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PREVALENCE OF DIABETES MELLITUS IN DISTRICT MARDAN, PAKISTAN

Afsar Ali[1], Fawad Ali[2]*, Mansoor Ahmad[1], Javed Khan[1], Mohammad Adil[1], Haider Ali Khan[3]
[1]Department of Zoology, Abdul Wali Khan University Mardan
[2]State Key Laboratory of Microbial Metabolism, and School of Life Sciences & Biotechnology, Shanghai Jiao Tong University, Shanghai, 200240, People's Republic of China
[3]Department of Microbiology, Quaid-i-Azam University

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*Corresponding Author
Email fawada47@yahoo.com

Abstract

Diabetes mellitus is a disease with abnormal metabolism and inappropriate glucose levels in the blood due to either a deficiency of insulin secretion or to a combination of insulin resistance in the body. Insulin resistance is a state in which the body cells do not react efficiently to insulin, a hormone produced by the pancreas that plays an essential role in controlling blood sugar (glucose) level. Generally, when you eat, your blood sugar levels increase, and as a result, the pancreas secretes insulin to help cells take in and utilize the sugar for energy or keep it for upcoming use. In this study prevalence of diabetes mellitus is determined in district Mardan, Khyber Pakhtunkhwa, Pakistan. A total number of 300 people were screened for diabetes mellitus, out of which 155 (51.7%) were diabetic positive and 145 (48.3%) were negative. A total of 162 males and 138 females were included in this study. About 74 (45.7%) males were found positive while 79 (57.3%) females were diagnosed positive for diabetes mellitus. Based on our result high prevalence was determined in females than males. Comparison based on age, gender, area and obesity groups etc. were presented in the form of figures and tables.

Keywords

Diabetes mellitus, Prevalence, Insulin, Glucose, Pancreas and Obesity.

1.Introduction

Diabetes mellitus is a non-transmittable medical disorder characterized by hyperglycemia due to defective insulin secretion and is currently amongst the top ten causes of worldwide death rate (Sohail, 2014). Diabetes was first recognized by the Egyptians and is characterized by weight loss and polyuria. Later on, a Greek physician Aertaeus gives it the term diabetes mellitus (DM). In Greek, diabetes means "to pass through" and mellitus means honey referring to sweetness (Kaul *et al*, 2013). The earliest description of diabetes was reported in the writings of Hindu scholars as long as in 1500 BC. They had already described "a mysterious disease-causing thirst, enormous urine output, and wasting away of the body with flies and ants attracted to the urine of people (Das & Shah, 2011).The Diabetes mellitus (DM) is a cluster of metabolic diseases, in which a person has high blood glucose (HBG), either because the cells of islet of Langerhans of pancreas does not produce enough insulin or due to no response of cells to insulin, although produced by islets of Langerhans of pancreas (Barcelo & Rajpathak, 2001; Ghulam & Dilshad, 2010).According to WHO (WHO., 2010) more than 220 million people were suffering from diabetes worldwide, 80% diabetic patients were from developing countries and every year 5% of deaths attribute to diabetes (Ijaz & Ajmal, 2011; Perveen & Ahmad, 2015). In industrialized and prosperous countries of the west, diabetes is common among elder population, while in developing countries, diabetes affects those aged from 34–65 years. In some countries of the globe diabetes also occurs in youth very frequently. Moreover, about 200 children suffer from type 1 diabetes daily which is also considered as one of the most common chronic diseases affecting children (Zuhaid *et al*, 2012). Worldwide the prevalence of diabetes mellitus for all age groups was 2.8% in year 2000 but in the year 2030 this figure will increase to 4.4% for all age groups (Sheikh *et al*, 2010). The prevalence of diabetes is high in Pakistan as reported in previous three surveys conducted in the provinces of Sindh, Baluchistan and Khyber Pakhtunkhwa (KPK) having 13.9%, 8.6% and 11.7% overall prevalence of type 2 diabetes comparable to other Asian populations (Shera *et al*, 2010). According to estimates, diabetes will be 7th leading cause of death in 2030. Pakistan had 5.2 million patients with diabetes in year 2013 it is expected to be 13.9 million in 2030 and it will be 6th on the list of countries with high numbers of estimated cause of diabetes (Hayat *et al*, 2014). Pakistan was 8th in world in 1995 with 4.3 million people affected by diabetes mellitus and it is estimated that it will be at 4th with 14.3 million people with this disease by the year 2025 (Ahmed *et al*, 2014). Prevalence of diabetes has increased in Pakistan. WHO ranked Pakistan 7th on diabetes prevalence list because more than 6.9 million people are affected by diabetes in Pakistan. International diabetes federation estimated that this number will grow to 11.5 million by 2025 unless and until measures are taken to control the disease (Zuhaid *et al*, 2012). According to Ijaz, the number of diabetes patients in Pakistan was 5,217,000 in 2000 and it is expected to be 13,853,000 in 2030 (Ijaz & Ajmal, 2011). In rural areas of KPK, as part of Pakistan

