t) - P_i(t-1) \leq UR_i \quad (4)$$

If reduced generation is required:

$$P_i(t-1) - P_i(t) \leq DR_i \quad (5)$$

In the above relationships, URi and DRi are upper and lower limits of i-th generator, respectively. By applying the aforementioned equations, generators' active power operational constraints will be as (6).

$$\max(P_{Gimin}, P_{Gi}(t-1) - DR_i) \leq P_{Gi}(t)$$

$$\leq \min(P_{Gimax}, P_{Gi}(t-1) + UR_i) \quad (6)$$

ICA algorithm

Fig 1 shows ICA algorithm flowchart. This algorithm, such as other evolutionary algorithms begins with some accidental primary crowds that each of them has been called a "country". Some of best elements of crowds are selected as imperialist (equal with elites in genetic algorithms) .the remaining crowds have been considered as colony. Imperialist, with their power, absorb these colonies to themselves with special trend that will be discussed at future. Power of each empire depends on its two constitutive part namely imperialist country (as central nucleus)

and its colonies. In mathematics this dependence models with empire power definition in the form of power sum of imperialist country plus percents of average power of its colonies. The imperialist competition between them begins with forming early empires. Each empire that cannot be successful in imperialist competition and increases its power, will be removed from imperialist competition scene .therefore the survival of each empire depends on its power in absorption of revival empire's colonies and ruling over them. As a result, in imperialist competition streams, the power of greater empires will be increased and weak empires will be removed. Empire will be obliged improve their colonies for increasing their power. Colonies gradually near the empires and we can observe some sort of convergence. Final extent of imperial extent is when we have had unit empire in the world, with colonies which are close to the imperialist country accordance with their position. For starting the algorithm , we create N numbers of early countries .we select N imp of the best members of this crowd as imperialist (the countries including minimum amount of cost function) , the remains forms N col of colonies countries in which each of them belongs to one empire. We give some of these colonies to each imperialist for dividing the early colonies among the imperialist accordance with their power. consider their normalized cost as follow:

$$C_n = max\{c_i\} - c_n \qquad (7)$$

Where c_n imperialist cost max (c_i) is highest cost among imperialist and C_n is normalized cost of this imperialist.

Each imperialist which have had more cost (be weaker imperialist), includes less normalized costs. Normalized respective power of each imperialist, with having normalized costs, has been calculated as follow and accordance with it, colonies countries have been divided between imperialist.

$$P_n = \frac{c_n}{\sum_{i=1}^{N} c_i} \qquad (8)$$

From other respect, normalized power of an imperialist is colonies proportion that are controlled by that imperialist.Therefore the early number of an imperialist's colonies equals with:

$$N.C.n = round\{P_n . (N_{col})\} \qquad (9)$$

Where $N.C.n$ is early number of empire 's colonies and N_{col} is the total number of existing colonies countries in the early countries crowds . Round is also function that give closest integer t a decimal number. We select accidentally some of these primary colonies countries, with considering N.C for each empire an give it to N imperialist, the imperialist competitive algorithm begins with having primary status of all empires. Evolutionary trend which located in a segment that continues till the stop condition fulfillment. Fig 2 shows the manner of early empires forming . Bigger empires have more colonies. In this Fig, imperialist number 1 creates the strongest empire and have most number of colonies. [21]

Absorption policy modeling

Colonies movement toward the assimilation policy of imperialist has done with the purpose of analyzing the culture and social structure of colonies in central government culture. Imperialist countries began to creating development (building transportation substructure , university establishing ,...).In fact this central government tries to close colony country to its self by applying attraction policy, in different political and social dimensions, with considering showing manner of country in solving optimization problem. This section of imperialistic process in optimization algorithm has been modeled in the form of colonies movement toward the imperialist country. The Fig 3 shows total image of this movement. According with this Fig, imperialist country attract to itself parallel with culture and language axis. As shown in this Fig, colony country moves in x unit size toward the attachment line of colony to the

imperialist and drawn to new situation. In this Fig, distance between imperialist and colony is shown by D, and x is accidental number with steady distribution.

