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Journal of Research in Health Sciences

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## Original Article

# Prevalence of Diabetes in People aged $\geq 30$ years: The Results of Screening Program of Yazd Province, Iran, in 2012

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## ARTICLE INFORMATION

### Article history:

Received: 16 May 2013

Revised: 01 July 2013

Accepted: 24 July 2013

Available online: 05 August 2013

### Keywords:

Diabetes mellitus

Screening

Prevalence

Iran

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## ABSTRACT

**Background:** Among the non-communicable diseases, diabetes mellitus has an important ranking and with annually increasing rate where it is expected the number of people suffering from the disease will reach to 300 million up to 2025 in all of world. The prevalence of type 2 diabetes in Iran is 4-4.5% and in population aged above 30 years is greater than 14%. The present study is attempting to find out the prevalence rate of the disease and its risk factors in Yazd Province, central Iran.

**Methods:** This cross-sectional study was carried out in 2012. A total of 14993 subjects were randomly selected and enquired by a pretested questionnaire. Data were analyzed by descriptive statistics and appropriate statistical tests such as chi-square, and multiple logistic regressions.

**Results:** The prevalence rate of known diabetes and impaired fasting glucose was 16.3% & 11.9% respectively. Age, sex, family history of diabetes, high blood pressure, BMI, and history of gestational diabetes were significantly associated with diabetes disease ( $P=0.001$ ).

**Conclusions:** The prevalence rate of diabetes is higher than other parts of the world and living in the city. Female gender, increasing age, high blood pressure, increased BMI and positive family history, are independent risk factor for diabetes, therefore performing prevention programs and controlling these high risk groups should be considered as a priority.

**Citation:** Lotfi MH, Saadati H, Afzali M. Prevalence of Diabetes in People aged  $\geq 30$  years: The Results of Screening Program of Yazd Province, Iran, in 2012. *J Res Health Sci.* 2014;14(1):88-92.

## Introduction

In the past, communicable diseases were regarded as the biggest health problem of the world. But now, the increasing role of non-communicable diseases on the rate of deaths, especially in developing countries, is a serious threat to the health system<sup>1</sup>.

In 1997, the World Health Organization (WHO) announced that the prevalence of non-communicable diseases has become more than communicable diseases worldwide, and has become a health issue. Among the non-communicable disease, diabetes is of particular important where WHO reported it as a hidden epidemic in 1993 and called all countries to deal with this event<sup>2</sup>. Type 2 diabetes is one of the most common chronic diseases, causing major burdens on the health systems due to its increasing prevalence, micro, and macro vascular complications<sup>3</sup>.

It is estimated that the population of diabetics in the world by 2025 will reach about 300 million which the higher amounts are belong to developing countries<sup>4</sup>. Unlike the developed countries where people often involved with diabetes in older age, in the developing countries the age of disease is lower (between 46-64 years) and resulted in increasing in the burden of disease in these countries<sup>5</sup>. In Iran diabetes is a public health problem of Iranian people, so that most of peo-

ple are not aware of their disease<sup>6</sup>. This leads to the importance of type 2 diabetes screenings in the community. The common risk factors of disease are overweight, obesity, low physical activity, high fat, low fiber diet, race, family history, age, low birth weight and blood pressure, which if the number of risk factors increase, the individual is in greater risk of diabetes<sup>6</sup>.

The reported prevalence rate of diabetes among different ethnic groups of worldwide is between 7.8% and 15.5%<sup>7</sup>. There are different statistics about the prevalence of diabetes in Iran. The prevalence of type 2 diabetes in Iran is 4-4.5% and in population aged above 30 years is greater than 14%<sup>8</sup>. A national study of risk factors for non-communicable diseases reported the prevalence of diabetes in Iran in 2008 to be 7.7%, equivalent to 2 million cases in the Iranian population aged 25 to 64 years<sup>9</sup>. In addition, the International Diabetes Federation has reported the prevalence of diabetes in Iran 9.3% in 2010 in the Iranian population aged 20 to 79 years<sup>10</sup>. More than 1% of the Iranian urban population older than 20 years develops type 2 diabetes each year<sup>11</sup>.

Given the importance of prevalence, symptoms and side effects of diabetes, the efforts are concentrating on the screening programs. In this study, the results of the screening

program for type 2 diabetes in Yazd Province in 2012 are presented.

### Methods

The present cross sectional study was carried out on the population of Yazd Province for the evaluation of the prevalence rate of diabetes and the related risk factors in 2012. Out of 90280 screened male and females aged above 30 years residing in the cities of Yazd, Meybod and Sadoughi, a random sample of 14993 (16.6% of total) were selected from the list of these cities of the province including Yazd (10628), Meybod (2821), and Sadoughi (1544). These three cities have been randomly selected from the list of province cities which each one is the representative of different geographical area of the province. A validated questionnaire, designed for the national diabetes screening program, was designed for gathering of data including demographic variables (age, gender, place of residence, history of hypertension, history of diabetes, family history of diabetes, etc.) biomedical (blood pressure, FBS value) and anthropometric values (height, weight and BMI). According to public announcement, male and female subjects of age above 30 years were voluntary invited to governmental health centers.