national diabetes survey by WHO, indicated that the overall prevalence of type 2 diabetes and impaired glucose tolerance (IGT) in both genders is 11.1% and 9.4%, respectively, and concluded that diabetes mellitus in rural areas of KPK is rising (Hasan *et al*,2004). The frequency of diabetes and impaired glucose tolerance is reported as 11.2% and 9.4% respectively in both sexes in Khyber Pakhtunkhwa (Hayat *et al*, 2014). In this study, the prevalence of diabetes was examined in both rural and urban areas of Mardan district of Khyber Pakhtunkhwa, Pakistan. A total number of 300 samples were collected out of which 155 were positive cases (51.7%) and 145 were negative cases (48.3%). Among the 139 samples obtained from urban areas, 96 cases (69.1%) were identified with diabetes, whereas 43 cases (30.9%) were labelled as non-diabetic. On the other hand, out of the 161 samples compiled from rural areas, 86 cases (53.4%) were found to have diabetes, and 75 cases (46.6%) were identified as non-diabetic. The higher incidence of diabetes in urban areas might be attributed to significantly increased obesity rates among both males and females, when compared to their rural counterparts. The other parameters such as gender and obesity were also checked for this study.

2. Materials and Methods

2.1 Research area

Mardan is a district in Khyber Pakhtunkhwa Province of Pakistan. It lies from 34° 05' to 34° 32' north latitudes and 71'' 48' to 72° 25' east longitudes. Mardan is the second largest city of the province.

2.2 Sample size

To assess the prevalence of diabetes in general population of district Mardan, a total of 300 blood samples were collected.

2.3 Data collection

The samples were collected in the pathology lab of district headquarter hospital (DHQ) Mardan. The present study was done through the questionnaire concerning the prevalence of diabetes in Mardan. The questionnaire including information about the gender, age, area, relation to other disease, family history, duration of diabetes and relation to smoking.

2.4 Blood collection

A total of 5mL blood was collected from the arm of each individual with the help of sterilized syringes. Then the blood was transferred very carefully to the anticoagulant, blood collecting tubes (EDTA) and the EDTA tubes were kept in icebox containing ice. And then blood was centrifuged at 3000 rpm for 4 minutes, at 25ºC. Serum was separated from RBCs, in Eppendorf tubes.

2.5 Methods for glucose estimation (Glucose oxidase test)

2.5.1 Procedure

In this procedure we take a blood from the patients, and then blood was centrifuged at 3000 rpm for 4 minutes, at 25ºC. Serum was separated from RBCs, in Eppendorf tubes. First of all, 3 tubes were arranged, one for test, second for standard and third one for blank. 1µl glucose reagent was added to each tube then 10 µl serum was added to test tube, 10 µl standard to another test tube and 10 µl distal water to blank tube were also added. Each tube was completely mixed and incubated for 10 minutes at room temperature 37 °C for seven minutes**.** Both the

blank tube and standard tube were adjusted to chemistry analyzer and the readings were noted. Then the tube containing serum was also adjusted and the reading was recorded.