It means for x, we have:

$$x \sim U(0, \beta \times d) \quad (10)$$

Where β is a number bigger than 1 and nears to 2. A good selection can be β=2. The existence of coefficient β >1 causes the colony country closes to the imperialist country from different aspects while moving. With historical survey of assimilation phenomena, one clear fact in this field is in spite that imperialist countries followed seriously the attraction policy but facts did not follow totally accordance with applied policy and there were deviances in the work results. In introduced algorithm, this probable deviation has done with adding an accidental angle to the attraction path of colonies. For this purpose, in the colonies movement toward the imperialist, we add an accidental angle toward the colony movement ,Fig 4 shows this state . this time we continue our path in stead of x movement toward the imperialist and in toward the vector and colony maxim to the imperialist in the same extent, but with θ deviation in the path, and consider θ accidentally and with constant distribution (but any ideal and proper distribution can be used), then $\theta \sim U(-\gamma, \gamma)$.

In this relation y is ideal parameter that its increasing causes increasing searching around imperialist and its decreasing cause's colonies close possibly to the vector of connecting colony to the imperialist. With considering the radian unit for , a number close to $\pi/4$ was proper selection in the most depletion .

Position Displacement of Colony and Imperialist

In some cases attraction policy has had possitive result for them, in spite of destroying political-economical structures of colony countries . some of countries with appling this policy accessed to general self confidence and after awhile it was the educated people who combat with the nation leadership for escaping from imperialist . We can find various cases of these in enland and france' s colonies . from other perspective , looking at up and downs of power circulation in the countries shows truly that the countries in which were at the peak of politic military power , after awhile declined and contrary the countries reached to the power that before were not into the power. This historical movement in the modeling in the algorithm has been applied in the way of colony movement toward the imperialist country , some of these colonies may reach to a better condition than imperialist (reaching to the points in cost function that generate less costs than cost function extent) . In this state , the imperialist country and colony change their position and algorithm continues with imperialist country in new situation and this time it is the new imperialist country in which begin to applying assimilation policy for its colonies. The colony and imperialist displacement is shown in the Fig 5. In this Fig the best empire's colony in which has less costs than imperialist, is shown with dark color. Fig 6 & Fig 7& Fig 8 shows the whole empire after position changing.

Total Power of an Empire

The power of an empire equals with the power of imperialist country in addition to some perceptage of total power of whole colonies , in this case the total cost of an empire calculate as follow:

$$T.C. = Cost(imprialist_n) + \xi mean\{Cost(colonies\ of\ empire_n)\} \quad (11)$$

Where T.C.n is the empire's total cost and ζ is positive number that is usually between zero and one and near to zero. This low considering of ζ cause total cost of empire be nearly equal with its central government and increasing ζ causes increasing the colonies' costs measure influence of an empire in determining the its total costs. In generic state ζ =0/ 05 in the most cases resulted to proper answers.

Imperial competition

Each empire which cannot increase its power and loses its competition power, will be removed from imperialistic competitions. This removing forms gradually. It means that with passing the time, weak empire give up their colonies and the strong empire take possession of these colonies and increases their power. For modeling this fact, we assume the empire at the time of deleting, is the weakest existing empire. So in the algorithm repetition, we take some of weakest colonies of the empire and create a competition between the whole empires. Mentioned colonies will not necessarily be possessed the strongest empire. But this is the stronger empire which has more chance for its ownership. Fig 9 shows total image of this part of algorithm.

For modeling the competition between the empires for possessing these colonies , first of all we calculate the ownership probability of each empire (that be fit with the power of that empire) with considering total cost of each empire , as follow: first we determine total costs of empire based on its nnormalized costs: $N.T.C._n = T.C._n - \max_i \{T.C._i\}$ (12)

Where T.C.N is n total cost of empire and N.T.C.n is normalized costof that empire. Each emire which have had less T.C.N ,has more n.t.cn . infact T.C .n equals total cost of an empire and N.T.C. N equalsits total power.

