ISSN: 2345-2897; Health Education and Health Promotion. 2019;7(2):89-93

Prevalence of Diabetes Mellitus in Adult Residents of Rural Regions of Grash Town, Fars, Iran during 2015-2016

ARTICLE INFO

Article Type
Descriptive Study

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How to cite this article
Soori H, Mohammmadi M N, Yoosefi Lebni J. Prevalence of Diabetes Mellitus in Adult Residents of Rural Regions of Grash Town, Fars, Iran during 2015-2016. Health Education and Health Promotion. 2019 ;7(2):89-93.

ABSTRACT

Aims To find prevalence and related factors of diabetes mellitus in rural regions of Grash Town located in central Iran (Fars province) composed of 25 rural regions.

Instruments & Methods This cross sectional study was conducted on a sample of 1523 adults aged ≥30 years, living in rural regions of Grash Town during 2015-2016. We used stratified random sampling. Participants were invited by calls and informed consent was obtained from all. We checked HbA1c of participants and demographic information, past medical history, and some risk factors (BMI, familial and personal history of diabetes and level of physical activity) among them were investigated. Cases with HbA1C≥6.5% were considered diabetics. Pregnant women and people with haemoglobinopathies, anemias, and chronic liver/renal diseases were excluded. Data were analyzed, using SPSS19 software. Statistical significant level was <0.05 in this study.

Findings In this study, 507(33.3%) cases were with HbA1c≥6.5%, of whom 241 (15.8%) were previously diagnosed as diabetic. Diabetes was associated with age (p<0.001), occupation (p=0.04), education (p<0.001), marital status (p<0.001), BMI (p<0.001), and familial history (p<0.001). Age ≥ 50 years, familial history of diabetes, obesity/overweight, unemployment, low educational attainment, and loss of partner were all more frequent in diabetics.

Conclusion Prevalence of diabetes measured by HbA1c in this study was greater than most previous studies in Iran. However, most studies have used FBS and we need further studies to determine optimal threshold of HbA1c for diagnosis of diabetes in Iranian population. High risk people should be focused in preventive and control programs.

Keywords Diabetes Mellitus; Glycated Hemoglobin A; Prevalence; Screening; Risk factor

CITATION LINKS

[1] Projection of the year 2050 burden of diabetes in the US adult population: Dynamic modeling ... [2] National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980 ... [3] Global burden of diabetes, 1995-2025: Prevalence ... [4] Diabetes in Iran: Prospective analysis from first nationwide ... [5] Projection of diabetes population size and associated ... [6] The direct medical costs of outpatient cares of type 2 diabetes in ... [7] Prevention or delay of type 2 diabetes: Standards ... [8] Iran Diabetes Research Roadmap (IDRR) study ... [9] Epidemiology of diabetes mellitus ... [10] Higher prevalence of diabetes mellitus and impaired glucose tolerance ... [11] Diagnosis and classification of diabetes ... [12] Classification and diagnosis of diabetes: Standards ... [13] Glycemic thresholds for diabetes-specific retinopathy: Implications for diagnostic ... [14] Diagnostic value of hemoglobin A1c for type 2 diabetes mellitus in ... [15] Prevalence of diabetes and prediabetes according to fasting plasma ... [16] Tools for practice: Screening and diagnosis of type 2 ... [17] HbA_{1c} as a diagnostic test for diabetes mellitus - reviewing ... [18] Body mass index and obesity: Tailoring "cut-off" for ... [19] Why screening for type 2 diabetes is necessary even ... [20] Screening for ... [21] Screening for diabetes with HbA1c: Test performance of HbA1c compared ... [22] Screening for abnormal blood glucose and type 2 ... [23] IDF diabetes atlas: Global estimates for the prevalence of ... [24] High prevalence of diabetes and abnormal ... [25] Third national Surveillance of Risk Factors of Non-Communicable ... [26] The prevalence of pre-diabetes and diabetes in the Kuwaiti adult ... [27] Prevalence of type 2 diabetes mellitus in a sample of the adult ... [28] The prevalence and management of diabetes in ... [29] The comparison of prevalence of diabete and hypertension ... [30] Optimal Glycated hemoglobin cutoff ... [31] Diabetes in older ... [32] Prevalence of and trends in diabetes among ... [33] Correlates of age onset of type 2 diabetes ... [34] Prevalence of type 2 diabetes mellitus in Iran and its ... [35] The correlation of HbA1c with body mass index and ... [36] Correlation of HbA1C levels with body ... [37] Familial history of diabetes and clinical ... [38] Family history of type 2 diabetes: A population-based ...