2.5.2 Calculation formula

Glucose concentration in the sample was calculated by using the following formula.

Glucose = Absorbance of sample ÷ **(**Absorbance of standard × concentration of standard)

2.5.3 Normal values for blood sugar test

Fasting (FBS) = 60-110 mg/dl

Random (RBS) = 80- 160 mg/dl

3. Results

The data has been showed using tables and figures to demonstrate the number of individuals grouped as diabetic and non-diabetic, the prevalence was based on area, gender wise factors, and a comparison was done across various age groups. In this study, a total number of 300 samples were collected from both urban and rural areas, out of which 155 were positive (51.7%) and 145 were negative (48.3%) (Fig.3.1). This detail enables for a clear understanding of the prevalence of diabetes within the given population, showing the proportion of individuals influenced by the condition. Moreover, the difference between urban and rural areas in the sample allows a comparison of the prevalence between these two particular environments, presenting valuable observations into possible variations in diabetes rates depending on geographical location.

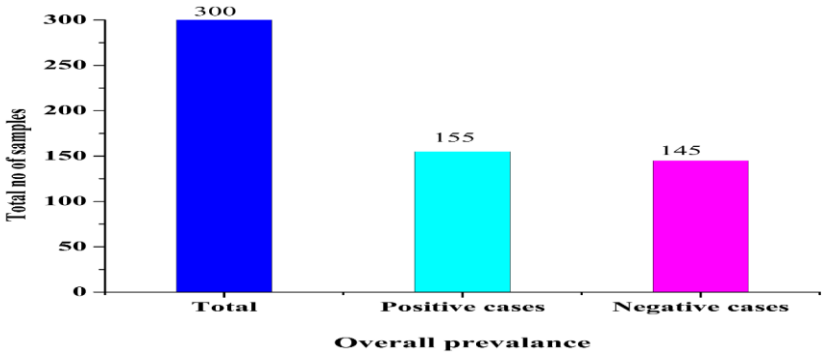

Fig 3.1: Overall prevalence of Diabetes in District Mardan

The gender wise prevalence of diabetes in district Mardan is shown in Fig 3.2. Out of total of 162 males 74 (45.7%) were found positive and 88 (54.3%) were negative. In the same way, out of a total of 138 females, 79 (57.3%) were determined as positive and 59 (42.7%) as negative. The increased gender-wise prevalence of diabetes in females are multifactorial and complex. These factors include body composition and obesity, lack of physical activity and economic and social factors can affect the prevalence of diabetes in females. More research and evaluation are required to better understand certain factors involved in high prevalence of diabetes in female.

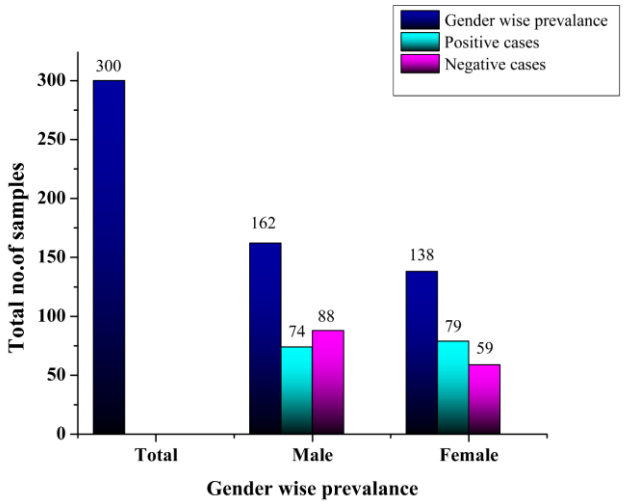

Fig 3.2: Gender wise prevalence of diabetes in District Mardan

The result of the area wise prevalence of diabetes in district Mardan is shown in Fig. 3.3. A total of 139 samples were collected from urban area out of these 96 (69.1%) were positive cases and 43 (30.9%) were negative cases. A total of 161 samples were collected from rural area out of these 86 (53.4%) were positive and 75 (46.6) were negative as shown in Fig. 3.3. It's very essential to note that these are the main possible reasons for these differences such as life style and diet, socioeconomic factors, genetic predisposition and environmental factors etc. further investigation and study might be required to figure out the exact elements adding to the observed variation in diabetes occurrence between the rural and urban regions of Mardan district.

