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Assessment of risk for type 2 diabetes mellitus in Jouf, Saudi Arabia

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Abstract: **Quantifying risky people for diabetes mellitus is important to allow for rational planning for delaying of the onset of the disease. Therefore, we designed this study to identify people at risk for developing Type 2 diabetes mellitus as a key strategy in prevention or delaying onset of diabetes among Saudi population. Subject and Method; one hundred and six Saudi men and women (20 - ≥ 65 Yrs.) live in Skaka City share into this cross - sectional pilot study as a convenient sample from Saudi community. Two tools used into this study, Socio-demographic and Type 2 Diabetes Risk Assessment Form. Results; The study results estimated that more than one third of the studied sample (36.80%) had moderate risk of diabetes, about one third had high risk of diabetes (34.00%), and only 13.20% had low risk of diabetes. There are statistically significant differences between age, sex, level of education and risk of diabetes. Conclusion/ Interpretation; Saudi nation at risk for diabetes mellitus. They need life modifications. Women and men of all ages should avoid becoming overweight. They should maintain a moderate level of physical activity, avoid smoking, avoid stress, take vegetable and fruits daily, decrease sweets, sugars, and fatty diet.**

Keywords: **Diabetes Mellitus, Risk, Saudi, Prevalence, recommendations.**

I. INTRODUCTION

Diabetes mellitus is a worldwide chronic condition and a health burden.(1) In 2012, diabetes was the direct cause of 1.5 million deaths and high blood glucose was the cause of another 2.2 million deaths and a major cause of blindness, kidney failure, heart attacks, stroke, and lower limb amputation.(2)

The prevalence worldwide already reached 366 million by 2011 according to the international Diabetes Federation (IDF), and the projections are that prevalence of diabetes on a global scale could well reach 530 million people in 2030.(3)

Approximately 35.4 million people, or 9.1% of adults aged 20–79 years, were living with diabetes in the Middle East and North Africa (MENA) Region in 2015 and four out of ten adults with diabetes are undiagnosed.(4)

The International Diabetes Federation estimates that, the four countries with the highest prevalence rates are United Arab Emirates, Saudi Arabia, Bahrain and Kuwait. According to World Health Organization statistics (WHO), diabetes in Saudi Arabia was estimated 890,000 in 2000 and predicted to be 2,523,000 in 2030.(5)

There were 3.4 million cases of diabetes in Saudi Arabia in 2015.(3) Previously estimated diabetes in Saudi around 23.7% in the adult population, which ranks it as one of the countries in the region with the highest prevalence of this condition. (3,4,6)

There are often several factors that may predispose clients to DM including age (over 40 years), obesity, stress, and a family history of diabetes. In some clients, a specific event such as a viral infection may be the precipitating factor. Genetic, autoimmune, viral, and environmental factors have all been linked to diabetes.[7]

Diabetes reduced life expectancy; the significant morbidity associated with diabetes arises from micro-vascular complications, increased risk of macro-vascular complications (ischemic heart disease, stroke, and peripheral vascular disease), and diminished quality of life.[4]

In addition, diabetes have a serious complications. It's the leading cause of new blindness in adults 20 to 74 years of age and is the leading cause of end-stage renal disease, accounting for about 40% of new cases. Like-wise, it's responsible for more than half the number of non-traumatic amputations in the United States.[2,8] So, early detection of DM risk persons is important to decrease the risks of undetectable Diabetes complications.

The main goal of this study to identify people at risk of Type 2 diabetes as a key strategy in prevention or delaying onset of diabetes among Saudi population.

II. SUBJECT AND METHOD

This study is a cross - sectional pilot study done in Moharem 1440. One hundred and six men and women (20 - ≥ 65 Yrs.) were taken in this study. As a convenient sample of Jouf, Skaka City, KSA. Both diabetic patients and Pregnant women were excluded from this study.

