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Original Article

Association between socio-demographic factors and diabetes mellitus in the north of Iran: A population-based study

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ABSTRACT

Objective: This study considers the prevalence of DM and some related factors among adults in the Golestan province (north of Iran) in 2006.
Methods: This is a Crossectional–Descriptive and population-based study, carried out among 1999 cases (1000 men and 999 women) between 25 and 65 years old. Participants were chosen by cluster and stratified sampling in urban and rural areas. Data on socio-demographic factors were collected using questionnaire, and anthropometric and biochemical indexes were measured. Fasting Blood Sugar (FBS) equal to or over 126 mg/dl was classified as type 2 DM.
Results: Mean of age was 39.2 years and mean ± SD of FBS among men and women was 94.51 ± 32.91 and 98.2 ± 40.1 mg/dl, respectively. Prevalence of DM was 8.3% [(men = 6.8% and women = 9.7%), (urban = 10.5% and villages = 6.4%)]. Twenty-five percent of patients were undiagnosed as whole, 43% of patients were unaware of their problem, in men more than women (48.5% versus 39.2%) and in rural area more than in urban area (35.1% versus 54.4%). We showed a positive and significant correlation between FBS and age, waist circumference and BMI ($P = 0.01$).
Conclusion: DM was the one of the biggest health problems in the north of Iran, and half of them were unaware of their morbidity. DM was influenced by socio-demographic factors.

1. Introduction

The number of people suffering from DM is increasing due to population growth, aging, urbanization, low physical activity and the high prevalence of obesity [1,2]. Quantifying the prevalence of DM and the number of people affected by diabetes, now and in the future, is important in permitting national planning and allocation of resources.

DM and its complications are a major cause of morbidity and mortality in developing countries. Successful management of DM requires that we understand the beliefs, lifestyles, attitudes, family and social networks of the patients being treated [3].

Veghari [4] announced that diabetes is one of the health problem in north of Iran and that patients do not have an effective knowledge about their diet and blood glucose controlling methods. Hadaegh [5] in Iran [5] reported that DM is a health problem, and most of patients were unaware of their problem.

The studies of Azimi-Nezhad [6] and Maddah [7] in Iran showed that DM was related to socioeconomic factors. Janghorbani [8] reported that metabolic syndrome was common among 65% of DM in Iran.

Of the 1,600,000 population in the north of Iran, 66.39% are 15–64 years old, whereas 43.9% and 56.1% are living in urban and rural areas, respectively [9]. Agriculture is the main job in rural areas. Different ethnic groups, such as Fars(native), Turkman and Sistani, are living in this region.

Due to the restriction in executing epidemiological projects, there has been no study of the DM in this area up till now; therefore it was necessary to design a research project to address this. The aims of this study are to determine the prevalence of DM and some socio-demographic factors such as sex, age, BMI, central obesity, residential area, physical activity, economic status and level of education in the north of Iran in 2006.

2. Material and methods

This population based cross sectional descriptive study was carried out in 1999 adults (1000 males and 999 females) between 25 and 65 years old. Participants were chosen by cluster and stratified sampling in urban and rural areas.

According to American Diabetes Association (ADA) criteria, Fasting Blood Sugar (FBS) equal to or more than 126 mg/dl was diagnosed as type 2 DM [10].

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FBS were determined using laboratory kits (enzymatic methods) and spectrophotometry technique. Data on socio-demographic factors and physical activity were collected using questionnaires. Anthropometric and biochemical indexes were examined. Body Mass Index (BMI) was calculated by dividing weight (kg) to height (m^2). Those with a BMI of 25.0–29.9 kg/m^2 were classified as overweight, while those with a BMI $\geqslant$ 30.0 kg/m^2 were classified as obese and BMI $\geqslant$ 40 classified as pathologically obese [11]. Central obesity was defined based on waist circumference (men $\geqslant$ 102 and women $\geqslant$ 88 cm) [12].

Weight measurement without shoes and clothing was carried out using a balance, and recorded to the nearest 0.5 kg. Height and waist were measured to the nearest 0.5 cm, while the participants were standing on their feet. Waist circumference was measured using a tape measure over the iliac and lower border of the ribs.