The probability of colony ownership in competition by each empire calculates as follow:

$$p_{p_n} = \left| \frac{N.T.C._n}{\sum_{i=1}^{N_{imp}} N.T.C._i} \right| \quad (13)$$

with ownership probability of each empire, we divide the mentioned colonies accidentally between the empires, but with related probability to ownership probability of each empire. Then we form vector P based on above probabiliy extents as follow:

$$\mathbf{P} = \left[p_{p_1}, p_{p_2}, p_{p_3}, ..., p_{p_{N_{imp}}} \right] \quad (14)$$

vector P' s size is 1×nimp and is consituted based on probability amounts of empires ownership. Then we form the accidental vector R as equal as vector P , the arrays of this vector are accidental number with the same distribution in [0,1].

$$R = \left[r_1, r_2, r_3, ..., r_{N_{imp}} \right]$$

$$r_1, r_2, r_3, ..., r_{N_{imp}} \square U(0,1) \quad (15)$$

Then we form vector D as follow:

$$\mathbf{D=P-R}=\left[D_1,D_2,D_3,\ldots,D_{N_{imp}}\right]$$
$$=\left[p_{p_1}-r_1,\ p_{p_2}-r_2,\ p_{p_3}-r_3,\ldots,p_{p_{N_{imp}}}-r_{N_{imp}}\right] \quad (16)$$

We give the mentioned colonies to the empires with having cector D so that related andis in vector D be bigger than others. The empire which has more ownership probability , has the highest extent ,with more chances in related andis in vector D.

Declining the weak Impires

Weak empires gradually decline in imperialistic competition and strong empires take the possession of their colonies. There are different conditions for declining an empire. In suggested empire, when an empire lose its colonies, it assumed deleted.

Convergency

The mentioned algorithm continues till fulfillment of one convergence condition or a finishing the number of whole repetition. After awhile all the empires will decline and we have only one empire and other countries are under the control of this united empire. In this new ideal world all the colonies are controlled bye an united empire and the colonies 's cost and situations equals with the imperialist 's cost and situation . in this new world, there are no difference not only between colonies but also between colonies and imperialist country . in other words, all the countries are both colony and imperialist at the same time. In such situation the imperialistic competition have been finished and stops as one stop condition of algorithm.

ICA alghorithm

Assimilation: this function applies assimilation part or in other word attraction policy. Primary empires: it forms primary empires with proper dividing of colonies among them , with considering situation and cost of primary countries. Imperialistic competition: The imperialistic competition between the empires in order to attract each other colonies is done by this function. Removing the weak empires is also in this function. Imperialist and colony displacement: Displacement of imperialist and colony is done in this function. If a colony reaches to a better position than imperialist, it immediately take the control of emperor and continues the work with applying the attraction policy on them. The colonies revolution: Revelation, that is main counterweight of discovery balance and exploitation and is useful for discovery, applies in this function. Sudden changes happen in some countries and in some cases leads to discovery of minimum indiscernible point in function.

ICA algorithms' similar code

1. Select some accidental point on the function and form the primarily empires. We mean the powerhouses power that are considered as primary guess.
2. Move the colonies toward the imperialist country (assimilation policy).
3. If there are an empire that has less costs than imperialist, change the position of colony and imperialist.
4. Calculate total costs of an empire (with pay attention to imperialist and its colonies' costs).
5. Select one colony from weakest empires an give it to the empire which has more chance for ownership.
6. Delete weak empires.

7. Stop if there are only one remained empire, otherwise go to 2

Case study

In order to validate the proposed method, we employed the ICA approach for ELD problems in a 6 unit system and a 15 unit system. The ICA approach was implemented in MATLAB software. The system contains six thermal generating limits, 26 buses and 46 transmission lines. The load demand is 1263 MW. The characteristics of the six thermal units are given in [17]. The best solutions using the proposed Imperialistic Competitive Algorithm are shown in Table 1 that satisfy the generator constraints. Convergence characteristic of ICA technique for 6 unit systems Shown in Fig 10. The system contains 15 thermal units whose characteristics are given in [17]. The load demand of the system is 2630 MW**.** In this second case, the results of numerical simulation of tested ICA method are shown in Table 2 that also satisfy the system constrains. Convergence characteristic of ICA technique for 15 unit systems Shown in Fig 11.

CONCLUSION

Experimental results of the presented algorithm tested on the economical dispatch cost functions shows the algorithm is quite successful in finding optimal solutions of these functions. Also, different solved problems by this algorithm show that the Imperialist Competitive Algorithm strategy along with other optimization methods including genetic algorithm (GA) and particle swarm optimization (PSO) can successfully help to solve the practical and engineering problems. Comparison of the obtained results of the presented algorithm with those of the current optimization methods, also show the superiority of the algorithm.

