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Body Mass Index and Waist Circumference as a risk factor for Diabetes Mellitus Type-2 in Turabah Province, Saudia Arabia

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Abstract

Background: *Diabetes Mmellitus Type -2 is a major public health problem, an estimated 439 million people will have the disease by 2030 [1]. It is possible to have the incidence of type 2 diabetes among individuals at high risk through lifestyle and pharmacological interventions [2&3].*
Methodology: *A cross-sectional survey was conducted in Turabah Province, Saudia Arabia, among the student and staff members of the Faculty of Applied Medical Sciences, Turabah, Taif University to observe the risk factors for DM2. All 483 female attends age (18-57) years were randomly selected for the study. From all participants fasting blood glucose, non-fasting blood glucose level, waist circumference was measured and body mass index (BMI) calculated. Prior to the measurement demographic data were obtained.*
Results: *Data of body mass index (BMI) showed that the age groups of (20-29) years having 88(25%), 146(41%), 68(19%) and 54(15%) counting 356 (74%) out of 483 participants were considered, underweight, normal, pre-obese and obese respectively. In a similar way there was a significant increase in waist circumference 69% were less than 80 cm the reaming were 31% with more than 80 cm.*
Conclusions: *There is a high prevalence of modifiable risk factors of DM2 among the participants such as overweight and central obesity was noted to be high especially in young age.*
Recommendations: *Given the emerging database of a significant prevalence of DM-2 and the risk factors in the community a national policy framework needs to be developed to address prevention, control and palliative of DM-2 and the risk factors.*

Keywords: *Risk factor, BMI, Waist Circumference, Turabah, Saudia Arabia*

Introduction

The term diabetes mellitus describes a metabolic disorder with heterogeneous etiologies characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion and insulin action or both [4]. The long–term relatively specific effects of diabetes include development of retinopathy, nephropathy and neuropathy [5]. Diabetic People are also at high risk to develop of cardiac, peripheral arterial and cerebrovascular disease [6].

Diabetes and lesser forms of glucose intolerance, impaired glucose tolerance (IGT) and impaired fasting glucose (IFG), can now be found in almost every population in the world. Epidemiological evidence suggests that, without effective prevention and control programs, the burden of diabetes is likely to continue to increase globally [7&8]. Because diabetes is now affecting many in the workforce, it has a major and deleterious impact on both individual and national productivity. The socioeconomic consequences of diabetes and its complications could have a seriously negative impact on the economies of developed and developing nations [9]. On 20th December, 2006, the United Nations General Assembly unanimously passed Resolution 61/225 declaring diabetes an international public health issue and declaring World Diabetes Day as a United Nations Day [10].

Type 2 diabetes is a major public health concern worldwide. An estimated 439 million people will have the disease by 2030 [11]. It is possible to have the incidence of type 2 diabetes among individuals at high risk through lifestyle and pharmacological interventions [1&2]. If a measure of blood glucose level were to be used to define the risk of developing diabetes, then it would seem logical to use the same test for diagnosis and informing treatment decisions [12].

Table (1) Summarize Age, Body mass Index (BMI) and Waist circumference (WC)

Variable	Obs.	Mean	Std. dev.	Min	Max
Age	483	22.96	6.64	18	57
BMI	483	23.14	5.94	12.11	50.22
CW	483	74.08	13.04	42	124

Table (2): Summarize Age and Body Mass Index (BMI)

Variable	BMI				Chi-square	P-value
Age	< 20	20 – 24	25 – 29	≥ 30		
< 20 year	46	30	8	3		
20 – 29 year	88(60%)	146(79%)	68(76%)	54(90%)		
30 – 39 year	**2**	**0**	**11**	**0**	83.88	0.013
40 – 49 year	**12**	**4**	**3**	**3**		
≥ 50	0	**5**	**0**	**0**		
Total	148(31%)	185(38%)	**(%19)90**	**(%12)60**		