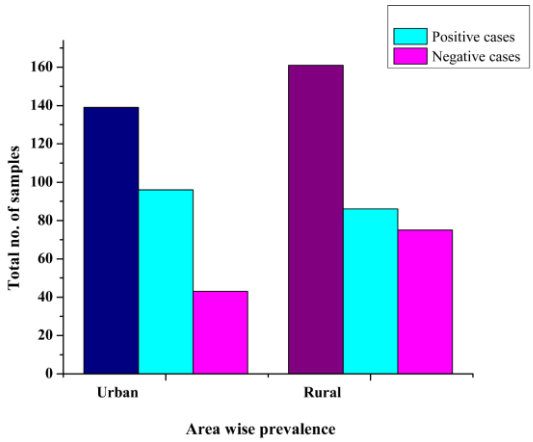

Fig 3.3: Area wise prevalence of diabetes in District Mardan

The age wise prevalence of diabetes in district Mardan was carried out using different age groups. Total samples for age group 0-30 were 34 out of these 7 (20.6%) were positive and 27 (79.4%) were negative. Age group 31-40 total samples were 55 out of these 13 (23.6%) were positive and 42 (76.4%) were negative. Age group 41-50 total samples were collected 67 out of these 34 (50.8%) were positive and 33 (49.2%) were negative. Age group 51-60 total samples were collected 69 out of these 54 (78.3%) were positive and 15 (21.7%) were negative. Age group 61-70 total samples were collected 55 out of these 46 (83.6%) were positive and 9 (16.4%) were negative. Age group 71-80 total samples were collected 20 out of these 13 (65%) were positive cases and 7 (35%) were negative cases as shown in Fig. 3.4.

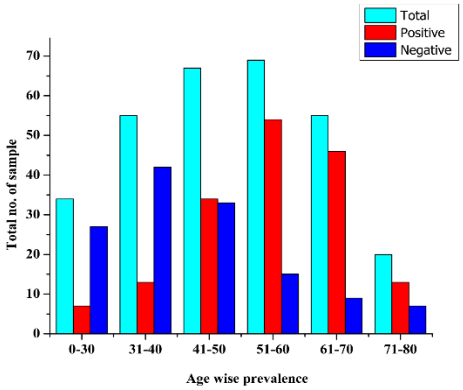

Fig 3.4: Age wise Prevalence of diabetes in district Mardan

The result for prevalence of diabetes in smokers and nonsmokers in district Mardan has been shown in table 3.1. A total sample of 122 were collected from smokers out of these 38 (31.1%) were positive and 84 (68.9%) were negative. 178 nonsmokers' samples were collected out of these 125 (70.2%) were positive and 53 (29.8%) were negative as shown in (Table 3.1). The studies show that regular smokers will be at risk of getting incident diabetes. Because the occurrence rates of smoking in individuals having diabetes are comparatively the same to those of the overall population, it's very important to tackle the main flexible risk factor of smoking to avoid the attack of diabetes as well as delay the progression of its challenges. Stopping smoking reveals obvious advantages in terms of slowing or reducing the possibility of cardiovascular morbidity and fatality in individuals with diabetes (Campagna *et al*, 2019).

Table 3.1: Prevalence of diabetes in smokers and nonsmokers in district Mardan

	Total	Positive cases	%	Negative cases	%
Smoker	122	38	31.1	84	68.9

Non smoker	178	125	70.2	53	29.8

Table 3.2: Prevalence of diabetes in Obese and Non-Obese in district Mardan

	Total	Positive cases	%	Negative cases	%
Obese	165	125	75.8	40	24.2
Non-Obese	135	30	22.2	105	77.8

Prevalence of diabetes in obese and non-obese in a district Mardan has been described in table 3.2. A total number of 165 obese samples were collected out of these 125 (75.8%) were found positive and 40 (24.2%) were negative. Total number of 135 of non-obese samples were collected out of these 30 (22.2%) were positive whereas 105 (77.8%) were negative cases as shown in (Table 3.2). The obesity is associated with many factors including insulin resistance in which the cells do not respond effectively to the insulin which lead to diabetes, the other reasons for high prevalence of diabetes in obese people are excess fat accumulation, pancreatic stress, hormonal changes and lack of physical activities (Saquib *et al*, 2013).