REFERENCES

1. Mezger Alfredo J, Katia de Almeida C. Short term hydro thermal scheduling with Bilateral transaction via bundle method. International Journal of Electric Power & Energy System 2007;29(5):387–96.
2. Martinez Luis Jose, Lora Trancoso Alicia, Santos Riquelme Jesus, Short term Alicia, Santos Riquelme Jesus, Short term hydrothermal coordination based on interior point nonlinear programing and genetic Algorithm, IEEE Porto Power Tech Conference, 2001.
3. Gar CW, Aganagic M, Waight JG, Tony Meding Jose B, Reeves S, Chrestoforides M. Experience with mixed integer linear programming based approach on short term hydrothermal scheduling. IEEE Transaction on Power System 2001;16(4):743–9.
4. Chan GW, Aganagie M, Waight JG, Medina J, Burton T, Reeves S. Experiences with mixed integer linear programming based approaches on short term hydro scheduling. IEEE 2001;743–8.
5. Shi CC, Chun HC, Fomg I-K, Lah PB. Hydroelectric generation scheduling with an effective differential dynamic programming algorithm. IEEE Transactions on Power System 1990;5(3):737–43.
6. Erion Finardi C, Silva Edson LD, Laudia Sagastizabal CV. Solving the unit commitment problem of hydropower plants via Lagrangian relaxation and sequential quadratic programming. Computational & Applied Mathematics 2005;24(3).
7. Tkayuki S, Kamu W. Lagrangian relaxationmethod for price based unit commitment problem. Engineering Optimization Taylor Francis 2004;36(December(6)):705–19.
8. Franco PEC, Carvalho MF, Soares S. A network flow model for short term hydro dominated hydrothermal scheduling problems. IEEE Transaction on Power System 1994;19(May (2)):1016–22.
9. Wood AJ,Wollenberg BF. Power generation operation and control. New York: John Wiley & Sons; 1984.
10. Sinha N, Chakrabarti R, Chattopadhyay PK. Evolutionary programming techniques for economic load dispatch. IEEE Transaction Evolutionary Computation 2003; 7(February) :83–94.

11. Xiaohui Y, Yanbin Y, Yongchuan Z. A hybrid chaotic genetic algorithm for short term hydro system scheduling. Mathematics and Computers in Simulation 2002;319–27.
12. Basu M. A simulated annealing based goal attainment method for economic emission load dispatch of fixed head hydrothermal power systems. International Journal of Electrical Power and Energy Systems 2005;27(2):147–53.
13. Huang JS. Enhancement of hydroelectric Generation scheduling using ant colony system based optimization approaches. IEEE Transactions on Energy Conversion 2001;16(3):296–301.
14. Mantawy AH, Soliman SA, El Hawary ME. A new Tabu search algorithm for the long term hydro scheduling problem. Proceedings of the Large Engineering Systems Conference on Power Engineering 2002;29–34.
15. Liang RH, Hsu YY. Scheduling of hydroelectric generations using artificial neural network. IEEE Proceeding Generation Transmission Distribution 1995;141(5):452–8.
16. Cohelo SL, Mariani VC, Economic dispatch optimization using hybrid chaotic particle swarm optimizer, IEEE:1963–1968.
17. Jiejin, C., Xiaoqian, M., Lixiang, L., & Haipeng, P. (2007). Chaotic particle swarm optimization for economic dispatch considering the generator constraints. Energy Conversion & Management, 48, 645–653.
18. Neyestani, M., Farsangi, M. M., Nezamabadi-pour, H., "A Modified Particle Swarm Optimization for Economic Dispatch with Nonsmooth Cost Functions," Eng. Appl. Artif. Intel., Vol. 23, No. 7, pp. 1121–1126, 2010.
19. Selvakumar, A. I., Thanushkodi, K.,"A New Nonconvex Economic Dispatch Problems" IEEE Trans. Power Syst., Vol. 22, No. 1, pp 42–51, 2007.
20. Gaing, Z. L. Particle swarm optimization to solving the economic dispatch considering the generator constraints. IEEE Transaction on Power Systems, (2003). 18(3), 1187–1195
21. Rajabioun, R., Atashpaz Gargari, E., Lucas, C., 2008. Colonial competitive algorithm as a tool for Nash equilibrium point achievement. Paper presented in the Int. conference on Computational Science and Its Applications, June 30 July 3, Perugia, Italy, pp.680–695

