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Prevalence of physical inactivity and its geographical distribution in Yazd City, 2014–2015

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background: One of the most important risk factors for non-communicable diseases is physical inactivity. This study was conducted to determine the geographical distribution of physical inactivity in Yazd City to identify places that need intervention.

Material and methods: This is a cross-sectional descriptive analysis conducted based on Geographic Information System (GIS). The data for residents between 20 to 69 years in Yazd city of Yazd Health Study (YaHS) yielded 8727 people. The short form of the International Physical Activity Questionnaire (IPAQ-SF) was used. The SPSS V.19 and ARC Map10.5 software were used to analyze the data.

Results: The pattern of geographical distribution of physical inactivity in the subgroups of sex, age, and socio-economic status were similar. Spatial auto-correlation analysis showed that physical activity score had a cluster significant level. Also, hot spot analysis showed that this clustering is different in men and women. Using interpolation, the lowest score of physical activity for the central parts of Yazd city and from east to west was estimated.

Conclusions: It is necessary to design and implement interventions to promote physical activity for women, older people and those with a better socio-economic status. In the meantime, it is necessary to prioritize areas with lower physical activity, especially in the central part and in the direction from east to west. .

Key words: Yazd, physical activity, activity, inactivity, geography, GIS.

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INTRODUCTION

According to the World Health Organization (WHO), any physical movement resulting from the contraction and expansion of the body's skeletal muscles and requiring energy is called physical activity. These activities include activities during work, play, home activities and commuting. This term should not be confused with the term sport, which is a series of organized activities. Both of these activities have health benefits (WHO, 2010). According to 2010 statistics, the prevalence of physical inactivity in the worldwide, in high-income countries and in low-income countries was 23, 30 and 17 percent, respectively [1]. According to the results of the National Survey of Risk Factors for Non-Communicable Diseases in 2016, the prevalence of physical inactivity in Iran was 56.3% and in Yazd province 65.8%. The prevalence of physical inactivity in the world, Iran and also in Yazd, in women is higher than in men [2].

Annually, non-communicable diseases in the world lead to the death of 38 million people, 16 million of which are premature deaths before the age of 70 [3]. The most important risk factors for non-communicable diseases include high blood pressure, high blood cholesterol levels, inadequate consumption of fruits and vegetables, overweight and obesity, physical inactivity, tobacco and alcohol, five of which are associated with physical inactivity and poor nutrition. More than 14 percent of deaths worldwide are attributed to physical inactivity, while it accounts for 21 to 25 percent of breast and colon cancers, 27 percent of diabetes, and 30 percent of cardiovascular disease. Thus, increasing physical activity in society is one of the effective ways to reduce the burden of non-communicable diseases [4, 5].

Determining the geographical distribution of a phenomenon is one of the most important ways to find out the causes of that phenomenon. Numerous studies have examined the relationship between the geographical distribution of habitat and environmental factors. For example, Sharman et al. [6] in their study examined the geographical distribution of obesity and physical activity in eight residential areas of Vancouver. In their study, neither obesity nor physical activity were shown to be clustered using the Moran’s I test. Estabrooks et al. [6] also examined the existence and availability of physical activity resources in neighborhoods with different socio-economic status in a small U.S. town, and they used a geographic information system to show that the number of physical activity resources in neighborhoods with low and medium socio-economic status was significantly lower than neighborhoods with high socio-economic status [6]. No study was conducted on this issue in Yazd city. This study aimed to depict geographical distribution of low physical activity in Yazd city, identifying low activity clusters and the zoning status of physical activity scores there.

MATERIALS AND METHODS

This is a cross-sectional descriptive analysis conducted based on the Geographic Information System (GIS). The data used are related to the first stage of the Yazd Health Study (YaHS). YaHS was conducted to determine the related risk factors and prevalence of non-communicable diseases in the Yazd Greater Area. The target population was all residents between 20 to 69 years of age. The data of YaHS, with the exception of rural and suburban areas, yielded 8,727 people. The sampling method in the YaHS design was cluster sampling with 94.9% response rate. To have the questionnaires completed, interviewers went to the houses of selected individuals with prior arrangement. The profile of YaHS has been published elsewhere [7].