The process of data collection was according to national program of diabetes screening format so that after getting personal data and personal history of diabetes and hypertension, familial history of diabetes, history of abortion and delivery of baby >4 kg in females, also measuring the height and weight, the individuals at risk were determined. Then, a blood sample was taken for the laboratory evaluation of biochemical items especially FBS. The criterion for disease diagnosis was FBS<100 as healthy, 100-126 as prediabetic and >126 mg/100 ml as diabetics patient. Preliminary analysis showed that out of 14993 whose data was analyzed, 3,966 people (26.5%) at risk were not screened and this was due to lack of cooperation and poor access to laboratory facilities. Finally data of 11027 subjects were analyzed by SPSS software version 16 using descriptive statistics like percent, mean (SD) and appropriate statistical tests such as chi-square for the quality variables, and multiple logistic regression model for the determining of the predictor independent factors of diabetes with 95% confidence interval.

**Table 2:** Comparison of characteristics among diabetic subjects (1802 cases) and non-diabetic subjects (7908 controls) using unadjusted odds ratio (OR)

Variables	Cases		Controls		OR (95% CI)	P value
	No	%	No	%		
<b>Gender</b>						0.001
Male	567	10.6	4768	89.4	1.00	
Female	1235	28.2	3140	71.8	3.30 (2.96, 3.68)	
<b>Residence Place</b>						0.362
Urban	1508	18.7	6547	81.3	1.00	
Rural	294	17.8	1361	82.2	1.06 (0.93, 1.22)	
<b>Family history of diabetes</b>						0.001
Yes	778	33.5	1544	66.5	3.14 (2.80, 3.49)	
No	1024	13.9	6364	86.1	1.00	
<b>History of hypertension</b>						0.001
Yes	709	53.6	614	46.4	7.05 (6.26, 7.93)	
No	1093	13.0	7294	87.0	1.00	
<b>Having hypertension</b>						0.001
No	1016	12.5	7126	87.5	1.00	
Yes	786	50.1	782	49.9	7.05 (6.26, 7.93)	
<b>Body mass index (kg/m<sup>2</sup>)</b>						0.001
<25	379	9.1	3788	90.9	1.00	
25-29.9	765	21.2	2836	78.8	2.69 (2.36, 3.07)	
≥30	658	33.9	1284	66.1	5.12 (4.44, 5.90)	
<b>Age group (year)</b>						0.001
<50	596	9.8	5448	90.2	1.00	
≥50	1206	33.3	2420	66.7	4.58 (4.11, 5.11)	

### Results

To determine the prevalence of diabetes, data of the screened people were used (n=11,027). The prevalence rate of known diabetes were 14.8% and new diabetes patients recognized by screening program was observed to be %1.5 that totally the prevalence of diabetes in Yazd Province was estimated to be 16.3%. The prevalence of impaired fasting glucose (IFG) was estimated to be 11.9%. The prevalence rate of diabetes according to sex showed that proportion of disease in women (25.3%) was more than men (9.2%), however, proportion of new cases of disease in men (1.8%) was observed to be more than women (1.2%) (Table 1).

**Table1:** Frequency distribution of Diabetes Screening state according to sex after laboratory test

Diabetes Screening state	Female		Male		Total	
	N	%	N	%	N	%
Healthy (not need to test)	866	17.7	2114	34.4	2980	27.0
Healthy (after the glucose test)	2274	46.5	2654	43.2	4928	44.7
known patient	1178	24.1	455	7.4	1633	14.8
New patient	57	1.2	112	1.8	169	1.5
Impaired fasting glucose(pre-diabetic)	511	10.5	806	13.1	1317	11.9
Total	4886	100.0	6141	100.0	11027	100.0

From 7,676 women screened, 851 (11.1%) had a history of abortion and 157 (2%) had a history of gestational diabetes. Out of these, 140 (16.5%) and 30 (19.1%) of women with history of abortion & gestational diabetes had known diabetes. No significant relationship was seen between history of abortion and diabetes (P=0.300) But there was a significant association between history of gestational diabetes and diabetes (P=0.001)

The relationships between diabetes disease and different demographic and biomedical factors along with 95% confidence interval have been shown in Table 2. Except to residence place, other factors including sex, age, positive familial history of diabetes, history of hypertension, having present hypertension and Body Mass index (BMI) significantly associated with disease.

To find the predictive and effective factors on diabetes, a total of 10 variables that had significant *P*-value in univariate analysis, and also those had clinical significance were entered into the multiple logistic regression models. Then using forward technique it was determined that actually 7 of variables remained significant on the model. It was observed that women 1.76 times more than men, people aged over 50 years 1.89 times more than those below 50 years, subjects living in urban areas 1.5 times more than those in rural areas, those who having hypertension 1.67 times more than healthy people. Patients with positive family history of diabetes, and women with a history of gestational diabetes, had a chance of getting diabetes 2.15 and 2.68 times higher than individuals without history. Moreover, people who have a BMI greater than 30 had a chance of diabetes 6.5 times more than normal people.

