

Prevalence of Diabetes Mellitus and Pre-Diabetes in Sarableh City, Ilam

Zahra Vahdat Shariatpanahi¹; Shaahin Shahbazi^{2,*}

¹Department of Nutrition, Faculty of Nutrition and Food Technology, National Nutrition and Food Technology Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

²Department of Internal Medicine, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, IR Iran

*Corresponding author: Shaahin Shahbazi, Department of Internal Medicine, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, IR Iran. Tel: +98-8412227134, Fax: +98-8412227136, E-mail: mdkabe@gmail.com

Received: January 22, 2014; Revised: March 17, 2014; Accepted: May 12, 2014

Background: Diabetes mellitus and its complications are the leading causes of mortality and morbidity in human.

Objectives: The aim of this study was to determine the prevalence of diabetes mellitus and prediabetes among adults older than 20 years in Ilam province.

Patients and Methods: This cross sectional-descriptive study was carried out on 3915 subjects aged older than 20 years. The sampling was done by census. Fasting blood glucose and two hours post prandial glucose level after administration of 75 g oral glucose were measured. American Dietic Association criteria were used for diagnosis of diabetes mellitus and prediabetes.

Results: The prevalence of diabetes was 7.04% (4.52% women, 2.52% men) and the prevalence of prediabetes was 8.58% (5.59% women, 2.98% men). The highest prevalence of diabetes and prediabetes were observed on sixth and fifth decades, respectively. Approximately two percent of population, mostly men, were unaware of their pre-existing diabetes.

Conclusions: Because of increasing prevalence of prediabetes at earlier age, it seems necessary to reconsider the screening age in urban areas and perform the screening in all adults at younger ages.

Keywords: Prevalence; Insulin Resistance; Screening; Lifestyle

1. Background

Diabetes is the most common endocrine disorder and a common cause of blindness, kidney failure and leg amputation. The prevalence of type 2 diabetes is raising due to lifestyle changes, reduced physical activity, nutrition and obesity (1, 2). There has been an alarming increase in prevalence of diabetes in recent years. In fact the incidence of diabetes has doubled in the last thirty years (3). According to the World Health Organization, in Eastern Mediterranean region in which Iran is located, the average prevalence of diabetes is estimated to be 14.5% in the adult population above 20 years (4). Pre-diabetes is an intermediate state and includes impaired glucose fasting test or impaired glucose tolerance test. Studies have shown that 25% of patients with prediabetes will develop type 2 diabetes in 3 to 5 years, and it's more likely to happen in people with more risk factors such as those with obesity or a positive family history (5). Although we cannot exclude genetic factors that contribute to diabetes, there is strong evidence that eradicating risk factors such as obesity, type of diet and physical inactivity can prevent diabetes (6).

2. Objectives

Since no study had been conducted in Ilam province for

estimating the prediabetes and diabetes prevalence in this region, this study aimed to inform health authorities regarding the control and management of this disease.

3. Patients and Methods

This study is a part of an ongoing longitudinal study which is initiated to investigate the incidence of diabetes in subjects with pre-diabetes in a small city called Sarableh, located in Ilam province. The first phase of the study was cross-sectional and was done by census in 2012. The study design was approved by the Ethics Committee in Ilam University of Medical Sciences. The data gathering was by referring to homes, offices, institutions, schools, shops and private institutions, and obtaining blood samples for diabetes and pre-diabetes testing from adults over the age of twenty. We first extracted data on the demographics of the city by referring to Ilam health center. According to the city statistics, 6545 adults over 20 lived in this city. By going to schools and offices and training and justifying the managers in March 2011, a month before the blood sampling, they were asked to familiarize the students and the staff with the work objectives and blood sampling so that they can pass on this information to their own families. Af-

Implication for health policy/practice/research/medical education:

Because of increasing prevalence of prediabetes at earlier age, it seems necessary to reconsider the screening age in urban areas and perform the screening for all adults at younger age.