The data collection tool in YaHS is the short form of the International Physical Activity Questionnaire (IPAQ-SF). In this questionnaire, the activities performed by the individual over the previous week are questioned according to the severity of that activity, and activities with the duration of more than 10 minutes are included in the calculation of the individual's

physical activity. The total physical activity score for each individual is calculated from the product of the duration of each activity in the metabolic equivalent of that activity. For high-intensity activities, metabolic equivalent 8, medium-intensity activity equivalent to metabolic 4, and low-intensity activity equivalent to metabolic 3 are considered. To calculate the duration of each activity per week, the number of repetitions of each activity per week is multiplied by the duration of each activity session. To group physical activity scores, individuals were grouped into two categories with scores less than 600 as inactive, and larger and equal to 600 as having the minimum physical activity required for health.

In the YaHS, 6 criteria (education, marital status, employment status, housing ownership, housing infrastructure and insurance) have been used to determine the individuals' socio-economic status (SES). The range of scores that can be obtained for the variable of socio-economic status is from 1 to 18.

In order to achieve the geographical coordinates of the people participating in the YaHS project, the companies providing geographical services and the Google map were applied. GIS was used to analyze the data in ARC Map10.5 environment. Initially, the data was entered through the Excel file in the ARC Map software environment and the reference land. To do this, the WGS_1984_UTM_Zone_40N coordinate system has been used. The geographical coordinates that were first extracted from the Google map were first entered using the GCS_WGS_1984 coordinate system and then converted to the WGS_1984_UTM_Zone_40N coordinate system.

To determine the distribution of inactive people, the average nearest neighbor function has been used. To determine the clustering status of the physical activity score, the spatial autocorrelation of (Moran's I) was analyzed and the analysis of hotspots was used to indicate the location of the clusters on the map. The Manhattan method was used to calculate distances, and the inverse distance method was used to conceptualize spatial relationships. The universal Kriging input was used to zone physical activity scores. In order to normalize the dependent variable in Kriging, the logarithm of the physical activity score was used, and the final output of the anti-logarithm was reported. Also, to compare the physical activity status according to demographic variables, Chi-square statistical test was used in SPSS.19 statistical software.

This manuscript is based on the master's thesis entitled: Study of physical activity and its relationship with the geographical distribution of green spaces and sports places in Yazd city 1993–94. This dissertation was approved in Dec.2, 2018 in the ethics committee of Yazd University of Medical Sciences.

RESULTS

The prevalence of physical inactivity in the population aged 20 to 69 years was 61.9% (CI 95%:60.9–62.9), 69.4% in women and 54.4% in men. With the increase in age, the prevalence of physical inactivity has increased, from 53.2% in the age group of 20–29 years old to 76.1% in the age group of 60–69 years old. There was also a significant inverse relationship between the prevalence of physical inactivity and socio-economic status. Thus, the prevalence of physical inactivity is 69.6% in people with a low socio-economic status, 57.4% in people with a medium socio-economic status and 48.2% in people with high socio-economic status. This difference was statistically significant using the Chi-square test (Table 1).

Table 1. Physical activity status by sex, age group and socioeconomic status in the population aged 20 to 69 years in Yazd City, 2014–2015

Variable	Inactive (MET Minute/Week<600)	Active (MET Minute/Week≥600)	Total	P value
Total	5405(61.9%) CI 95%:60.9-62.9	3321(38.1%) CI 95%:37.1-39.1	8727	
Sex				
Male	2359(54.4%)	1976(45.6%)	4335	< 0.001
Female	3046(69.4%)	1345(30.6%)	4391	
Age group				
20-29	910(53.2%)	802(46.8%)	1712	
30-39	941(54%)	801(46%)	1742	
40-49	1083(60.1%)	718(39.9%)	1801	< 0.001
50-59	1164(66.9%)	575(33.1%)	1739	
60-69	1286(76.1%)	404(23.9%)	1690	
Socioeconomic status				
low	2088(69.6%)	911(30.4%)	2999	
Medium	2630(57.4%)	1955(42.6%)	4585	< 0.001
High	212(48.2%)	228(51.8%)	440	

Figure 1 shows the state of physical inactivity distribution in three groups: women, men, and the whole sample. Using the average nearest neighbor test, the inactive distribution in all three groups was seen as a cluster with the nearest neighbor ratios of 0.35, 0.4, and 0.28, respectively, at a significant level (P-Value: 0.0001). Comparing these maps with each other shows that the geographical distribution of inactive people in these three groups is not much different from each other.