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Article History
Received: September 09, 2018
Accepted: February 26, 2019
ePublished: April 09, 2019

Introduction

Diabetes is a great public health concern in the world [1]. This chronic disease with severe complications imposes high burden to all communities [2]. Prevalence of diabetes has been increasing in recent decades and this pattern is expected to continue [3]. The greatest prevalence of diabetes belongs to Middle East [4, 5]. Prevalence of diabetes in Iran is considerable and it shows rapid rise as estimated to double during 2011-2030 [4]. Age distribution of diabetic patients in Iran is also different from developed countries, while the majority cases in western countries are old; most Iranian cases are middle aged people that are productive and economically active [6].

It is proven that preventive measures such as lifestyle modification can reduce burden of diabetes [7]. Due to increasing burden of diabetes, establishment of preventive measures is a priority [5]. Community-based preventive measures have been implemented in Iran since 2003 [5], but still, there is not enough focus on the prevention of diabetes [8]. There are regional varieties in the prevalence of diabetes in Iran [9]. Studies demonstrate higher prevalence of diabetes in rural areas, which may be attributed to socioeconomic factors [10]. Knowledge of the prevalence of diabetes is essential for implementation of effective preventive measures. Therefore, we need regional studies about the extent of diabetes in our country.

In this study, we investigated the prevalence of diabetes mellitus in rural regions of Grash Town that is located in central part of Iran (Fars province) composed of 25 rural regions with 14456 inhabitants.

Instruments and Methods

This cross sectional study was conducted on a sample of adults aged ≥30 years, living in rural regions of Grash Town during 2015-2016. 7 Rural health centers cover rural regions of this town. Stratified random sampling was used in this study. Each rural health center was regarded as a stratum and random quota sampling was applied in each stratum.

People were invited to take part in the study randomly by phone call and informed consent was obtained from all study participants. Trained health care workers conducted the study. First, people were interviewed and their demographic information (age, sex, occupation, education, and marital status), past medical history, and some risk factors (BMI, familial and personal history of diabetes, and level of physical activity) of them were investigated. We used a questionnaire for data gathering completed by interview. Participants were referred to the laboratory of each health center for taking blood samples and, then, their samples were analyzed at the referral laboratory of Grash Town for glycated hemoglobin A (HbA1c).

HbA1c is proposed as a screening tool by American Diabetes Association (ADA) [11, 12]. Cases with HbA1C≥ 6.5% [11, 13-16] were considered as diabetics. Pregnant women were not included in the study. In addition, people with proven history of hemoglobinopathies, anemias, and chronic liver or renal diseases were excluded because these problems can affect level of HbA1c [17]. Based on ADA recommendations, optimal physical activity was determined as 150 minutes of moderate level activity in a week [7]. According to Body Mass Index (BMI), people were classified as underweighted with BMI<18.5, normal-weighted with BMI of 18.5-25, over-weighted with BMI of 25-30, and obese with BMI≥30 [18]. Association between diabetes (HbA1c ≥ 6.5%) and personal information and risk factors were also investigated.

The data were analyzed, using SPSS 19 software. Chi-squared test was used for data analysis. Statistically significant level was <0.05 in this study.

Findings

In this study, 1523 inhabitants of rural regions of Grash Town were investigated. Among the study population, 241 (15.8%) were previously diagnosed with diabetics by Fasting blood glucose (FBS). Age distribution of study population is summarized in Figure 1. Of study population, 999 (65.6%) were female and 524 (34.4%) were male. Mean age of men and women were 50.7 and 49.7 years, respectively (p<0.05). Among the study participants, 938 (61.6%) were housewives, 416 (27.3%) were self-employed, 129 (8.5%) were unemployed, and 40 (2.6%) were employees. Educational attainment of participants was as follow: 489 (32.1%) were illiterate, 918 (60.3%) were not completed high school, 79 (5.2%) were high school graduates, and 37 (2.4%) were with college/ university degree. 1297 (85.2%) participants were married, 148 (9.7%) were widow or divorced, and 78 (5.1%) were single. Regarding BMI, 58 (3.8%) were low-weighted, 527 (34.6%) were with normal weight, 646 (42.4%) were over-weighted, and 292 (19.2%) were obese.

