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Spatial Prevalence of Intellectual Disability and Related Socio-Demographic Factors in Iran, Using GWR: Case Study (2006)

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ABSTRACT

Background: Although intellectual disability (ID) is a common disability in Iran, there is no investigation on the spatial distribution pattern of these patients in national level and the spatial maps for recognition the areas with higher prevalence of IDs and local neighborhoods of these regions or effect of socio-demographic factor on this scattering is not still available. This proposition motivated us to assess the population with ID in our country.

Methods: In a cross-sectional study, we applied Moran's Index (Moran's I) which includes information about the strength of the neighboring association between counties, as global univariate distribution assessment. A geographically weighted regression was used to explore relation between ID patient's prevalence and some socio-demographic factors (migration and illiteracy rate, physician number (PN)/10,000 people and health-care centers (HCCs)/10,000 people).

Results: We found that spatial clusters of ID patients exist among Iran counties (Moran's I = 0.36, $P < 0.01$) and in a rural area population groups (Moran's I = 0.20, $P < 0.01$). Further, we detected spatial associations between ID patients and all of our investigated socio-demographic factors in national scale. In rural areas, illiteracy has high association with ID especially in the south region of Iran. Urban area has random pattern of ID patients both within and between the Iran counties (Moran's I = 0.01, $P > 0.3$).

Conclusions: According to the results, our Initial hypothesis about the existence of spatial clusters in distribution of people with ID in Iran was proven. Spatial autocorrelation between migration and illiteracy rate and prevalence of patients with ID was shown and was in agreement with our hypothesis. However, our supposition that the prevalence should have inverse relationship with PN and HCC was rejected.

Keywords: Geographic information system, geographically weighted regression, intellectual disability, Iran, prevalence

Original Article

INTRODUCTION

The medical and socio-economic burden of raising people with intellectual disability (ID) is a complex issue all over the world. "ID is a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior, which affects many of the everyday social and practical skills" so, this result in decreasing ability to deal with problems independently, which often begins before adulthood and has permanent effects on development and subsequently impose a lot of cost on families, health-care systems and governments annually.[1-4] Therefore, prevalence of ID is an important topic too that is reported in broad ranges, from 0.3-0.7% in Sweden to 1.6-3% in an under developed country. Overall, prevalence of between 0.5% and 2.8% has been described in various studies.[5-7] Since the majority of these studies have been conducted in other parts of the world, the most recently investigation that was done in South-East Asia estimated the prevalence of ID across this continent at 0.06-1.3% except in China (ID's prevalence: 6.68%), although another survey that was carried out in that country did not confirm that estimation (prevalence of about 0.75% was reported).[8,9]

So considering their affected population, IDs in brief are important problems of public health because of problems those are associated with this condition such as: Unexplained causes in nearly half of the cases and sometimes their impossibility to prevent, high prevalence in most communities and losing productive years of life, early onset of most of these disabilities in childhood and long-term consequences of failures throughout life and etc.[6]

Besides, due to the importance of this issue, large numbers of investigations have been also performed on the specific needs of this group of individuals, cost of treatment and keeping them up. Lacks of services suitable for the special conditions that confront a high proportion of this population such as psychiatric and neurologic problems, impaired social relationships and etc., are other issues for assay.[10-15]

Nevertheless, with developments in techniques that study various medical conditions, assessment on IDs has been changed and applying the achievements of other sciences to studying the spatial patterns of disease and practices providing health facilities to these patients and other diseases is expanding. The utilization of geographical information systems (GIS) in recent decades is an example of these accomplishments.

Since communication between a person's health status, specific geographic factors, spatial distribution of a disease and other such information can be used as powerful tools, this property creates new kinds of vision to medical data by application of spatial methods that develop individual and public health. Considering this actuality, medical geography usually debates two domains: "Geographical epidemiology" and "health system planning" that from initial aspect, "spatial epidemiology" analyses cases with a recognized health condition or disease and explains spatial differentiation of them by using statistical methods.[16-21]

As noted before, although several studies have been performed in patients with IDs and different techniques have been applied for evaluation of their related condition in Asia and especially China; limited evidence exists for using modern techniques of spatial analysis such as geographically weighted regression (GWR) on data related to these patients, especially in Iran.[22]

Forasmuch as-according to our far-reaching search in credible scientific site -, no investigation was done at the nation scale in Iran and only based on local or residential area some studies were perused. However, for the 1st time, these data was an appropriate source at household level, made possible considering the prevalence of IDs patient and their spatial distribution patterns across the country. Hence, after preliminary statistical analysis and discovering the spatial distribution pattern of these patients, as an initial hypothesis, this assumption was also raised that the spatial pattern of patients with IDs maybe associated with some socio-demographic factors such as illiteracy, migration, physician number (PN) and number of health-care centers (HCCs) in the study region. Illiteracy as an indicator of the tendency to receive preventive health-care services; migration, element for seeking further therapeutic and rehabilitation services by these patient's families; PN and HCCs as the measures for health-care delivery for prevention and thus decreasing the number of these patients were considered and for demonstrating these relationships, the spatial exploring analysis was employed in this work.