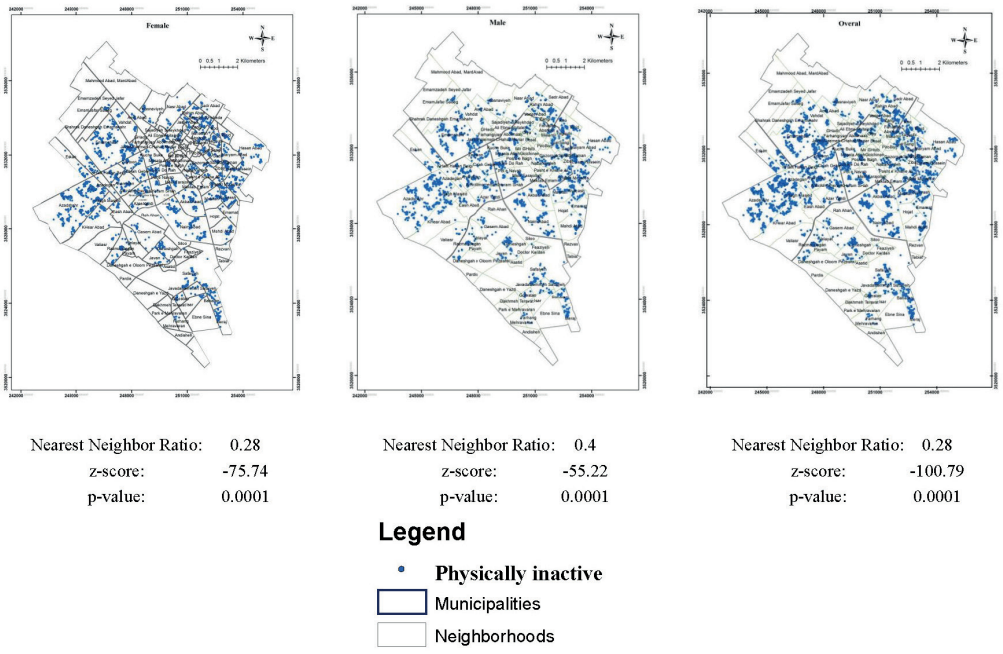

Fig.1. Distribution of physically inactive residents 20-69 years old in Yazd city by sex in 2014–2015

Figure 2 shows the geographical distribution of inactive people in Yazd in terms of age groups. The average nearest neighbor test showed the physical inactivity distribution as a cluster in all age groups with ratios of 0.35, 0.41, 0.43, 0.4 and 0.38, respectively, at a significant level (P-Value: 0.0001). Comparing the distribution of inactive people by age groups shows that the pattern of distribution of inactive people in these five age groups is not much different.