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ter the necessary coordination with the governor, referral cards were issued for the blood sampling staff. In each region, the day before the blood sampling, the target homes were visited to inform the families of the fasting duration and blood sampling procedure. Participants were asked to keep fasting for 8-12 hours to test their blood sugar the next morning. On the next morning, two trained individuals referred to the homes in each region, took written consents, and collected blood samples to determine fasting blood glucose and the glucose two hours after the ingestion of 75 g glucose. The collected blood samples were analyzed in the laboratory of the only hospital of town. Diagnosis of pre-diabetes and diabetes was performed according to the latest American Dietetic Association criteria (7), this means that fasting glucose level of 100 to 125 mg /dL or the glucose in the range of 140 to 199 mg/dL two hours after receiving 75 g of glucose was defined as pre-diabetes. If both tests were positive, the diagnosis was pre-diabetes and in case one of them was positive, the test was repeated the next day, a positive result then would lead to a confirmed diagnosis of pre-diabetes. Diabetes diagnosis was based on one of these criteria: a previous diagnosis of diabetes by a physician, fasting glucose greater than or equal to 126 mg/dL or two-hour-after-meal glucose greater than or equal to 200 mg/dL which should have been confirmed in two different occasions. If a diagnosis of diabetes was made, they were introduced to an internist to receive the necessary treatment. The sampling took two months, from mid-April to mid-June. The results were shown as the mean,

standard deviation and percentage calculated with SPSS software version 16. The differences between genders were calculated by Chi square test. P-values less than 0.05 were considered as significant.

4. Results

Altogether, blood sampling was done from 3915 adults more than 20 (59.81% of the population). The mean age of the subjects was 37.93 ± 11.8 . In this population, 7.04% were diabetic. The prevalence of diabetes was higher in women than men, and this difference was statistically significant (177 women versus 99 men, $P = 0.02$). From the total of 276 patients who were diabetic, 69.56% had known diabetes and 30.43% had unknown or hidden diabetes. Unknown diabetes was significantly higher in men than in the women (47 men versus 37 women, $P = 0.05$). The prevalence of prediabetes shown by two impaired glucose tolerance tests (4.16%), two impaired fasting glucose tests (2.6%) or a one-time positive result in both tests (1.76%), was 8.58 percent. The mean prevalence of prediabetes in women was significantly higher than men (219 women vs. 117 men, $P = 0.01$). Prevalences of prediabetes and diabetes according to the age group and sex in people above 20 are shown in Tables 1 and 2, and these tables show that the prevalence of diabetes is increasing until the sixth decade of life, but its incidence has declines afterwards. The prevalence of prediabetes also increases until the fifth decade of life and declines subsequently.

Table 1. Prevalence of Diabetes Among Adults According to Age and Gender ^a

Age Groups, y	Male Number	Female Number	Total Number	P Value
20-29	0	0	0	-
30-39	6 (1.1)	17 (3.1)	23 (2.1)	-
40-49	28 (7.1)	68 (21)	96 (13.4)	-
50-59	55 (23.7)	71 (45)	126 (32.2)	-
60-69	7 (13.7)	10 (20)	17 (17.1)	-
≤70	3 (4.9)	11 (12)	14 (9.4)	-
Total	99 (4.9)	177 (9.3)	276 (7.04)	0.02 ^b

^a Data are presented as No. (%).

^b Chi square test.

Table 2. Prevalence of Prediabetes Among Adults According to Age and Gender ^a

Age Groups, y	Male Number	Female Number	Total Number	P value
20-29	9 (1.2)	9 (1.2)	18 (1.2)	-
30-39	24 (4.5)	81 (14.8)	105 (9.7)	-
40-49	54 (13.7)	89 (27.6)	143 (20)	-
50-59	25 (10.7)	30 (19.1)	55 (14.1)	-
60-69	2 (3.9)	5 (10.4)	7 (7)	-
≤ 70	3 (4.9)	5 (5.7)	8 (5.4)	-
Total	117 (5.8)	219 (11.5)	336 (8.5)	0.02 ^b

^a Data are presented as No. (%).