METHODS

The data

For access to data of patients with ID, the statistics recorded by the Iranian population and housing census (2006) were used. According to official statistics, this is the 1st time; the data of these patients in the whole country were available for investigation and the required information were accessible on the official site of the statistical center of Iran (Available from: http://www.amar.org.ir). Information listed on the site, including data on physical and intellectual disabilities and different age groups and sex segregation and separation of various provinces and cities of each province is presented too. The population living in urban areas, rural and non-resident population in each of these sections has been separately recorded.

Data required for performing this research, including information related to people with ID in the whole country (total number was 295,218) were extracted from these tables and entered into the Excel software. Based on the available frequency of patients and census of the general population in 2006, the overall prevalence of patients with ID in accordance with the cities and provinces and the calculated values according to sex and rural and urban areas was computed [Tables 1 and 2]. Since the prevalence of ID can be related to items such as illiteracy, immigration, the PN and the number of HCCs particularly in rural areas (providing services before and during pregnancy for prevention and help for early diagnosis), necessary information to evaluate the effect of these variables on the prevalence of ID were used from data of immigration and illiteracy rates listed in the statistical center of Iran and information inserted in the National Statistical Yearbook 2007 (Available from: http://salnameh.sci.org.ir).

The map

To display and analysis of phenomena that spatially distributed of them is important, use of GIS as a decision support tool can offer much more realistic image or pattern than purely statistical methods. The GIS analysis is a feasible method that furnishes opportunity for generating hypothesis and identifying the effects of different factors such as environmental, social, cultural-behavioral and genetic factors on the spatial pattern of diseases. So, for spatial analysis of the prevalence of ID patients, counties division in 2006 was needed. The prevalence of ID patients tables in urban and rural area were jointed to the table of counties map and finally attribute tables were prepared to perform spatial analysis.

The analysis stage

Explore on the spatial distribution of the prevalence of ID patients

For estimation of spatial distribution of prevalence of ID patients in the counties, the Croplet maps of spatial distribution of their total prevalence, prevalence of men and women and ID patient prevalence in rural and urban areas were provided [Figure 1]. After reviewing the plans, in order to obtain the patterns of spatial distribution and follow-up of prevalence of ID patients from clustering, random or disperse patterns in various provinces and cities, each province was delineated separately and then exploratory spatial data analysis (ESDA) on the scattering pattern of ID patient's prevalence was done.

Spatial distribution assessment

At this stage, ESDA of prevalence of ID patients and their sex segregation, IDs patient's prevalence in urban and rural areas were mapped. Two indicators helped us to interpret the result of this phase:

Global spatial autocorrelation coefficient or Moran's index

Spatial autocorrelation statistic was used to measure the correlation among neighboring observations in a pattern and the levels of spatial clustering among neighboring were districted.

Table 1: Prevalence of patients (male or female, in urban or rural regions) with intellectual disability by the counties in Iran (2006)

Parameters	IDs patients' prevalence			Total IDs patients' prevalence		Urban IDs patients' prevalence		Rural IDs patients' prevalence	
	Total	Urban area	Rural area	Male	Female	Male	Female	Male	Female
Mean (%)	0.45	0.42	0.49	0.54	0.35	0.51	0.33	0.59	0.39
Minimum (%)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum (%)	0.7987	2.4879	2.1793	1.2830	0.7124	2.9081	2.0589	2.5515	1.7686
P value		0.000		0.000		0.000		0.000	

IDs=Intellectual disabilities

Table 2: Prevalence (%) of patients with intellectual disability by provinces in Iran (2006)

Province name	Total ID prevalence	Total male ID prevalence	Total female ID prevalence	Total urban ID prevalence	Total rural ID prevalence
Markazi	0.29255	0.51309	0.3663	0.39568	0.20514
Gilan	0.52706	0.62619	0.42857	0.40679	0.66756
Mazandaran	0.42699	0.49625	0.3572	0.38398	0.47564
East Azarbaijan	0.3952	0.49028	0.29607	0.38934	0.40694
West Azarbaijan	0.38003	0.46086	0.29668	0.34279	0.43596
Kermanshah	0.39582	0.49847	0.28924	0.37289	0.44194
Khuzestan	0.41986	0.51529	0.32009	0.40097	0.45861
Fars	0.45731	0.55636	0.35488	0.4325	0.4964
Kerman	0.3772	0.46445	0.28624	0.37462	0.38086
Razavi Khorasan	0.49908	0.60699	0.39017	0.47674	0.54689
Isfahan	0.49929	0.60242	0.39099	0.48506	0.57039
Sistan and Baluchestan	0.32684	0.40384	0.24745	0.33523	0.31859
Kurdistan	0.41612	0.51776	0.31171	0.40079	0.43863
Hamadan	0.44379	0.55285	0.3334	0.40427	0.49744
Chaharmahal and Bakhtiari	0.48397	0.59563	0.3709	0.47683	0.49156
Loristan	0.38345	0.48014	0.28321	0.38514	0.38097
Ilam	0.44102	0.52627	0.35214	0.42025	0.47307
Kohgiluyeh and Boyer-Ahmad	0.46019	0.56015	0.35779	0.38816	0.52573
Bushehr	0.44885	0.5042	0.3869	0.44782	0.45077
Zanjan	0.38617	0.49637	0.27625	0.35613	0.42763
Semnan	0.40323	0.46688	0.33623	0.34978	0.56106
Yazd	0.43126	0.48826	0.36903	0.40896	0.51887
Hormozgan	0.36412	0.42637	0.29758	0.29683	0.42406
Tehran	0.34595	0.41053	0.2776	0.33784	0.4315
Ardabil	0.4553	0.57522	0.33409	0.45039	0.46219
Qom	0.45105	0.574	0.32158	0.44768	0.50281
Qazvin	0.35252	0.42321	0.27873	0.35155	0.35458
Golestan	0.48829	0.61269	0.36522	0.48206	0.49431
North Khorasan	0.47919	0.61836	0.34269	0.42043	0.53422
South Khorasan	0.57179	0.68479	0.45597	0.50843	0.63863
Mean of column	0.43	0.53	0.34	0.4	0.47