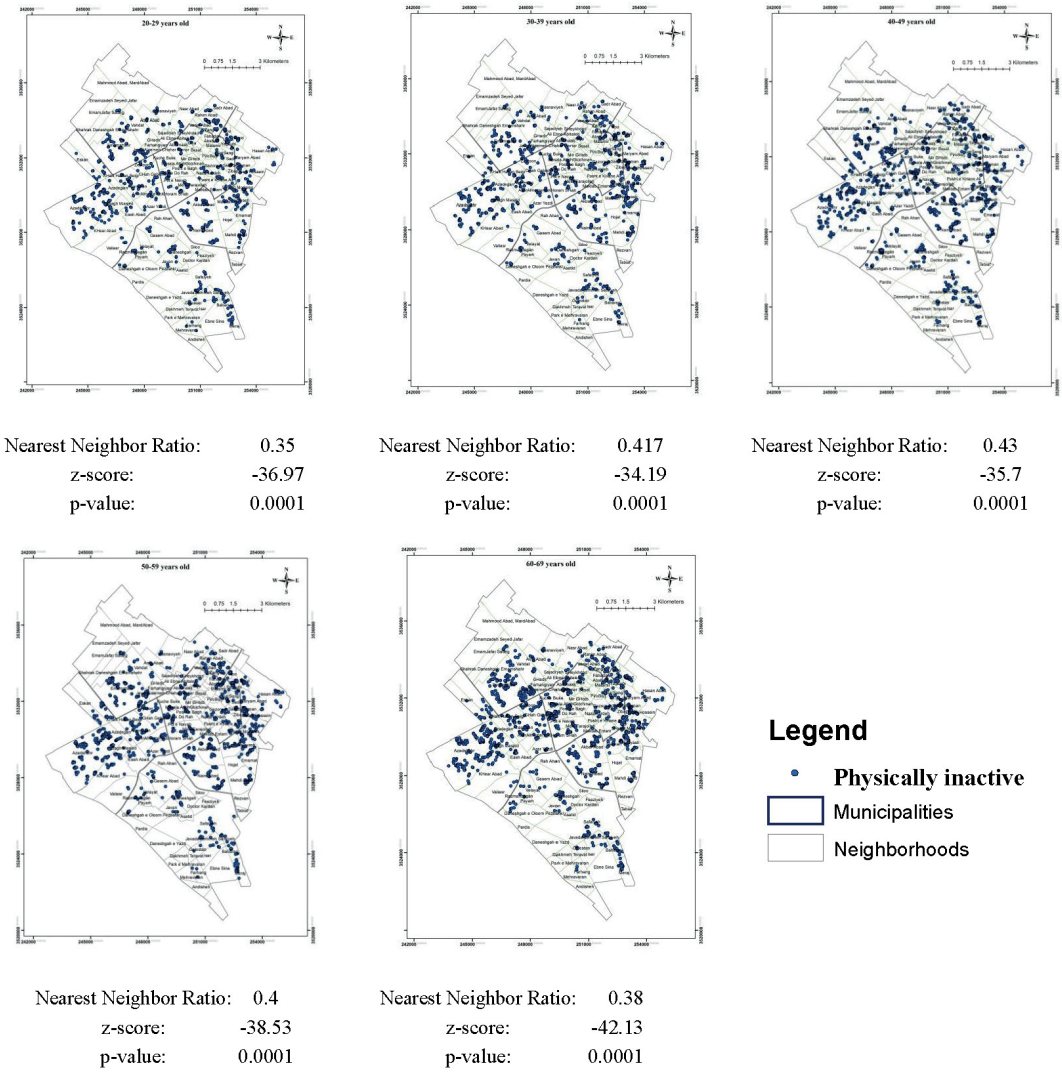

Fig. 2. Distribution of physically inactive residents in Yazd city by age in 2014-2015

Figure 3 shows the geographical distribution of inactive people in Yazd in terms of their socio-economic status. The average nearest neighbor test showed the physical inactivity distribution in low, medium, and high socio-economic groups as a cluster with ratios of 0.33, 0.37, and 0.64, respectively, at a significant level (P-Value: 0.0001). A comparison of inactive distribution in these three groups does not differ much.

Figure 4 shows spatial autocorrelation analysis of the physical activity score in three groups: women (Moran's index: 0.4), men (Moran's index: 0.29), and the whole sample (Moran's index: 0.3) as cluster at a significant level (P-Value: 0.0001). In this map, the geographical distribution of hot and cold spots of the physical activity score of the people of Yazd city is shown by using the analysis of Hot Spots. According to this map, the distribution of hot and cold spots of physical activity scores in the three groups (men, women, and the whole sample) is almost the same, yet with the difference that in the map of women in the southern neighborhoods, such as Baharan, Safaieh, Javadalaimeh, Farhang, Daneshgah and Javan, there are hot clusters that are not seen in the map of men. Also, in the map of men, in western neighborhoods, such as Hassanabad, Imam Hossein and Shahid Motahhari, there are hot clusters that are not seen in the map of women.