Type 2 diabetes is the most common form of diabetes, estimated to account for 85–90% of diabetes [13]. Impaired glucose tolerance (IGT) is a predictor for the subsequent development of Type 2 diabetes and itself a high risk factor for macro-vascular disease. Type 2 diabetes is often asymptomatic in its early stages and can remain undetected for several years [14]. Increasing evidence shows that half of those with Type 2 diabetes are not aware that they have the condition. Early diagnosis of the condition is important; as careful diabetes management can reduce long-term complications, such as blindness, kidney failure, cardiovascular disease and limb amputation [15&16]. In Saudi Arabia, the prevalence of diabetes mellitus has been observed at 11.8% and 12.8% for males and females, respectively [17]. This study was carried out to investigate the risk factor of DMtype-2, by using BMI also the waist circumference as indicators for obesity.

Materials and Methods

A cross sectional study, including students and staff members were conducted in the Faculty of Applied Medical Sciences, Turabah-Taif University, Saudia Arabia. All participants completed questionnaires about their personal and family history of disease, medication, and lifestyle factors.

For each individual participant, height and weight measurements were taken using a Stadiometer (Soehnle, China). Body Mass Index (BMI) was calculated as weight (kg) divided by the square of the height (m^2). Obesity was defined as a BMI of more than 30 kg/m^2 [20].

Waist circumference was measured and recorded for all participants since it is one way to determine whether a participant has an increased amount of fat around your belly, an indication of increased health risk, e.g. hypertension, elevated blood lipids, type 2 diabetes, and cardiovascular disease –according to The National Institute of Health..

Prior to the completion of questionnaires and conducting various measurements the purpose of the study was described to all participants who signed consent. Participants were clearly informed that they could choose not to participate or to withdraw at any time during the study. They were assured of anonymity and confidentiality.

Data Entry and Analysis

Data were entered and analyzed using Statistical Package for Social Sciences program (SPSS) for Windows, Version 16. (Log Xact8, Crossover, USA). Differences between proportions were considered statistically significant if 95% confidence intervals (95% CI) did not overlap. In addition, the Chi - square test was used to determine the significant difference between the populations studied.

Results

A total of 483 participants were randomly selected to be enrolled in the study; the age ranged from 18-57 years, the mean, Std.dev of the Body Mass Index (BMI) was (23.14 ± 5.94) and for waist circumference (WC) was (74.08±13.04) cm. as shown in table (1).

Table (2) and Figure (1) summarize the Age and Body Mass Index (BMI) showed significant correlation with P-value of 0.013 between the increase in BMI and Age which was more clear in age groups of (20-29) years, having 88 (25%), 146 (41%), 68 (19%) and 54 (15%) counting 356 (74%) out of 483 participants were considered, underweight, normal, pre-obese and obese respectively. In a similar way there was a significant increase in waist circumference 69% were less than 80 cm the reaming were 31% with more than 80 cm.

