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Original Article

Behavioral and familial predictors of diabetes mellitus in adults aged 20–69 in Yazd, Iran during 2014–2015

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ABSTRACT

Introduction: The present study aimed to assess the behavioral and familial predictors of diabetes mellitus as well as their interaction in the risk of diabetes mellitus type2.
Methods: The present cross-sectional study was conducted using the Yazd health study (YaHS) data which was collected in 2013–14. Statistical population of this study consisted of all 9340 individuals aged between 20 and 69 in Yazd City. Logistic regression was used to determine behavioral factors and family history of diabetes and their interaction in the risk of diabetes.
Results: In the present study, age, family history of type 2 diabetes, waist-to-hip ratio, BMI, educational level, physical activity and smoking were considered as the risk factors for type 2 diabetes.There was a significant interaction(negative interaction) between family history of diabetes and other risk factors only for BMI, so that the risk of developing type-2 diabetes was lower in the presence of two risk factors-family history of diabetes and BMI- than the risk of diabetes in the presence of each of these factors.
Conclusion: Results of the present study suggested that despite the consideration of family history as an independent risk factor for type 2 diabetes, if it was used as a tool to raise the awareness and sensitivity in people with type 2 diabetes, it would reduce the risk of developing this type of diabetes in people who had other risk factors for type 2 diabetes.

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1. Introduction

In recent decades, progressive sciences and technology, and rising health and well-being in communities have led to an increase in the life expectancy and age populations throughout the world. These factors lead to the creation of an epidemiologic transformation, so that the death from infectious diseases is changed to non-communicable diseases; and it is expected that 70% of death causes in developing countries will be due to non-communicable diseases by 2020 [1]. Among the non-invasive diseases, type II diabetes or non-insulin-dependent diabetes is one of the most important types of diabetes; hence, the World Health Organization (WHO) introduced it as a hidden epidemic in 1993; and all countries were invited to confront with this disease [2]. 382 million people were diagnosed with type 2 diabetes. According to conducted studies in 2013, it was expected that the number of people with this disease would reach 592 million by 2035. Most people with diabetes are living in low and middle income countries [3,4]. Among the regions of the world, the Middle East and North Africa (MENA) region with the prevalence of diabetes 10.9% has the highest global prevalence among the population aged 20–79, and the highest prevalence was observed in Saudi Arabia (20.2%), Egypt (15.6%), the United Arab Emirates (10%), Tunisia (9.2%), and Iran (8.4%) respectively among the population aged 29–79 [5].

According to the conducted studies, the prevalence of diabetes is estimated from 3.2% to 9.34% in Iran [6,7]. According to a recent study, the prevalence of diabetes and glucose tolerance deficiency in Yazd are estimated equal to 11.9% and 16.3% which are two times higher than the other cities of Iran [8].

In the epidemic of type 2 diabetes, it is believed that the human lifestyle changes due to the modernization and interaction with genetic predisposition lead to the epidemic of disease in the world [9,10]. Despite the fact that most studies have been conducted on the risk factors of lifestyle, they have often studied the interaction between individual genetic talents and the risk factors of lifestyle in developed countries; and a few studies have been conducted in the Iranian population [7].

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The individual family history of diabetes can be utilized to investigate the role of genetic predisposition in the prevalence of diabetes. Despite the fact that the individual family history is a common index of environmental and risk factors of behavioral and genetic agents, studies on this field indicate that there is a constant relationship between the individual familial history of diabetes and the risk of type 2 diabetes after adjustment of lifestyle risk factors which may be interpreted as an index of the individual genetic talent [11].

Several reports have indicated a significant relationship between family history of diabetes and risk of developing this disease and also up to 20% of hereditary effects on the incidence of diabetes [12].

This power and stability of correlation between the family history of diabetes and risk of developing disease have led to the consideration of family history as a simple and available tool for identifying people at risk and undiagnosed diabetics in communities with statistics of about 33%–50% [13].

Yazd city has the highest prevalence of diabetes among the Iranian cities. It seems that the family history plays an important role in this increasing prevalence. Family history information of Yazd can be useful in public health interventions. Therefore, we decided base on the population-base data and identified a sufficient number of people with a family history of diabetes in Yazd. Afterwards, we separately investigated the behavioral predictors of type-2 diabetes and the individual family history and determined the effect of interaction between family history of diabetes and other risk factors on the risk of type-2 diabetes.