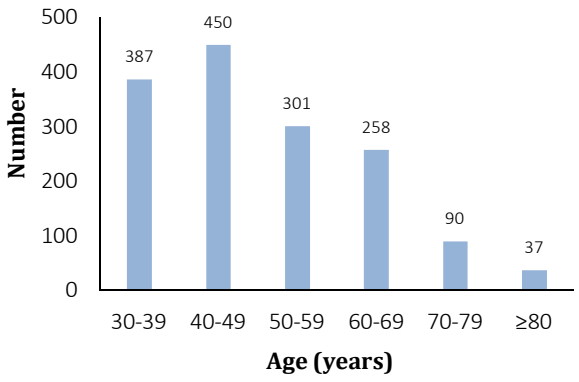

Figure 1) Age distribution of study population

All 241 previously diagnosed diabetic patients had HbA1c≥6.5%. 266 out of 1282 persons (without previous diagnosis of diabetes) had HbA1c≥6.5%; thus, prevalence of diabetes using HbA1c as a screening test with cut-off point of 6.5% was 33.3% (507 out of 1523). Association between diabetes (FBS>6.5%) and related factors are summarized in Table 1.

Table 1) Association between diabetes and study variables

Variable	HbA1c <6.5%[1] N (%)	HbA1c ≥6.5%[2] N (%)	p-value
Gender			
Male	346 (34)	178 (35)	0.36
Female	670 (66)	329 (65)	
Age (Years)			
30-39	323 (31.8)	64(12.6)	<0.001
40-49	329 (32.4)	121(23.9)	
50-59	162 (15.9)	139 (27.4)	
60-69	132(13)	126 (24.8)	
70-79	48 (4.7)	42 (8.3)	
≥80	22 (2)	15 (3)	
Occupation			
Employee	29 (72.5)	11 (2.2)	0.04
Self-employed	285 (68.5)	131 (25.8)	
Unemployed	72 (55.8)	57 (11.2)	
Housewife	630 (67.2)	308 (60.8)	
Education			
Illiterate	270 (26.6)	219 (43.2)	<0.001
Undereducated	648 (63.8)	270 (53.3)	
High school	69(6.8)	10 (2)	
College/University	29 (2.8)	8 (1.5)	
Marital status			
Single	67 (6.6)	11 (2.2)	<0.001
Married	865 (85.1)	432 (85.2)	
Divorced/Widow	84 (8.3)	64 (12.6)	
BMI (kg/m²)			
Underweight	43(4.23)	15 (3)	0.01
Normal	375(36.9)	152 (30)	
Overweight	406 (40)	240 (47.3)	
Obese	192(18.8)	100 (19.7)	
Familial history of diabetes			
Yes	330 (32.5)	271(53.4)	<0.001
No	686 (67.5)	236 (46.6)	
Optimal Physical activity			
Yes	863 (84.9)	449 (88.6)	0.06
No	153 5.1)	58 (11.4)	

1- Non-diabetics; 2- Diabetics

Discussion

Screening of diabetes mellitus is cost-effective even in rural and poor areas with low resources [19]. By early detection of asymptomatic patients or pre-diabetics, preventive interventions and control measures would be best applied to targeted populations and this will substantially reduce burden of the disease [20]. HbA1c have been commonly used for monitoring blood glucose in patients with diabetes, but recently its use for screening of diabetes have been underscored [12, 21, 22]. Lower interpersonal variability of HbA1c compared to FBS [16] and the possibility of its application on random non-fasting blood samples [21] make it an easy method for screening. However, this method is not globally accepted for screening of diabetes and there is not also a consistent cut-off level [16].