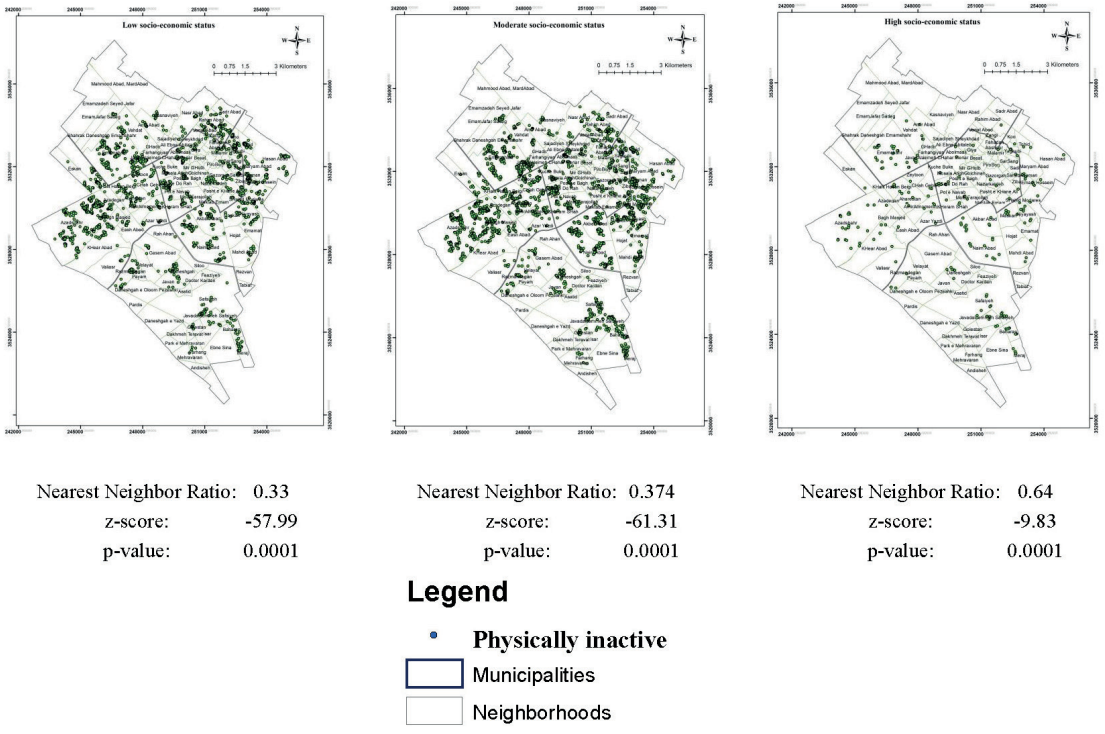

Fig. 3. Distribution of physically inactive residents 20-69 years old in Yazd city by socio-economic status in 2014-2015