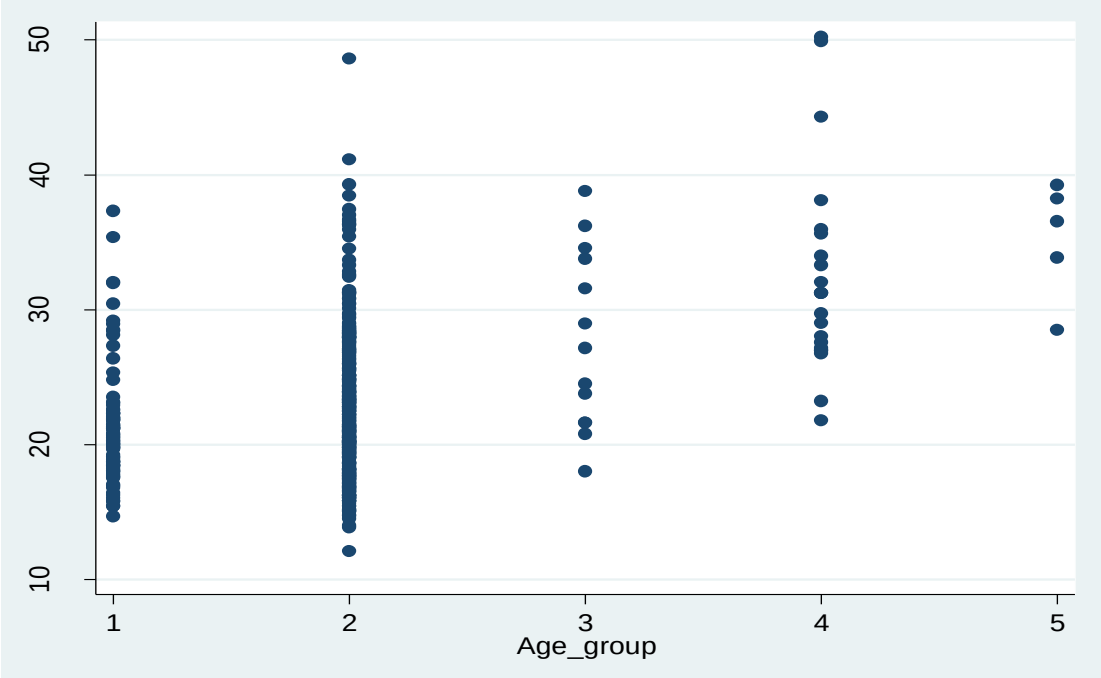

Figure (1) Distributions of BMI among different age groups, (1=<20, 2=20-29,3=30-39,4=40-49 and 5=≥50) Years

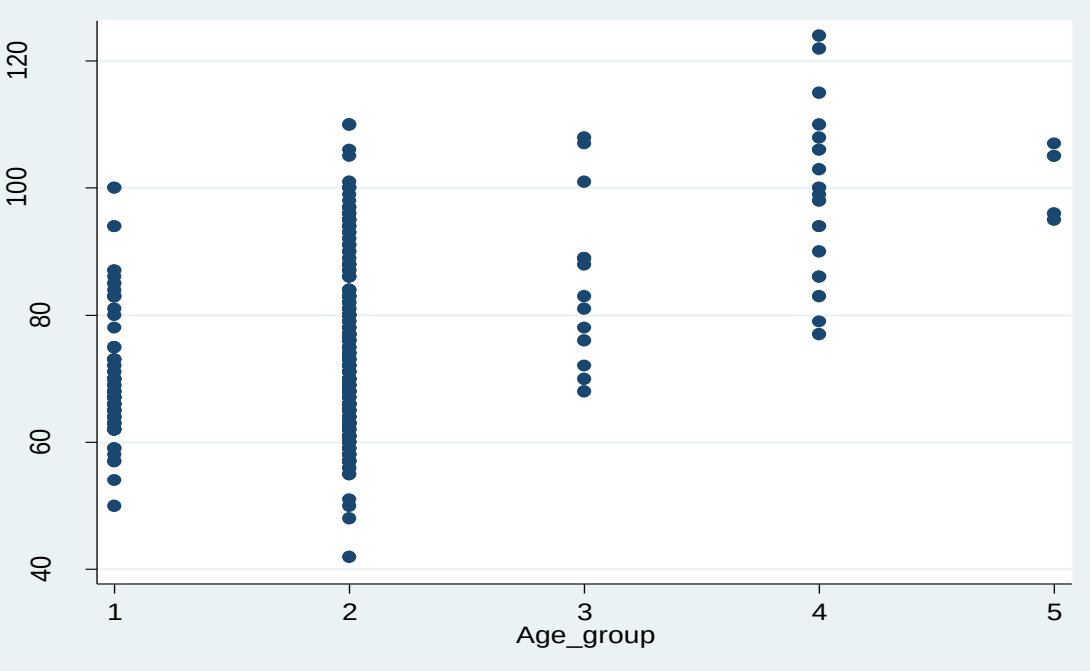

Figure (2): Distributions of Waist Circumference (WC) among the Age among different age groups, (1=<20, 2=20 29,3=30-39,4=40-49 and 5=≥50) Years