## Discussion

In this study the true prevalence of diabetes was 16.3% including known patients and new patients. Given the high prevalence of diabetes in the city of Yazd, which is ranked first in the country, our finding is justifiable<sup>11</sup>.

A study carried out by Dr. Afkhami et al. in 1998 showed that 14.5% of people in Yazd Province suffered from known diabetes<sup>12</sup>. Moreover in the study that conducted in the Azad Shahrof Yazdin, the result showed the prevalence of diabetes was 9.83%<sup>13</sup>. Comparing the results of our study with recent studies in Iran shows that the prevalence of diabetes in Yazd province is 2 times more than the country that reported the prevalence of diabetes in adults 5.5 to 7.7%<sup>9,14</sup>. This can be explained by the fact that there is a main difference in genetics, ecological and lifestyle of province's people compared with others especially in the type of nutrition, lack of exercise, genetic and climatic conditions of the province. There is a need to design a study for the exploration of the actual contribution of each of these factors. In this study also it was found that 11.9% of the subjects had impaired fasting glucose, that according to the aforementioned descriptions, rise in the prevalence of diabetes in future is expected in Yazd Province.

Our findings showed that the prevalence of diabetes in women was more than men which according to current literatures, these results cannot explain the differences of diabetes among the sexes. Since the women with a previous history of diabetes have welcomed a diabetes screening program more than men, this result can be related to women emphasizing their health, and due to the volunteer bias. In line with the results of this study, a higher prevalence of diabetes in women than men is described in some studies<sup>15-19</sup>. In this study also the results of the regression model showed that the risk of diabetes in women was 1.7 times more than men that are in line with the results of the prevalence of diabetes among the sexes. While the results of the study by Aziminejad et al. in Iran, on the people of Khorasan showed that there was no significant relationship between gender and the risk of diabetes<sup>14</sup>.

As expected, in this study, with increase in age, the prevalence of diabetes increases, so that the prevalence of diabetes increased from 9.8% in individuals less than 50 years, to 33.3% in people over 50. The results of the regression model also showed that the risk of diabetes in ages over 50 years is about 2 times more than ages less than 50, which could ex-

plain the inevitable impact of age on diabetes. This is consistent with findings of the study by Larijani et al. that is carried out on 1,000 samples of people over 25 years in Qazvin<sup>20</sup>. The results of other studies are also in line with the results of this study and confirm it<sup>15,17,21,22</sup>.

In examining the relationship between place of residence and risk of diabetes, the results of the regression model showed that the risk of diabetes in urban areas was 1.5 times more than rural areas, which seems the difference between urban and rural lifestyle, nutritional status and physical activity also environmental stress that play a significant role in this regard. The results of this study are consistent with the results of various studies that showed increase in the prevalence of diabetes in urban areas in comparison to rural areas<sup>15,17,19,23</sup>.

Regarding the relationship between body mass index and risk of diabetes, the results of this study showed that increase in BMI increases the chance of diabetes, so that the risk of diabetes in subjects with BMI 25-30, is 4 times more than those with normal BMI and in subjects with BMI over 30, is 6 times more than those with a normal BMI. That this result was consistent with results of other studies. A study in China showed that there was a significant relationship between the BMI index and diabetes. The study by Odegaard et al. and some other similar studies showed that factors such as obesity, aging and a family history of diabetes, increase the risk of diabetes<sup>20,24,25</sup>. Obesity in several studies is noted as a risk factor for diabetes and lack of controlling it<sup>26,27</sup>.

In examining the hypertension as a risk factor of diabetes, the results of the regression model showed that the risk of diabetes in people with hypertension was 1.5 times more than people with normal hypertension, that this result was consistent with the results of other studies that identified hypertension as an independent risk factor for diabetes<sup>28-30</sup>.

In the present study, in examining the family history of diabetes and diabetes, a significant relationship was found and is identified as a predictor variable, so that the chance of diabetes in individuals with a family history of diabetes is two times more than those without a family history of diabetes. In line with the results of this study, in a study carried out in India, results showed that people with a family history of diabetes, are more likely to have diabetes<sup>31</sup>. There seems the role of genetic and familial factors are very important in the increased occurrence of Diabetes in Yazd people that can explain the high differences with other part of Iran and even with world.

## Conclusions

The prevalence of diabetes in Yazd Province, in comparison with other areas is higher that it can be probably explained by differences in genetic and climatic conditions of the province, presence of factors of bad lifestyles especially type of nutrition and lack of exercise. Since comprehensive study has not been carried out in this province to explore the role of each of these factors, it is suggested that future studies aim to determine each of these factors by analytic & experimental designs.

## Acknowledgments

The study was supported in part by the research credits of Deputy for Research Affairs, Shahid Sadoughi University of

medical sciences- Yazd, Iran. The authors wish to thank all colleagues working in Deputy for Health Affairs especially Dr. Mirzaei & Dr. Jafarizadea who assisted for doing this work.

### Conflict of interest statement

The authors declare that they have no competing interest.

### Funding

The study was funded by the research credits of the Deputy for Research, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

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