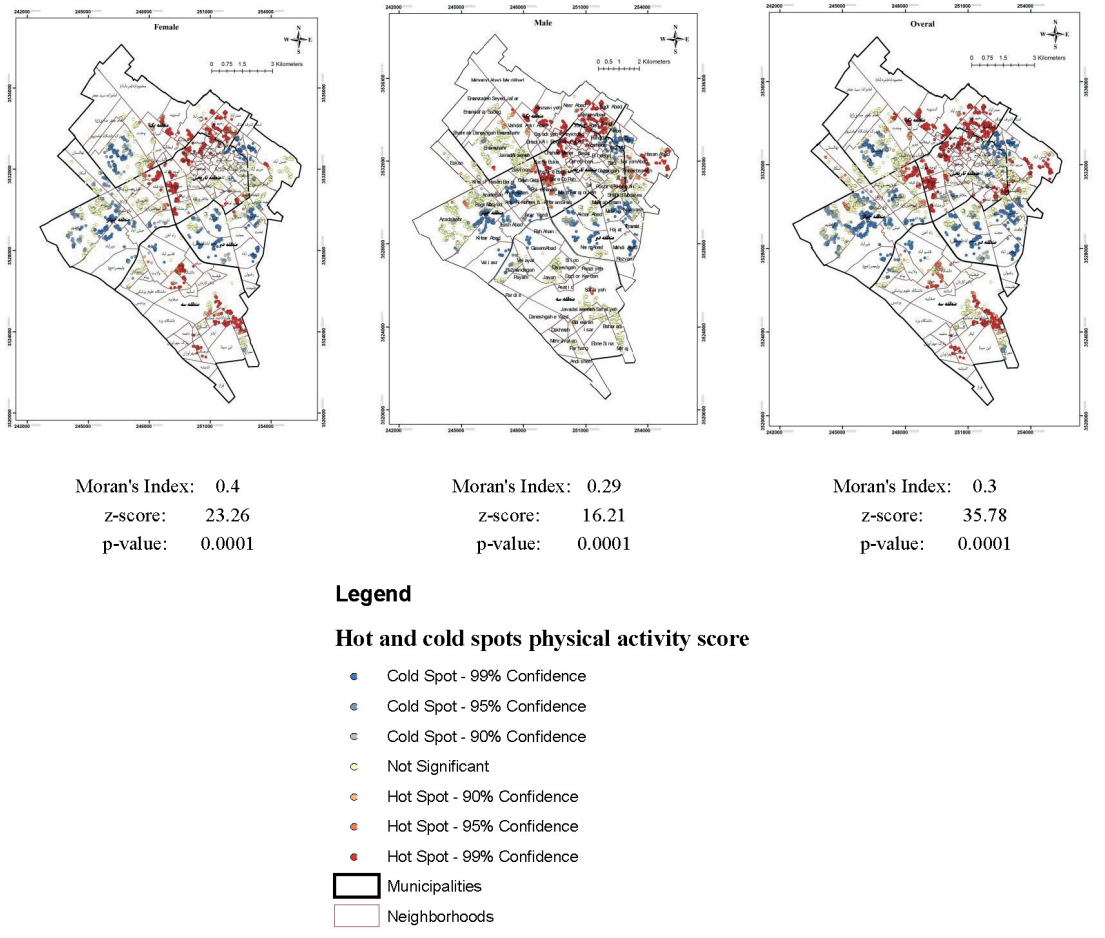

Fig. 4. Distribution of hot and cold spots physical activity score residents 20-69 years old in Yazd city by sex in 2014–2015

Figure 5 shows the status of the physical activity scores of the people of Yazd in three groups of men, women, and the whole sample. According to this map, the zoning status of the activity score in women is similar to that of the whole sample in a way that for central neighborhoods of Yazd and from the east to the west, such as Azadshahr, Eishabad, Khairabad, Akbarabad, Naeem Abad, Hojjat, Mehdiabad and Tohid, a lower score has been estimated. The zoning map of men's physical activity score is such that a higher score has been estimated only for the northern neighborhoods of Yazd, such as Kasnaviyeh, Mahmoudabad, Nasrabad, as well as Hassanabad. The spatial coherence of this modeling is poor, but the RMS of all three maps is less than one and close to zero.