Table (3) Summarize Body Mass Index (BMI) and Waist circumference (WC)

Variable	BMI				Chi-square	P-value
WC	< 20	20 – 24	25 – 29	≥ 30		
< 80	141(95%)	167(90%)	36(40%)	2(3%)	254.4	0.055
≥ 80	7(5%)	18(10%)	54(60%)	58(97%)		
Total	148(31%)	185(38%)	90(19%)	60(12%)		

Table (4): Summarize Age and Waist Circumference (WC)

Variable	WC		Chi-square	P-value
Age	< 80	≥ 80		
< 20 year	74(21%)	13(9%)		
20 – 29 year	245(71%)	111(81%)		
30 – 39 year	**6**(2%)	**7**(5%)	13.77	0.008
40 – 49 year	**17**(5%)	**5**(4)		
≥ 50	4(1)	1(1%)		
Total	346(72%)	137(28%)		

In a similar way there was a significant relation between BMI and waist circumference with P-value of (0.05) as shown in table (3).From table (4) and Figure (2) we observe that the increase in waist circumference (≥ 80) was more prominent in the age groups of (20-29) years as compared to other groups, 111 (23%) out of 483 participants.

Discussion

The purpose of this study was to determine the prevalence of diabetes mellitus and associated risk factors among the students and staff members of the Faculty of Applied Medical Sciences in, Turabah, Taif University, Saudi Arabia. The results indicate that the associated risk factor of DM type-2 like obesity were widely prevalent. Data on body mass index (BMI) showed that the age groups of (20-29) years, having 88 (25%), 146 (41%), 68 (19%) and 54 (15%) counting 356 (74%) out of 483 participants were considered, underweight, normal, pre-obese and obese respectively. In a similar way there was a significant increase in waist circumference 69% were less than 80 cm the reaming were 31% with more than 80 cm.

Obesity and physical inactivity are increasing in the world, the study of Saleh M. Al Osaimi et.al [(22)] showed **t**he prevalence of diabetes mellitus was found to be 15.8% (24.2% in males and 11.3% in females) only 23.3% of them were well controlled. Fifteen percent (15%) of the diabetics were undiagnosed.

Type-2 diabetes is often asymptomatic in its early stages and can remain undetected for several years. Increasing evidence shows that half of those with Type 2 diabetes are not aware that they have the condition. Early detection program should be will establish with proper knowledge of associated risk factor to increase the awareness of the disease.The diagnosis of the condition is important for careful diabetes management can reduce long-term complications, such as: blindness, kidney failure, cardiovascular disease and limb amputation [(23)].

Our study showed than an increase in BMI, which is an indication of high risk, could be an early detection to increase the awareness about the importance of changing the lifestyle may be the first step towards the prevention of obesity and DM type-2. There is also well known correlation between the increase of waist circumference and the risk of developing DM type-2. Moreover, an increased amount of fat around the belly is associated with an increased risk for health conditions like hypertension, elevated blood lipids, type 2 diabetes, and cardiovascular disease.

This study is in agreement with previous work, where there is a correlation between an increase in BMI as a risk factor for DM type 2, but our study has a limitation since the majority of observed obese students refused to participate in the study despite their background and the knowledge of DM type -2 and associated risk factors.

In conclusion, the results of this study indicate that individuals with high BMI and WC are more likely to have high blood glucose and could be at risk of DM type-2 and other complications.

It is recommended to carry-out a large population screening program using more accurate detecting elements since early detection will contribute in decreasing the risk of diabetes and its associated factors. Alternative strategies to identify high-risk individuals may be necessary, complementary population-based approaches need to be developed to better estimate the burden of the disease and potential benefits of preventive interventions.

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