Information regarding diabetes was obtained from study subjects using a Semi-structured interview schedule consisting of;

a- Socio-demographic characteristics; age, gender, and education.

b- Risk factor profile: a detailed interview was taken to assess the various life style related risk factors for Diabetes as; daily activities, daily eat vegetables and fruits, previous taking of anti-hypertensive medication, previous elevation of blood sugar and family history.

c- Anthropometry: the waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, using a stretch resistant tape that provides a constant 100 g tension. Digital weighing scale was used to measure weight. The weighing scale was adjusted to 0.0 and the study subject was asked to remove his/her footwear and stand in the middle of the scale with feet slightly apart, hands at sides, and ahead looking straight. Participants were weighed with minimal clothing and weight was noted down. Standing height was measured using a portable stadiometer with a fixed vertical backboard and an adjustable head piece. The study subject was told to stand up straight with the body weight evenly distributed and both feet flat on the platform and look straight. The height was recorded. The weight and height were then used to calculate body mass index (BMI).

d- Saudi Diabetes Risk Score (SDRS): includes five parameters: age, sex, education, physical activity, and hypertension. Each parameter has assigned score ranging from 0 to 60 and accordingly the subject was graded as having low risk, slightly risk, moderate risk, high risk or very high risk.

Data Analysis:

Data was entered and analyzed in SPSS version 12. Data was expressed in frequencies, mean, and percentages. Chi-square test was used as a test of significance to compare differences between groups for categorical data and independent sample t-test was used for continuous data. P value ≤ 0.05 was considered to be statistically significant.

Ethical Issues:

A written consent was taken from each study Participants. Those who were illiterate, thumb impression were taken in front of a witness. All information collected was kept confidential. All the study subjects who had a diabetic risk score >30 (moderate, high and very high risk) were referred to a secondary level /tertiary level hospital for getting their blood sugar levels checked and further workup.

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III. RESULTS

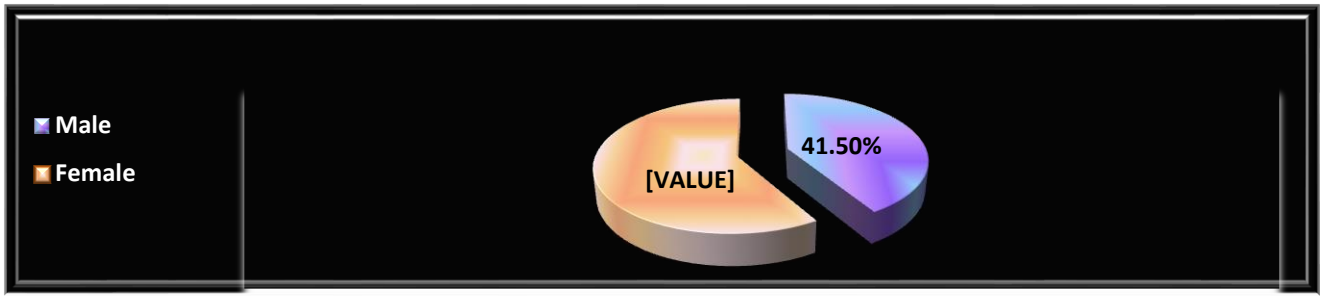

Fig. (1): Distribution of the studied sample according to their sex

More than half (58.80%) were females and 41.50% were males.