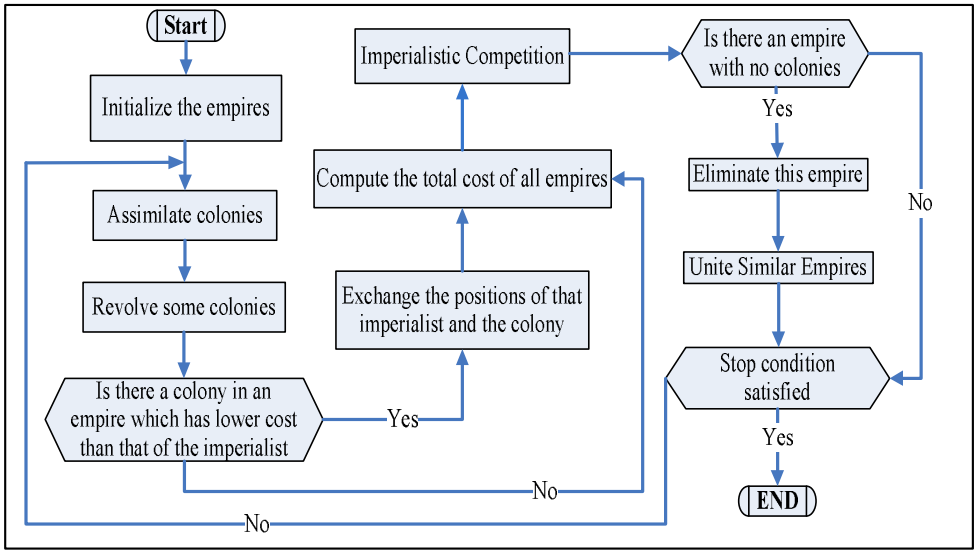

Fig 15: Flowchart of the Imperialist Competitive Algorithm

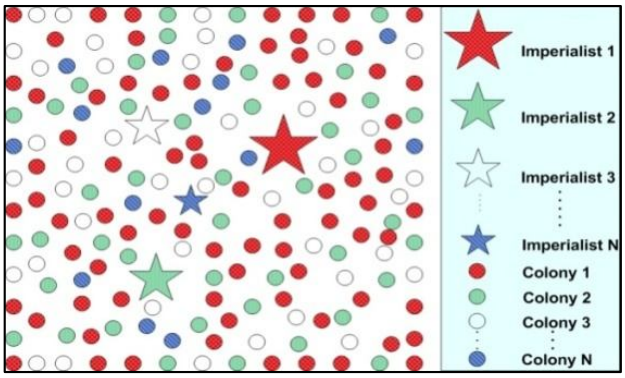

Fig 2. Manner of forming primary empire, imperialist number 1 creates strongest empire and has maximum number of colonies.

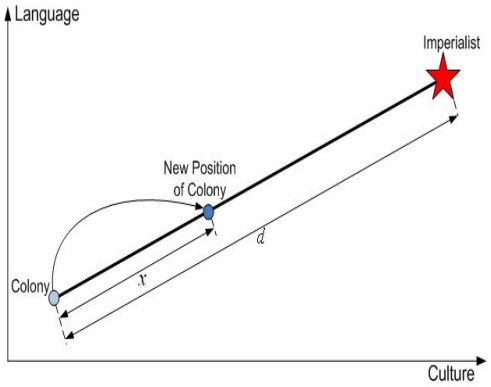

Fig 3: Total image of colony movement toward imperialist.