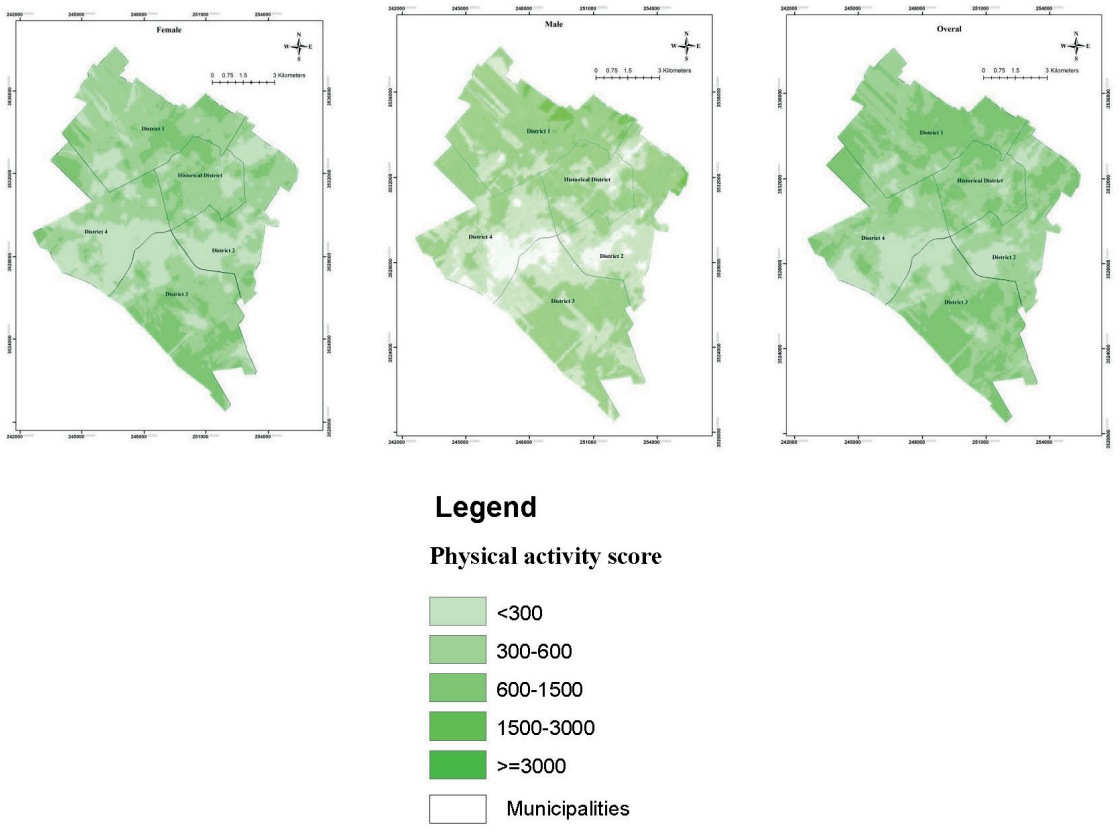

Fig. 5. Zoning the physical activity score in residents 20-69 years old in Yazd city by sex in 2014–2015

DISCUSSION

In this study, the prevalence of physical inactivity in the population of 20 to 69 years of age in Yazd city was 61.9%, which is higher compared to the prevalence of physical inactivity in the population of 18 to 69 years of age in the whole country (56.3%) [2] and also the statistics published in 2010 (23%) [1]. In addition, the trend of physical inactivity prevalence in Yazd province has been increasing, from 42.4% in 2006 to 61.9% in 2016 [2,8,9].

In this study, the prevalence of physical inactivity was significantly higher in women than in men (69.4% in women and 54.4% in men). According to the surveys of non-communicable disease risk factors in Yazd province from 2006 to 2016, the prevalence of physical inactivity in women has always been higher than in men [2, 9]. Higher prevalence of physical inactivity in women than in men has also been shown in several studies, including the case study in the population of 40 to 60 years old in northern Iran [10], the staff of the University of Medical Sciences [11], students [12, 14], and the elderly [13]. Also, in 17 out of the 20 countries surveyed by Bauman et al. [15], physical activity was reported to be higher in men than in women. Although the prevalence of physical inactivity in women is higher than in men

in this study, the distribution maps in men and women in Yazd are very similar. Also, the geographical distribution maps of hot and cold points of physical activity scores in men and women are similar.

In this study, with an increase in the age group, the prevalence of physical inactivity has increased, which is consistent with the study of Ishaqi et al. [13] and Bauman et al. [15]. In Rejali's study [14], the relationship between age and the overall score of physical activity is not at a significant level. Despite the positive relationship between age and the prevalence of physical inactivity, the distribution of physical inactivity in Yazd in different age groups is similar.

In this study also a significant inverse relationship between the prevalence of physical inactivity and socio-economic status which is consistent with the study of Agha Ali Nejad et al. [16] and Ishaqi et al. [13]. In Ebrahimi's study [17], with the increase in education and income, the subjects' sports participation had also increased. Dagkas and Stathi [18] also showed in their study that the participation rate of students with low economic background was limited compared to their peers with higher economic status. However, in a study by Rejali et al. [14], the lower social class reported significantly higher physical activity. In Hosseini's study [11], no significant relationship was obtained between physical activity score and socio-economic status. In this study, despite a positive and significant relationship between the socio-economic status and physical activity, there is a similar pattern in the inactivity of geographical distribution in groups of different socio-economic status.

In this study, the zoning status of Yazd people's physical activity score by the Kriging interpolation method is shown in three groups of men, women, and as a whole. Based on these maps, the estimated physical activity score in the central part and from east to west of Yazd, such as Azadshahr, Eishabad, Khairabad, Akbarabad, Naeemabad, Hojjatabad and Mehdiabad neighborhoods, is lower. In this regard, the results of a study by Stronegger et al. [5] stated that high social quality in residential environments predicts high levels of physical activity. This can be generalized to the status of physical activity scoring in Yazd. Of course, according to the study by Lotfi et al. [19], the pattern of interference of uses has a significant effect on the rate of walking and increasing the citizens' physical activity.

CONCLUSIONS

The prevalence of physical inactivity is high in Yazd city compared to the whole country. It is more common in women than in men. It increases with age and decreases with high socio-economic status. It is necessary to design and implement the interventions to promote physical activity for women, older people and those of better socio-economic status. In the meantime, it is necessary to prioritize areas with lower physical activity especially in the central part and in the direction from east to west.

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