2. Materials and methods

The present study was a cross-sectional research which was conducted according to Yazd health study data (YaHS). Yazd health study (YaHS) has been the most comprehensive study on the health and disease community and in Yazd province. In this study, ten thousand people were questioned about various aspects of physical and mental health in Yazd. Details of research method were also published [14]. Statistical population of this study consisted of all 9340 individuals aged between 20 and 69 in Yazd. Subjects were divided into four age groups: 20–39, 40–49, 50–59-, and 60–69-years old. The age group of 20–39 years was selected as the reference group, and it was compared with other age groups. Based on the Yazd health study (YaHS), the sample size was about 2% of the Yazd population. Sampling method of the present study was population-based and implemented in a two-step method. In the first step, 200 clusters were randomly selected from Yazd regions, and in the next step, the clusters were selected according to the list of households in 2014, and then the computer letters were continuously completed by moving from the right.

The next household was selected according to the distance of a house from the first house. If there were several households on the plaque (e.g. the residential complexes), it started from the first unit and continuously went on to the next units.

Data collection was done using a comprehensive YaHS questionnaire which contained 300 questions about various issues. This questionnaire was designed based on the participation of all faculties and university-related research centers. Desired reforms desired were applied to the questionnaire and its validity was confirmed after several consecutive consultation sessions with professors.

Pilot questionnaire was carried out on 200 people in Yazd for confirmation of its reliability and validity. Cronbach's alpha was obtained equal to 0.8%; and a final questionnaire was developed [15].

Interview method was used to examine the individual health indices. Family history of diabetes was achieved by asking the question of “Do your first-degree relatives (father, mother, sister, brother, and children) have a history of this disease?” Subjects' weights were measured using the Omron Digital Balance (BF511 Made in Japan with a range of 0.1–150 Kg) with a precision of ±100 g. Weighting people was done with the lowest number of clothing and without any shoes. To prevent any error in measuring people's weights, the scale was installed on the flat and tight floor rather than the carpet or smooth surface. A tape measure was used to measure people's heights in centimeters. People's heights were measured with naked feet on a flat surface. People were asked to remove their hats, fillets, plumes, etc. Females' hair was not tied, and they should lean against the wall and stand facing the examiner. Their feet should be side by side; and the heels' back should lean the wall. The knees should not bend. People should look on the face, so that their eyes were at the same direction as their ears. The researcher then marked over their heads by a pencil [16].

The body mass index (BMI) was calculated by dividing the individual weights in kilograms by squared height in meters. In the present study, we categorized subjects into three groups with BMI < 25, BMI = 25–29.9 and BMI ≥ 30. Subjects with BMI < 25were selected as the reference group.

The subjects' waist circumference (WC) was measured with the smallest clothing in the thighs and the navels through a tape measure with a precision of 0.1 cm without any pressure on the body surface. The hip circumference was measured with the same method as the WC by a tape measure in the most prominent part of hip. The WC was then divided into the hip circumferences; and the waist-to-hip ratio (WHR) was obtained in cm. WHR ≥ 0.85 cm in females, and WHR ≥ 0.9 cm in males were considered as the risk levels [17]. Those people with WHR of less than the above-mentioned rate were selected as the reference group. The present study was approved by the Ethics Committee of University

The research objectives were described for all participants before inclusion in the study. The consent forms were was asked by all participants. Logistic regression was used to determine the effects of variables on the risk of diabetes. Statistical analysis was performed using SPSS 20; and the P-value of less than 0.05 (two tail) was selected as the statistical significance.

3. Results

The base line characteristics of the study populations are presented in Table 1. Indicating that 39.7 percent of population had a family history of diabetes in one of their first-degree members. Different behavioral and demographic factors were considered in the logistic regression model in order to determine the variables, which affected the prevalence of type 2 diabetes. Seven out of the above-mentioned variables had a significant relationship with the risk of type 2 diabetes.

The first group of each variable was selected as the reference group; and other groups were compared with the reference group as shown in Table 2. According to this table, despite the fact that other confounding factors were controlled, subjects with a family history of diabetes were at higher risk of 4.61 fold for diabetes (CI: 95%, 3.98–5.33) higher than those without any family history of diabetes. When the subjects' age increased, the risk of developing type 2 diabetes was also increased, so that people aged 60–69 were at higher risk of 17.82 fold for diabetes (CI: 95%, 13.46–23.60) than those aged 20–39. Risk of developing diabetes was increased in higher body mass index; hence, subjects with BMI ≥ 30 were at higher risk of 1.33 fold for diabetes (CI: 95%, 1.09–1.62) than the reference group. About the waist-to-hip ratio with the same BMI, the subjects with abnormal waist to hip ratio (WHR $\geq$ 85cm in females, WHR ≥ 0.9 cm in males) had higher risk of 1.73 fold (CI: 95%:1.38–2.16) for type 2 diabetes than the reference group.

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