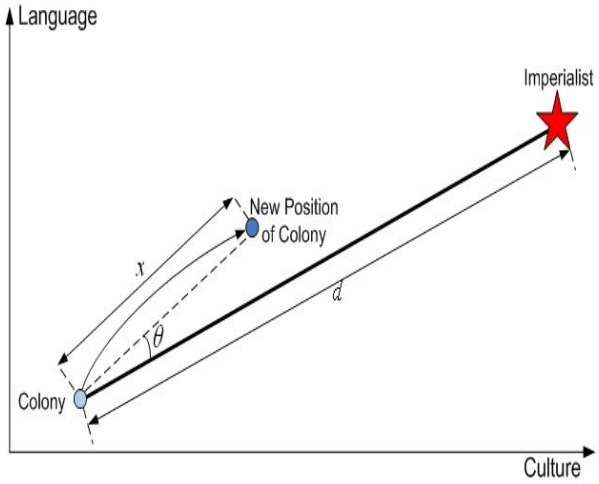

Fig 4: Real movement of colonies toward the imperialist.

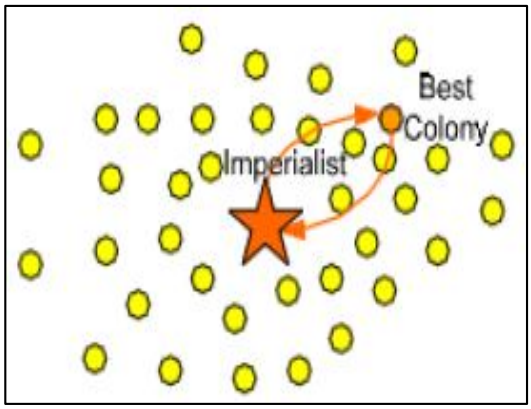

Fig 5 :Displacement of colony and imperialist

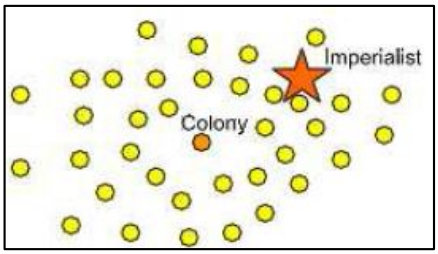

Fig 6: The whole empire after displacement

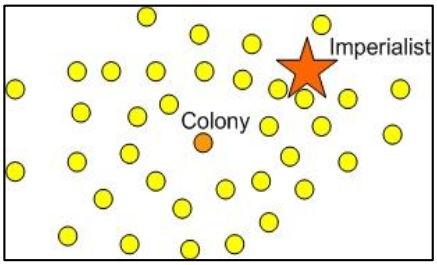

Fig 7 : Exchanging the positions of a colony and the imperialist

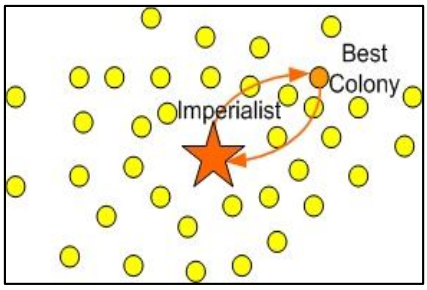

Fig 8: The entire empire after position exchange

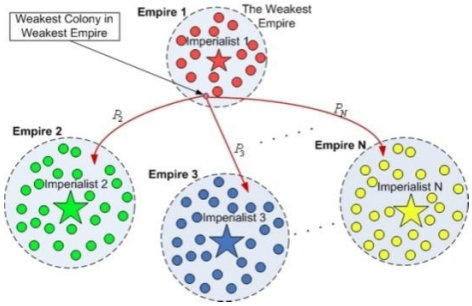

Fig 9 :Total image of imperialistic competition : bigger empire take the possession of the other emire's colonies with more liklihood.

Table 1: Best simulation results of 6-unit system

Unit power output (MW)	GA [20]	PSO [17]	MPSO [18]	GCPSO [18]	ICA
P_1	474.8066	447.8066	446.4869	444.8881	**441.1103**
P_2	178.6363	173.3221	168.6612	168.1455	**176.0123**
P_3	262.2089	263.4745	265	265	**260.5697**
P_4	134.2826	139.0594	139.4927	129.4751	**132.1361**
P_5	151.9039	165.4761	164.0036	173.0299	**171.6923**
P_6	74.1812	87.1280	91.746	95.0435	**93.7589**
Total power output	1276.03	1276.01	1275.391	1275.5823	**1275.2796**
Minimum Cost ($/h)	15459	15450	15443.0925	15443.97	**15442.5619**
P_{loss}	13.0217	12.9584	12.3736	12.6411	**12.3577**