ID=Intellectual disability

Moran's I as a device was used in ESDA for exploring the general model of spatial autocorrelation in the study area and the overall spatial distribution pattern of variable on the map including disperses, random or cluster could be identified as showed in Figure 2.

Local indicator of spatial association

Without considering the presence or absence of an overall spatial autocorrelation, another form of spatial correlation of data at the local level could be examined too. In other words, the possibility of recognition of spatial clusters in each local data sets and spatial significance of each of these indicators was assessed. Usually, six categories are classified in LISA cluster and significant maps and for each category one color is allocated. LISA made it possible to know the separated regions of the whole map with low or high values of the variable that surrounded by areas with high or low values and significant level of each color was calculated.

GWR

Limitations of global regression models such as ordinary least squares are related to their incapability into taking consideration the spatial differences of variables. Geographic regression models provide a local model of the variable or process that help to understand/predict the relations by fitting a regression equation to every feature in the regions. By entering the coordinates of location items, solve Simpson paradox.

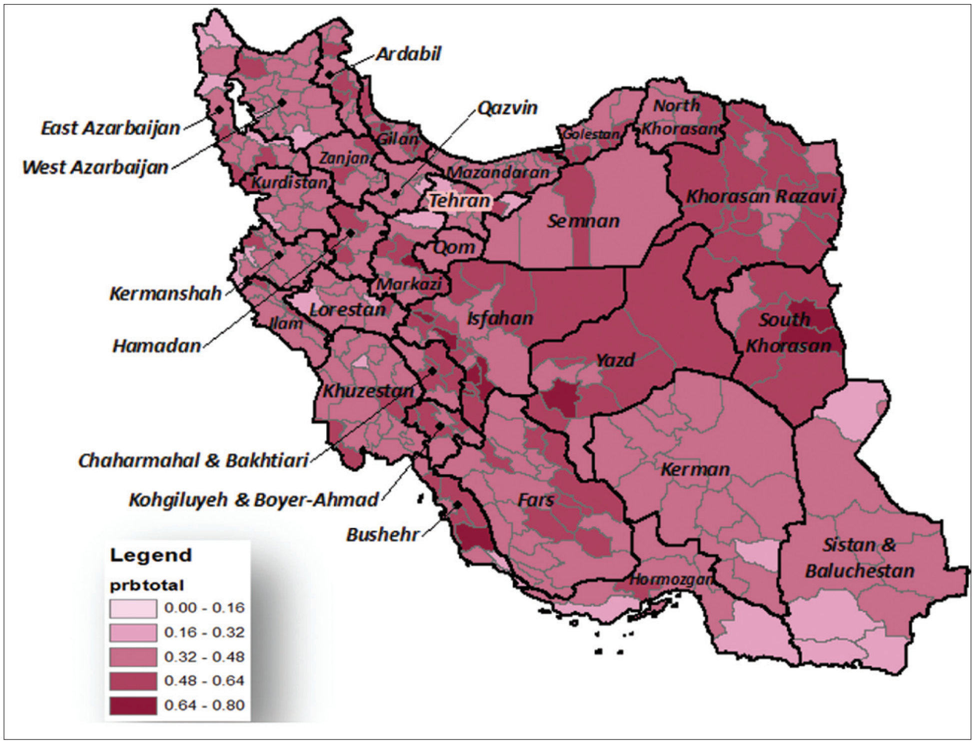
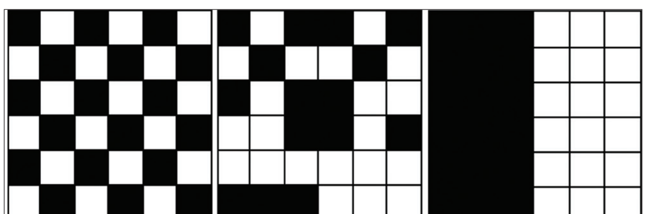


Figure 1: Spatial distribution pattern of prevalence of patient with ID (Iran-2006)



	Moran's index	
−1	0	+1
Disperse	Random	Cluster
	Z score	
−2.58	0	+2.28
	P value	
0.01	0	0.01

Figure 2: Spatial pattern of different Moran's index values

However, it is also necessary to express that for considering the patterns of association between two or more variables in an area, probability of associated values for adjacent regions of space should be controlled. One of the methods to control the impact of spatial correlation that can be used is GWR, calculated using the following equation:

$$Y_i = \beta_{0i} + \beta_{1i} X_{1i} + \beta_{2i} X_{2i} +.+ \beta_{ni} X_{ni} + \beta_i$$

Where, Y_i: Value of the dependent variable observed at the location i.