Economic status, with regard to Iranian social-economic was categorized as based on home ownership, number of the rooms in the house, owning of a private car, structure of the house and the number of the family members. According to this list, the scoring of economic status of the sample population in this study was as follows: low $\geqslant$ 1, moderate = 2–3, and good $\geqslant$ 4. Physical activity was categorized as based on activity during daily work, in five categories: (1) no physical activities (without moving from one place to another place); (2) low activity (physical activity involving the extension of muscular-skeletal and moving from one place to another place); (3) moderate activity (physical activity sometimes involving an increase in respiratory rate like cleanliness, gardening, building painter,...); (4) high activity (physical activity involving a highly increased reparatory rate such as manual labor, building labor, porter,...) and (5) all of the above activities during the day.

Educational level categories were based on three levels: illiterate, 0–12 years schooling and college.

Data were analyzed using SPSS version 16.0 and statistical significance was defined as a p-value of <0.05. Analysis of variance (ANOVA) and chi-2 tests were used to compare group means and frequencies, respectively.

3. Results

Mean and standard deviation of FBS are present in Table 1, and prevalence of DM was shown in Table 2.

Mean and standard deviation of FBS was 96.40 ± 36.38 mg/dl and the prevalence of DM was 8.3%. Nearly 25% of total cases of diabetes were undiagnosed. The portion of type 2 DM is 95.4%. There was a positive and significant correlation between age and blood glucose ($P < 0.05$). The mean of blood glucose was shown to be more significant in women more than men ($P < 0.05$). The prevalence of DM in women was 3.1% more than in men, and in 55–65 years olds, was five times more than the 25–35 years old group.

Statistically significant differences were shown among four age groups, based on the mean of FBS ($P < 0.001$).

The mean of blood glucose among central obese people was 10.1 mg/dl more than in normal people, and the prevalence of DM was also 7.3% more. The prevalence of DM in urban areas was more than rural (10.4% versus 6.4%), and statistical differences were significant ($P = 0.003$). Meanwhile, there was a direct relationship between FBS level and economic status, but statistical differences were not significant between the three economic groups.

Physical activity has a marked effect on FBS level, and the prevalence of DM in the low physical activity group was two times as much as in the high physical activity group, and the statistical differences were significant ($P = 0.04$). There was a positive correlation between BMI and FBS level, and it was elevated to 1.77 mg/dl per 1 kg/m^2 of BMI increasing, as whole. The prevalence of DM among pathologic obese people was five times more than in normal people. Statistical differences were significant ($P = 0.001$). There was a statistical significant difference among the three educational levels and DM was significantly observed in illiterate people, more so than in other educated groups ($P = 0.004$). The prevalence of DM among central obese people was significantly more than in normal people ($P = 0.001$).

Table 1
FBS and socio-demographic factors among adult people in the north of Iran.

Characteristics	*N*	Mean(SD) mg/dl	ANOVA test *P*-value
Sex			
Male	1000	94.56(32.2)	0.023
Female	999	98.25(40.10)	
Age group(y)[*]			
25–35	548	87.74(27.01)	0.001
35–45	538	94.36(33.59)	
45–55	489	103.33(44.18)	
55–65	419	102.39(38.04)	
Central obesity			
No	1113	92.05(29.67)	0.001
Yes	850	102.65(44.84)	
Residential area			
Urban	931	99.79(40.18)	0.001
Village	1067	93.45(32.45)	
Economic status[**]			
Low	211	93.83(38.30)	0.549
Moderate	1717	96.68(36.29)	
Good	70	97.30(32.70)	
Physical activity[***]			
Low	508	99.34(40.67)	0.004
Moderate	883	93.34(30.90)	
High	83	88.39(18.17)	
Whole	96	96.75(36.48)	
BMI[*]			
<18.5	58	87.69(16.62)	0.001
18.5–24.9	665	91.12(31.67)	
25–29.9	663	95.94(33.72)	
30–34.9	538	103.35(44.53)	
35–39.9	42	113.67(52.19)	
Educated level			
Illiterate	731	98.90(39.21)	0.04
0–12 year schooling	1147	95.34(35.41)	
College	120	91.41(25.24)	
Overall	1999	94.40(36.38)	

SD: standard deviation.
FBS equal to or more than 126 mg/dL defines hyperglycemia and diabetes mellitus.
[*] The mean of FBS has a positive and significant correlation with age and BMI.
[**] Although a positive correlation has shown between economic status and FBS, statistical differences is not significant.
[***] There is a negative and significant correlation between FBS and physical activity.