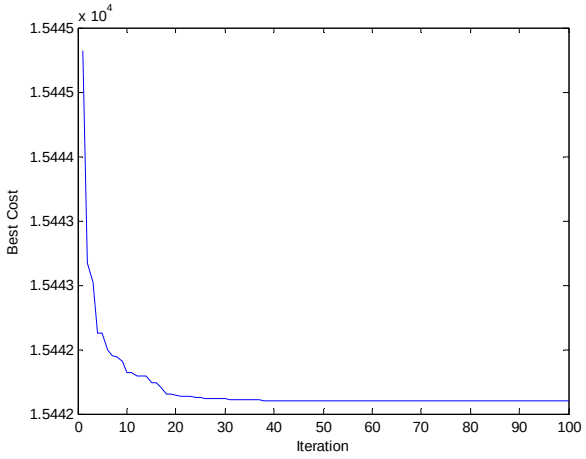

Fig. 10. Convergence characteristic of ICA technique for 6 unit systems

Table 2: Best simulation results of 15-unit system

Unit power output (MW)	GA [20]	PSO [17]	MPSO [18]	GCPSO [18]	ICA
P_1	415.3108	439.1162	455	449.8925	**455**
P_2	359.7206	407.9727	380	366.9906	**379.0025**
P_3	104.425	119.6324	130	130	**130.2701**
P_4	74.9853	129.9925	130	130	**130.00**
P_5	380.2844	151.0681	170	170	**168.8117**
P_6	426.7902	459.5601	460	460	**460.0200**
P_7	341.3164	425.5601	430	430	**430.7533**
P_8	124.7867	98.5699	92.7278	75.8846	**58.9945**
P_9	133.1445	113.4936	43.0282	50.2268	**76.6211**
P_{10}	89.2567	101.1142	140.1938	160	**156.1023**
P_{11}	60.0572	33.9116	80	80	**78.641**
P_{12}	49.9998	79.9583	80	77.7806	**79.1293**
P_{13}	38.7713	25.0042	27.6403	25	**26.0371**
P_{14}	41.9425	41.414	20.7610	15.8312	**15**
P_{15}	22.6445	35.614	22.2724	39.6614	**15**
Total Power Output	2668.4	2262.4	2661.6235	2661.3580	**2659.3824**
Minimum Cost ($/h)	33113	32858	32738.4177	32764.4616	**32711.9263**
P_{loss}	38.2782	32.4306	29.9870	30.8659	**29.9645**

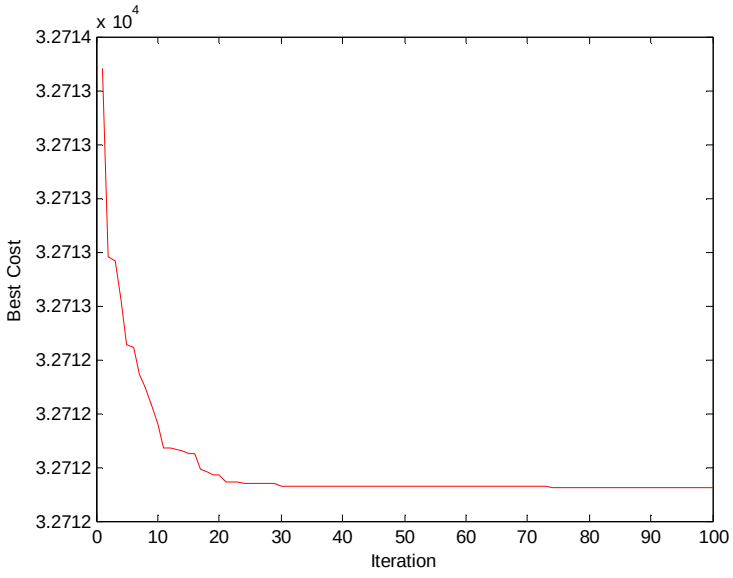

Fig. 11. Convergence characteristic of ICA technique for 15 unit systems.