X_{1i}, X_{2i},…X_{ni}: Values of the independent variables observed at i, #1,… #n.

β_{0i}, β_{1i}, β_{2i},…β_{ni}: Parameters to be estimated.

β_i: Random error term/residual which is assumed to be normally distributed.

So as a result we can say that the spatial regression models that obtain the spatial dependence in the regression analysis prevent statistical problems such as unstable parameters and unacceptable statistical tests. Spatial dependence can enter in the regression model as a relationship between predictor (independent) and dependent variables. GWR is a local version of spatial regression that provides non-aggregated parameters of the spatial units of analysis. These features have been provided examination of spatial heterogeneity of estimated relationships between dependent and independent variables.

Regarding this fact in the present study for GWR analysis, modeling spatial relationships in Arc GIS was used and spatial modeling relationships were performed. In order to evaluate the effect of predictor variables (migration and illiteracy rate, HCCs and PN) and the impact of them on the prevalence of ID patients in Iran, these independent variables were entered into the model simultaneously [Figure 3]. The spatial correlation of these four variables was assessed and the spatial correlation coefficient of prevalence of ID patients was found. Separately, the effect of each independent variable on the prevalence of ID patients with GWR was studied and coefficience of determination (R^2), Adjusted R^2 and akaike information criterion (AICc) in these cases were recorded in tables [Table 3].

Based on our access to HCC, PN and illiteracy data in rural areas and the higher prevalence of ID in these areas, regression modeling for these three independent variables and the prevalence of ID patients as dependent variable in rural areas was also performed and the values obtained from the

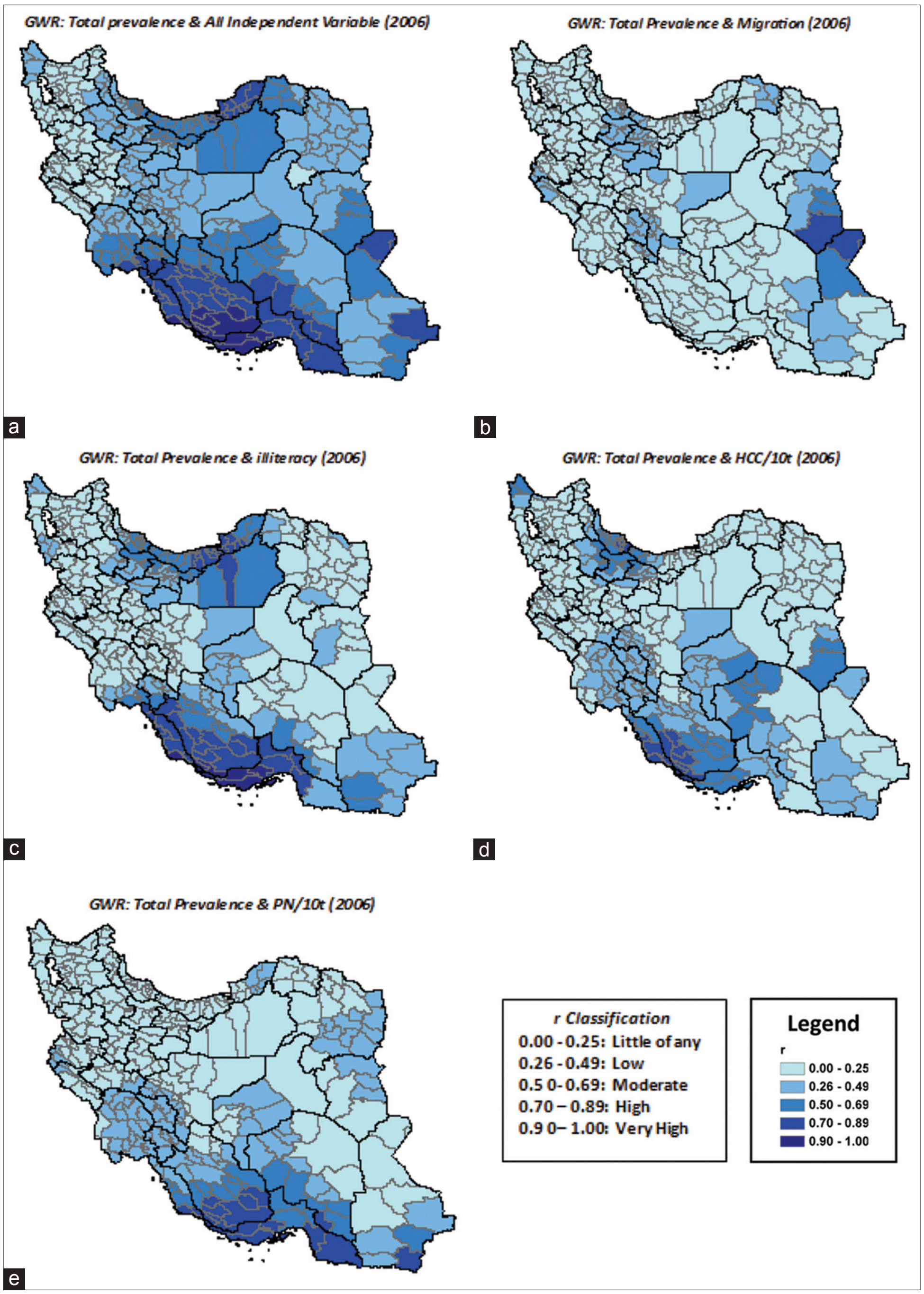


Figure 3: Geographic weighted regression analysis of prevalence of intellectual disabilities (dependent variable) and migration, illiteracy, health-care centers per 104 people and physicians number per 104 people (predictor variables) by county (Iran 2006)

GWR are included in Table 4. The overall effects of these three factors together and in the next step, each of these items separately were expressed in the form of maps [Figure 4].