^b Chi square test.

5. Discussion

Prevention of type 2 diabetes is very important as most of the diabetes-related complications are hard to treat. Identifying high-risk individuals and moderating the risk factors can reduce the incidence of diabetes or delay its onset. One of the risk factors for diabetes is impaired glucose tolerance and impaired fasting glucose (8). Studies have shown that 1.5 to 10 percent of patients with this disorder will develop diabetes within one year (5, 9). In our study of the above 20 population in Sarableh, prevalence of 8.58 percent for prediabetes and 7.04 percent for diabetes were obtained. According to one of our study results, hidden diabetes is more common in men than in women. This can be due to men's less referrals to the health care centers for checkups and general examinations. In Tehran lipid and glucose study, the prevalence of diagnosed and undiagnosed diabetes in people over 20 were 9.1 and 4.9 percent, respectively (total 14%). As reported in the same study, the prevalence of impaired glucose tolerance test in people over 20 was 6.8%, the prevalence of impaired fasting glucose was 6.6%, and the prevalence of both of impaired glucose test and impaired fasting glucose was 4.6 %. According to this study, the prevalence of diabetes increased with age. Also the prevalence of glucose intolerance increased with age (10). In our study, the prevalence of diabetes increased with age until the end of the sixth decade, but it decreased after this age. The prevalence of prediabetes also increased with age and the highest prevalence was observed in the fifth decade of life but after this age its prevalence decreased. Although the prevalence of diabetes and prediabetes in this study is lower comparing to that of Tehran, the high percentage of prediabetes in younger ages should be considered an alarm for the health authorities in this region.

Sarableh was recognized as a city in 1982 but it was considered one of the villages of Ilam theretofore. At that time, most of the people were working as farmers. Since then, due to establishment of government agencies and institutions, people turned to sedentary jobs and they became more inactive as a result. It seems that the low prevalence of diabetes and prediabetes in the seventh and sixth decades, respectively, is due to changes in people's lifestyles and jobs. Today's people unhealthy lifestyles, contributes to a variety of physical and mental illnesses that were rare in the past (11). Low physical activity can be one of the causes of high prevalence of diabetes and prediabetes at younger ages. Some studies in Iran indicated that the prevalence of diabetes in the urban populations is higher than the rural populations (12, 13).

The American Diabetes Association recommends that all adults who have a body mass index greater than 25 or one or more of the risk factors for diabetes (history in first-degree relatives, inactivity, polycystic ovary syndrome, history of coronary artery disease, hypertension, dyslipidemia, high-risk ethnicity, gestational dia-

betes) should have diabetes or prediabetes screening once every three years. In people who do not have these risk factors, the screening should be performed at the age of 45. Three studies conducted at the national level indicate that 80 percent of Iranian urban population is physically inactive which is one of the risk factors for diabetes (14). In our study, the prevalence of pre-diabetes in adults aged 40-49 and 30-39 was 19.3 and 10.03 percent, respectively. It is a considerably high percentage and most of the affected subjects were women. Since 25% of patients with prediabetes will develop type 2 diabetes within three to five years, and also lack of physical activity is associated with urban life, it seems wise to reconsider the screening age in urban areas and perform the screening in all adults at younger ages, and due to men's reluctance to refer to health centers for general checkups and also unknown glucose abnormalities in them, they need more attention from the healthcare service providers.

Acknowledgements

We convey our gratitude to the Ilam University of Medical Sciences, Ilam, Iran.

Authors' Contributions

Zahra Vahdat Shariatpanahi: design of the study and analysis and interpretation of data; Shaahin Shahbazi: study design and writing of the manuscript.

Funding/Support

Study was provided by the Ilam University of Medical Sciences.

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