4. Discussion

The results of this study were discussed from two aspects, prevalence and certain factors related to DM. In the present study, the prevalence of DM was 8.3%, and 25% of them were undiagnosed. The prevalence of diabetes was estimated to be 10% and 8.1% in women and men in Theran (center of Iran), respectively; based on this study, 40% of patients were undiagnosed [5]. Another study [6] reported that the prevalence of DM in Iran was 5.5%. The proportion of undiagnosed diabetes in China population was 70.5% and 58% in rural and urban areas, respectively [13]. In comparison with other studies, the undiagnosed DM rate in the north of Iran is appropriate.

King and et al. [2] were estimated the prevalence of DM in Iran up to 5.5% in 1995, 6.8% in 2000 and 6.8% in 2025. The prevalence

Table 2
Relationship between hyperglycemia and socio-demographic factors among adult people in the north of Iran.

Characteristics	*N*	Hyperglycemia *N* (%)	Chi 2 test *P*-value
Sex			
Male	1000	68(6.8)	0.029
Female	999	97(9.7)	
Age group(y)[*]			
25–35	548	14(2.8)	0.001
35–45	538	26(5.2)	
45–55	489	53(10.6)	
55–65	419	72(14.5)	
Central obesity[*]			
No	1113	58(5.2)	0.001
Yes	850	106(12.5)	
Residential area			
Urban	931	97(10.4)	0.003
Village	1067	68(6.4)	
Economic status			
Low	211	14(6.6)	0.665
Moderate	1717	146(8.5)	
Good	70	5(7.1)	
Physical activity[*]			
Low	508	51(10.0)	0.038
Moderate	883	55(6.2)	
High	83	4(4.8)	
Whole	96	7(7.3)	
BMI[*]			
<18.5	58	2(3.4)	0.001
18.5–24.9	665	32(4.8)	
25–29.9	663	51(7.7)	
30–34.9	538	69(12.8)	
35–39.9	42	8(19.0)	
Educated leve[*]*l*			
Illiterate	731	72(9.8)	0.056
0–12 year schooling	1147	89(7.8)	
College	120	4(3.3)	
Overall	1999	16.5(8.3)	

[*] Statistical differences are significant.

of DM in our study was approximately equal to other studies. We showed the prevalence of DM in women 3.1% more than men. Another study [2] have similar result. In religions countries like Iran, because of family priorities women can not exercise in public places. Like the other study [2], we have DM prevalence in urban more than rural residents.

The prevalence of DM increased with age, low physical activity, central obesity and BMI. Some studies [14–16] showed a higher DM rate in older people.

Patrick [17] and Wannamethee [18] showed that the prevalence of DM in low active people is more than in highly active people. Harris in US [15], Simmons [19] O'Rahilly [20], Regzedmaa [21], Brancati [22] and Thompson [23] announced that obesity and central obesity are two risk factors for the incidence of DM.

Like other studies [24,25] there was no positive correlation between economic status and educational level. Meanwhile, Weissman [26] showed that low economic status was associated with low access to health care. Limited access to health care not only influences the use of preventive services [27], but also elevates the risk of a decline in health [28].

In the present study, there was an association between illiteracy and DM which was consistent with other studies [29–31]. Moreover, limited literacy is associated with a decreased knowledge of medical conditions [32,33]. These persons have no access to knowledge about self care for the prevention or treatment of DM and other diseases [34,35].

We had no information about medical supervision status, and we did not determine all of the factors related to DM, such as quantity and quality of diet, duration of diabetes morbidity and ethnic differences in this area. These are the limitations of this study.

Briefly, our study has shown that DM was a health problem in the north of Iran, and one to four of diabetic patients remained undiagnosed. Socio-economic status, obesity and low physical activity are predisposing factors for DM morbidity. A screening and intervention program for preventing of DM in the north of Iran is necessary.

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