RESULTS

Considering calculated Moran's I for determination the spatial distribution patterns of prevalence of ID patients [Table 5], clustering model was found in total, men and women distribution of ID patients (Moran's I = 0.36) and this pattern repeated in rural areas too (Moran's I = 0.01). According to Moran's I in the urban region, prevalence of ID patient in these areas followed random model (Moran's I = 0.01) and *P* values confirmed the existence of these spatial distribution (*P* = 0.38).

LISA showed that the highest local spatial autocorrelation in total prevalence of ID

Table 3: AICc, R^2 and R^2 adjusted of figure 3 calculated by GWR (Arc GIS 9.3 software)

Figure number	1	2	3	4	5
AICc	−700.18	−500.76	−715.00	−621.80	−596.18
R^2	0.71	0.50	0.70	0.61	0.58
R^2 adjusted	0.64	0.40	0.65	0.54	0.51

AICc=Akaike information criterion, GIS=Geographical information systems, GWR=Geographically weighted regression, R^2=Coefficience of determination

Table 4: AICc, R^2 and R^2 adjusted of figure 4 calculated by GWR (Arc GIS 9.3 software)

Figure number	1	2	3	4
AICc	−265.67	−299.85	−268.07	−234.80
R^2	0.17	0.45	0.14	0.40
R^2 adjusted	0.11	0.39	0.10	0.30

AICc=Akaike information criterion, GIS=Geographical information systems, GWR=Geographically weighted regression, R^2=Coefficience of determination

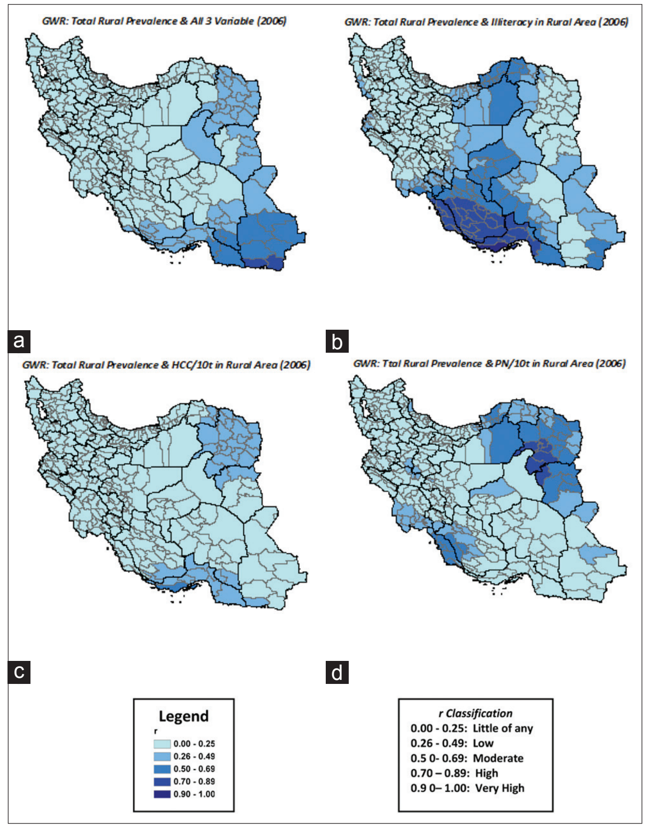


Figure 4: Geographic weighted regression analysis of prevalence of intellectual disabilities in rural area (dependent variable) and illiteracy, health-care centers per 104 people and physicians number per 104 people (predictor variables) in rural area by county (Iran 2006)

Table 5: Calculated Moran's I and determination of spatial pattern of prevalence of ID patients by GeoDa and Arc GIS software (Iran 2006)

Item	Moran's* index	Expected index	Variance	Z score	*P* value	Spatial distribution
Total ID prevalence	0.36	−0.003	0.001	5.70	<0.001**	Clustered
Male ID prevalence	0.30	−0.003	0.001	5.18	<0.001**	Clustered
Female ID prevalence	0.30	−0.003	0.001	5.38	<0.001**	Clustered
Urban ID prevalence	0.01	−0.003	0.001	0.87	0.380	Random
Urban male ID prevalence	0.01	−0.003	0.001	0.91	0.360	Random
Urban female ID prevalence	0.002	−0.003	0.001	0.48	0.630	Random
Rural ID prevalence	0.20	−0.003	0.001	4.65	<0.001**	Clustered
Rural male ID prevalence	0.17	−0.003	0.001	3.96	<0.001**	Clustered
Rural female ID prevalence	0.20	−0.003	0.001	5.14	0.000**	Clustered

*Moran's index=Calculated by GeoDa software, **Significant, GIS=Geographical information systems, Moran's I=Moran's index, ID=Intellectual disability patients is in eastern provinces such as Khorasan Razavi (with 27,914 patient), South Khorasan (with 3,639 patient) and Semnan (with 2,378 patient) that contain % 3.43 of total IDs patient's prevalence in Iran and its predominant local spatial cluster showed clearly a High-High pattern in comparison with their neighborhoods [Figure 5].