4. Discussion

Diabetes mellitus (DM) is one of the most widespread public health issues around the world. It is a dysfunction of carbohydrate metabolism in which blood sugar level is chronically increased as a result of insulin's impaired action or secretion. There are two types, type 1, which takes place in childhood and is generally mediated by immune system, and type 2, which develops in old age, due to pancreas disorders (Kerner *et al*, 2014). In the present study the prevalence of diabetes was investigated. A total of 300 samples were collected out of these 155 (51.7%) were diabetic cases and 145 (48.3%) were non diabetic cases (Fig. 3.1). A total of 139 samples were collected from urban area out of these 96 (69.1%) were diabetic cases and 43 (30.9%) were non diabetic cases. A total of 161 sample were collected from rural area out of these 86 (53.4%) were diabetic cases and 75 (46.6%) were non diabetic cases. The reason for high prevalence in urban area was that the urban male and female subjects were significantly more obese than their rural counterparts (Misra *et al*, 2001). Diabetes prevalence was still approximately double in urban subjects when we compared the rural and urban populations after removing the differences in obesity and age. The results suggest that, apart from age and obesity, other factors, e.g., differences in diet, physical activity, or stress (or a combination of these), may participate in the rural to urban difference in diabetes prevalence. This result is similar to the finding of (Zimmet *et al*, 1981) who also identified that the prevalence of diabetes in the

urban population was almost three times higher than that in the rural population. The prevalence of diabetes mellitus at the age of 70 is found to be about 83.6% supported by another study conducted by (Laakso & Pyorala, 1985) who also showed high prevalence of diabetes mellitus at the age of 70 (73%) because in the old age the body is not very efficient at processing glucose, which can cause insulin resistance which results to develop type 2 diabetes, which is more prevalent in older people as compared to young people (Fig 3.4).In the present study the association of obesity and diabetes was also studied. A total of 300 samples were collected out of these 165 were obese and out of these obese 125 (75.8%) were diabetic cases and 40 (24.2%) were non diabetic cases. A total of 135 non-obese samples were also collected out of these 30 (22.2%) were diabetic and 105 (77.8%) were non diabetic (Table 3.2). The reason of high prevalence in both male and female is the lack of exercise and fatty food. This result is agreeable to (Cameron *et al*, 2003) the prevalence of diabetes in obesity was found in both male and female (60.9%). The reason of obesity in both gender is due to lower educational status, higher television viewing time and less physical activity time were strongly associated with obesity, the television viewing time showing a stronger relationship than physical activity time. The high prevalence of diabetes mellitus in district Mardan can be assigned to a combination of lifestyle factors, environmental and genetic factors. It is important to identify that the reasons of high diabetes prevalence can change from one area to another. Dealing with the high prevalence of diabetes in a specific area usually demands a multifaceted strategy, including improved access to healthcare, public health initiatives and education, lifestyle interventions. Early diagnosis and efficient management of diabetes are essential to decreasing its impact on communities and individuals.

5. Conclusion

It is concluded that the overall prevalence of diabetes was found to be 51.7%. Most of the patients feel increase thirst and frequent urination at night. The most frequent age at diagnosis was above 40 years. It was observed that most of the patients have family history of DM. The diabetes is more found in female population due to the lack of exercise in female, exercise is the main risk factor of obesity, and obesity is leading cause of diabetes. There is an increased prevalence of Type 2 diabetes in district Mardan and the main risk factors identified were obesity, overweight, of diabetes mellitus, and hypertension.

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