Prevalence of diabetes in our study was 33.3%. This rate is greater than most studies conducted in various parts of Iran and also world. A great body of evidence exists about diabetes; however, differences in sampling and screening methods, studied populations, and study designs make comparison of results imprecise. Global report of 2016 shows the prevalence of 8.5% for diabetes [23]. Prevalence of diabetes in a study conducted by Hadegh *et al*. on a random adult sample of Tehran in 2008, was 14% [24]. In a national study during 2007 on a random sample of 5278 Iranians of 15-64-year-old, the prevalence of diabetes was 8.7% [25]. Prevalence of diabetes was 18.8% in Kuwait [26], 16.8% in adult rural residents of Alexandria, Egypt [27] and 13.2% in rural India [28].

In another study in rural regions of Fars province during 2008-2009, prevalence of diabetes was 14.1% [29]. None of the above-mentioned studies used HbA1c as their screening tool. The great prevalence of 33.3% of diabetes mellitus is a public health concern; however, this rate may be affected by cut-off level and may be inaccurate. It should be mentioned that HbA1c of 6.5% as the cut-off point for diabetes set by American Diabetes Association may not be optimal in Iranian population and regional studies determine the best threshold of HbA1c for screening of diabetes [30].

We found differences in age distribution of diabetics and non-diabetics. Most diabetic people (63.5%) were older than 50 years, while 35.8% of non-diabetics were ≥50. This is consistent with other studies that show diabetes is more prevalent in older people [31-33]. There was an association between occupation of participants and diabetes (p=0.04). Proportion of unemployed diabetics was greater than this rate in non-diabetics. Unemployed people are less physically active and also with low income and these two factors are related to diabetes development [34]. In the present study, relative frequency of illiterates was 17% greater in diabetics compared to non-diabetics. This finding is in line with other studies in Iran [34].

It is hypothesized that health care services are not affordable for illiterates, who are usually in low socioeconomic situation and they are not also aware of symptoms and consequences of diabetes [34]. Association between diabetes and marital status showed that relative frequency of widow/divorced diabetic participants was greater than those without diabetes. This is consistent with other reports from Iran that show loss of partner is a big stress, which can make people more vulnerable to chronic diseases such as diabetes [34]. Prevalence of diabetes in over-weighted and obese people was greater than

people with low or normal weight. Studies have revealed that HbA1c and BMI are positively correlated in diabetic patients or those with metabolic syndrome [35, 36]. In our study, 53.4% of diabetics were with positive family history, while this rate was 32.5% in non-diabetics and this difference was significant. Familial history of diabetes is a risk factor of its occurrence in people [37, 38]. In our study, the majority of people (diabetic and non-diabetic) fulfilled the criteria for optimal physical activity because rural residents are more physically active than urban inhabitants and we may need another scale to assess physical activity in our study population.

There were several limitations in this study. Due to difficulties in accessibility to residents of far rural areas and limited financial and human resources, we were not able to screen all of them and tried to obtain a representative sample by stratified random sampling, but it does not warrant generalization of the results. Approximately, 62% of the study population were housewives, showing that despite our random sampling, there is the probability of bias that should be regarded during interpretation of the results. Housewives in rural regions have special lifestyle that may affect occurrence of diabetes among them. In addition, about 62% of the participants were also over-weighted or obese and this distribution of BMI is also a contributor to great prevalence of diabetes. We need further studies with more representative samples to determine real prevalence of diabetes in rural Grash regions. In our study, People's information was gathered by interview which is not free of bias.

Conclusion

In our study, prevalence of diabetes in rural regions of Grash (diagnosed with HbA1c with cut-off level of 6.5%) was 33.3%, which is greater than most studies that diagnosed diabetes by FBS in Iran. We need further studies on the efficacy of HbA1c and its optimal cut-off level for diagnosis of diabetes in Iranian population. People with risk factors such as aging, overweight/obesity, low educational level, unemployment, and familial history of diabetes should be regarded in diabetes screening programs. Psychological factors such as loss of partner and socioeconomic determinants are also important in development of diabetes and should be also regarded.

Acknowledgements: Authors would thank all health care professionals of Grash Rural Health Centers.

Ethical Permissions: Study was approved by Ethics Committee of Shahid Beheshti University of Medical Sciences.

Conflict of Interests: None declared by authors.

Author's contribution: Soori H. (First author), Introduction author/ Original researcher (35%); Mohammmadi M.N. (Second author), Methodologist/ Discussion author (35%); Yoosefi Lebni J. (Third author), Assistant researcher/ Statistical analyst (30%)

Funding: None declared by authors.

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