Besides, according to analyzes for local spatial auto-correlation that was done in GeoDa for other variables such as prevalence of ID patients in rural and urban areas, prevalence of IDs men and women that are indicated in Figures 6-9 (their LISA Significant Map, LISA Cluster Map and Moran Scatter Plot are shown in these figures too), the comparison between prevalence of IDs patients in the urban region and national scale show random distribution (LISA Moran = 0.0119) [Figure 6] but analysis indicate that IDs patient's prevalence in a rural area in some counties have significant Moran LISA values [Figure 7]; for instance, Isfahan, Semnan, South Khorasan, Markazi and Qom counties (LISA Moran = 0.194), have significant positive local spatial auto-correlation. As showed in related map, all the counties located in the central region of the country with a high rate of ID's patient prevalence, surrounded by other high rate areas (High-High).

But, the other important areas that can draw attention in Geoda maps are also zones with different spatial distribution pattern when compared with neighboring areas. For instance, as the distribution maps for patients with ID has been shown in urban areas, a region with high prevalence of ID is located into low prevalence areas in the southern parts of Iran (High-Low pattern).

As noted before, another aspect of our study was GWR analysis. Regarding the prevalence of ID patient as dependent variables and entering PN, HCC, immigration and illiteracy rate in the model as independent variables simultaneously,

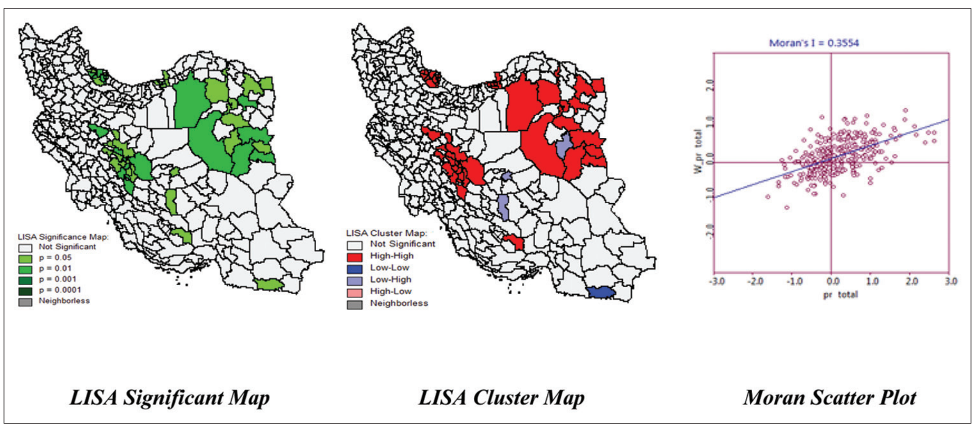


Figure 5: GeoDa Local Indicator of Spatial Association significant and cluster maps, Moran's Scatter plot of prevalence of intellectual disabilities by county (Iran-2006) (*pr total: Total IDs patient's prevalence in Iran)

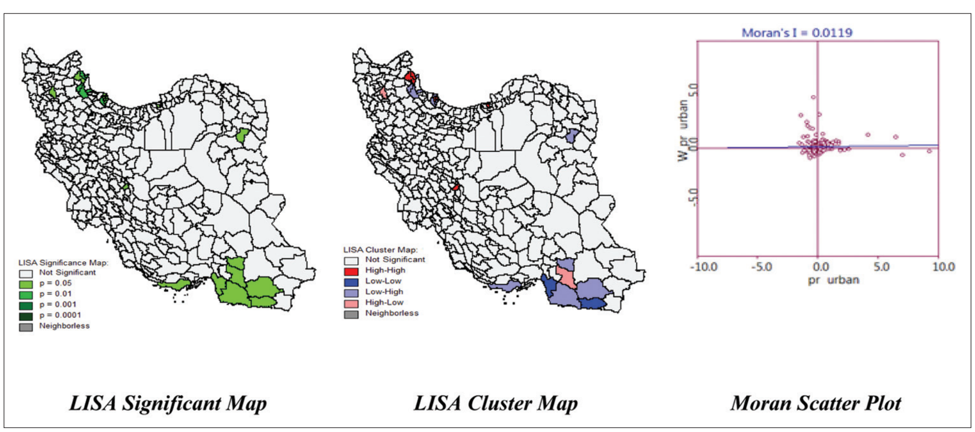


Figure 6: GeoDa Local Indicator of Spatial Association significant and cluster maps, Moran's Scatter plot of prevalence of intellectual disabilities in urban area by county (Iran-2006) (*pr urban: IDs patient's prevalence in Urban area)

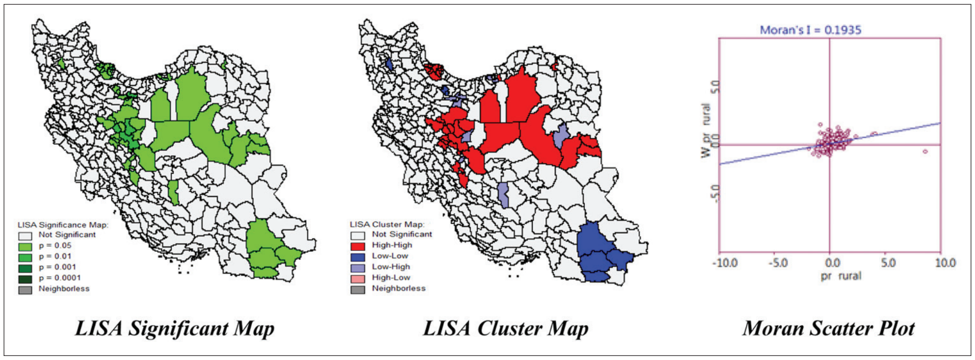


Figure 7: GeoDa Local Indicator of Spatial Association significant and cluster maps, Moran's Scatter plot of prevalence of intellectual disabilities in rural area by county (Iran-2006) (*pr rural: IDs patient's prevalence in rural area)

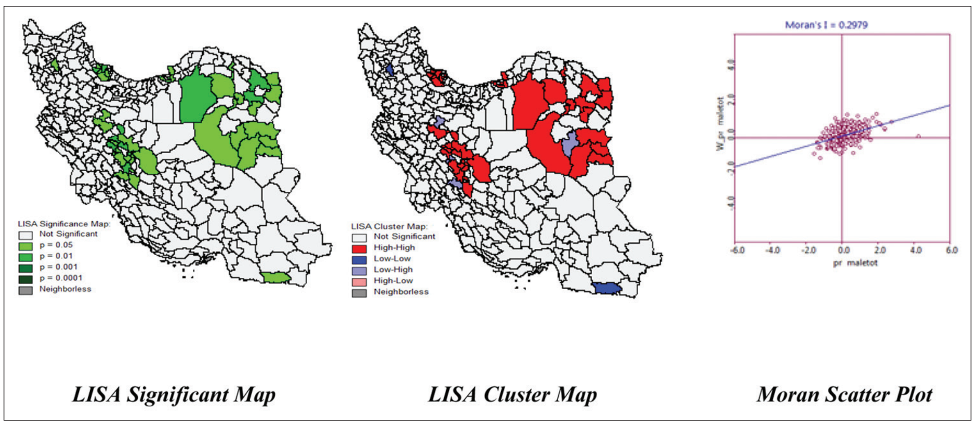


Figure 8: GeoDa Local Indicator of Spatial Association significant and cluster maps, Moran's Scatter plot of prevalence of male intellectual disabilities by county (Iran-2006) (*pr maletot: Total prevalence of male IDs patients)

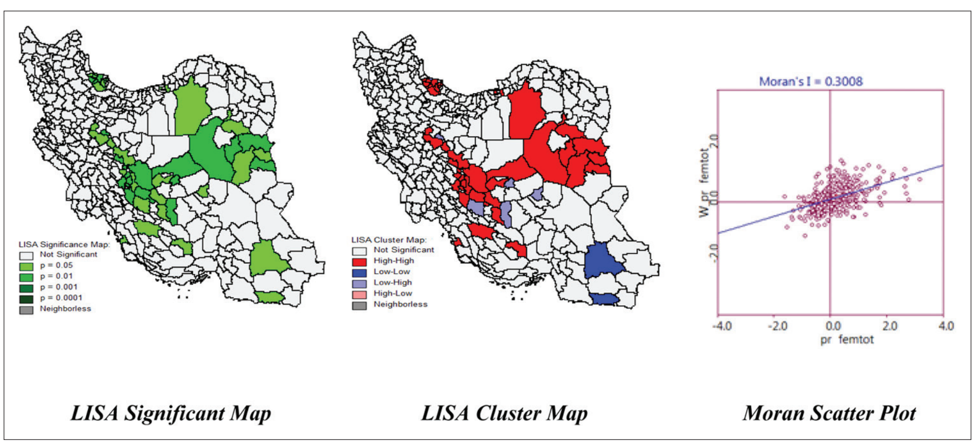


Figure 9: GeoDa Local Indicator of Spatial Association significant and cluster maps, Moran's Scatter plot of prevalence of female intellectual disabilities by county (Iran-2006) (*pr femtot: Total prevalence of female IDs patient's)

coefficience of determination (R^2) are calculated. Based on R^2, the correlation coefficient (R) vary across county (Total R^2 = 0.71) and R values fluctuate from 0.0002 to 0.94 for total independent variables [Table 3]. So, according to calculated R in this section which is depicted in the form of maps [Figure 3a], the highest correlation in southern parts of Iran where especially southern part of Fars and Hormozgan province is evident. The highest correlations are also existed in Golestan province too. However, it seems that North West and West counties, including the provinces of West and East Azarbaijan and Ardebil, Kurdistan and Kermanshah, Ilam and Lorestan have the least correlation in this analysis.

Same from is shown in the Figure 3, all of our independent variable import to GWR analysis separately for finding the relationship between the four predicted variables and ID patient's prevalence in the country and as explained in the map legend, different R value with special interpretations can be found in investigated area [Figure 3b-e].

Maps regarding GWR analysis between three independent factors and prevalence of rural ID patients indicate an overall weak relationship in the correlation, but exceptions are shown in Eastern regions with relatively strong solidarity [Figure 4a].

As has been stated in the Table 4, it appears that when the relationship between prevalence of ID patients in rural areas and independent variables are examined, the lowest correlation existed with the number of HCC in rural populations but in assessment of this predictor variable, some exceptions are demonstrated in some parts of North Khorasan, Razavi Khorasan and South Khorasan provinces and the southern border regions, areas that have a higher correlation coefficient. The only significant observed pattern of relationship is the correlation between illiteracy rates in rural areas that show different patterns in the country. However, the high values of this interface are in southern regions (Hormozgan, Bushehr and southern areas of Fars) [Figure 4b-d].

DISCUSSION

As mentioned in the introduction, more recent studies in Asia state that the prevalence across this continent is estimated between 0.06% and 1.3%.[8] According to our official data, mean prevalence of IDs patients was obtained 0.45 as a total in Iran and mean prevalence in a rural area has a significant difference comparing with urban regions. These results were consistent with the results of previous studies that predict prevalence in Asia and in developing countries.[7,8] Difference between mean prevalence of male and female at nationwide, urban and rural area was statistically significant and finding were also according to other surveys [Table 1].[23-25]

Although many examples of population based studies of specific health status of ID are available, few studies about the spatial pattern of patients with ID have been examined. However, spatial distribution pattern of disease prevalence and incidence and recognition of the potential causes of occurrences of diseases such as socio-demographic factors and environmental exposures increase the need for new methods for analyzing health data (such as patients with ID). So in these situations, the maps can be the final product of analysis and for example, where there are concerns about the etiology of ID in childhood, GIS can be used as a tool for generating hypotheses, particularly in the areas of environmental epidemiology, etc.[26]

Results from application of GIS and doing spatial analysis by using GeoDa and GWR enabled us to be able to answer our research questions. Our Initial hypothesis about the spatial distribution pattern of ID patients in Iran and its spatial discipline has been proven. The results of the analysis performed in the GeoDa software, the distribution pattern of Iranian ID patients in the whole country and in rural areas and the general patterns of male and female distribution were shown as spatial clusters. But according to the calculated Moran's I in urban regions, spatial distribution that was observed, even by considering sex segregation, was random.

Local tests can determine spatial clustering and aggregation in the study area and they can also identify boundaries and regions with high or low clusters and region with lower or higher cases or rates than expected. In this study, such an analysis was performed by using LISA and from recognized clusters; areas that were affected by neighboring and showed significantly higher or lower prevalence were found too.

Epidemiological studies assessed the effect of some socio-economic factors such as poverty and health inequalities on life conditions of people with ID and their families.[2] These researches gave us this idea to check the association between some of these factors with prevalence of ID patients in our country.

There are many studies that use the GWR technique to assess the correlation between different dependent and predictors variables, but in this domain and especially in our country, it is the first study that emphasizes ID prevalence and the effect of some variable on it.[17,21,27-34]

First, as mentioned before and in nationwide we entered four independent variables in the GWR method and calculated R^2 between these predictor variables and total ID patient's prevalence in our analysis. According to the classification in a valid biostatistician reference that divided "*r*" (correlation coefficient) into five categories and gave equal values to each classes (show in the map inset), all correlations showed "high" spatial relationship in this section, while some of these results were antithetical with our first hypothesis.[35]

We assumed that more PN and access to HCCs should be associated with low ID patient prevalence and have inverse effects on ID patient's frequencies. This theory was rejected both regarding whole country and in rural areas. We construed that this result may be due to more facilities or sooner and better diagnose of these patients.

However, other speculations about spatial correlation between illiteracy and migration rates were proven. More often, many families migrate to states suggested by health-care system as better communities for accessibility to facilities needed for their ID patients. Furthermore, it is clear that people with low illiteracy degree know less about health threatening statuses, seek less for health-care services and often have lower socio-economic conditions. Each of these items can serve as a powerful risk factor for increased prevalence of ID. In this survey and analysis, this hypothesis was seen to be correct.

CONCLUSIONS

As we know, the logic of using geography for studying diseases or health-care is created from conception of factors that cause uneven distribution of diseases and this logic helps the researchers for recognition of existing spatial rules.

Accordingly, it can be concluded that the integration of medical and spatial geography creates a new medical vision that is infrastructure of the method of using spatial data for improving population health. There for communication between an individual health status and specific geographical factors can be a powerful device that able medical specialists to utilize them for health promotion and medical geography has these potency to show how changes in the location can effect on individual exposure with health threatening risk factors.

In our study, we used geographical techniques to show the spatial distribution of ID patient's prevalence and clustered pattern in Iran and analyzed the relationship between some socio-demographic factors and these patients prevalence in our country to perceive whether there is any spatial autocorrelation between them. Furthermore, we decided to discuss about these patients for inviting other researchers and policy makers to investigate in this field. We really believe that with appropriate planning and adoption of good policies, health-care systems can prevent and reduce the burden of people with this disability, provide more facilities for the specific need of these patients and their families and promote their quality of life.

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