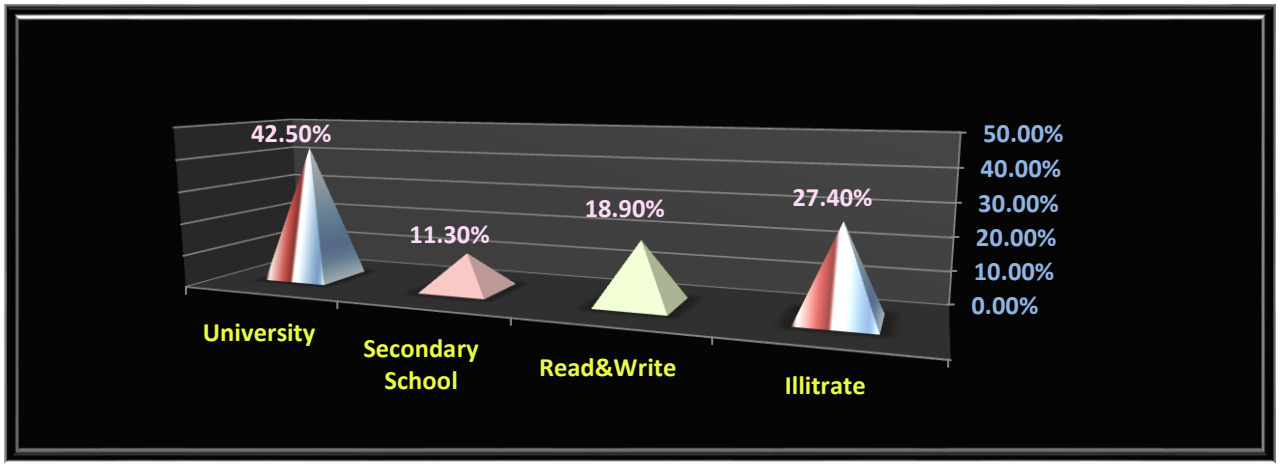

Fig. 2: Distribution of the studied sample according to their level of Education

More than one quarter (27.40%) were illiterate, 42.50% graduated from Al Jouf University, 18.90% can read and write and only 11.3% graduated from secondary school.

Table (1): Type 2 diabetes risk assessment form items

Frequency / Item	No.	%
1. Age:		
a- Under 45 Yrs.	53	50.0
b- 45 – 54 Yrs.	20	18.9
c- 55 and above.	33	31.1
Means ± SD	42.3 ± 16.921	
2. Body Mass Index (BMI):		
a- Lower than 25 kg/m^2	6	5.6
b- 25 – 30 kg/m^2	5	4.7
c- Higher than 30 kg/m^2	95	89.6
3. Waist Circumference:	4	3.6

a- Men: Under 94 cm b- Women: Under 80 cm c- Men: 94–102 cm d- Women: 80–88 cm e- Men: Over 102 cm f- Women: Women: Over 88 cm	21 23 32 16 10	19.8 21.7 30.2 15.1 9.5
4. Daily Activity: Do you usually have at least 30 minutes of physical activity every day? a- Yes b- No	21 85	19.8 80.2
5. Fruits and Vegetables: How often do you eat vegetables, fruit, or berries? a- Every day b- Not every day	11 95	10.4 89.6
6. High Blood Pressure: Have you ever taken anti-hypertensive medication regularly? a- No b- Yes	77 29	72.6 27.4
7. High Blood Sugar: Have you ever been found to have high blood glucose? a- No b- Yes	88 18	83.0 17.0
8. Family: Have any members of your family been diagnosed with diabetes (type 1 or type 2)? a-No b- Yes: grandparent, aunt, uncle or first cousin (but not own parent, brother, sister or child) c- Yes: parent, brother, sister, or own child	43 35 28	40.6 33.0 26.4

Mean age of the studied sample were 42.3 Years old. Body mass index of the majority of them (89.6%) were higher than 30 kg/m2. And (80.2%, and 89.6% respectively) didn't perform physical activities every day and didn't eat vegetables, fruit, or berries every day respectively. More than one quarter (27.4%) never taken anti-hypertensive medication, and 83.0% never been found with high blood glucose level. More half (59.4%) had family history of diabetes.

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Table (2): Distribution of the studied sample according to their diabetic risk

Frequency / Item	No.	%
Low risk	31	29.20
Moderate risk	39	36.80
High risk	36	34

About two thirds of the studied sample 66% (36.80% and 34.0% respectively) had moderate and high risk for diabetes, and only 34.00% had low risk of diabetes.

Table (3): Relation between personal data and diabetic risk scores

Scores / Item	low risk		Moderate risk		High risk		Total
	No.	%	No.	%	No.	%	No.
1- Age:							
a- Under 45 Yrs.	28	29.6	23	24.4	2	2.1	53
b- 45 – 54 Yrs.	1	1.1	7	7.4	12	12.8	20
c- 55 and above	2	2.1	9	9.6	22	21.4	33
X2 (P- Value)	**55.826 (0.000)**						**106**
2- Sex:							
a- Male	7	7.4	15	15.9	22	23.3	44
b- Female	24	25.4	24	25.4	14	14.8	62
X2 (P- Value)	**12.464 (0.014)**						**106**
3- Level of education:							
a- Illiterate	2	2.1	8	8.5	19	20.2	29
b- Read and write	3	3.2	5	5.3	12	12.8	20
c- Secondary school	3	3.2	9	9.5	0	0.0	12
d- University	23	24.3	17	18.0	5	5.3	45
X2 (P- Value)	**47.192 (0.000)**						**106**

One fourth (24.4%) of the studied sample who under 45 Yrs had moderate risk for diabetes. It can be clearly noticed that older participants are at higher risk of type 2 DM (21.4%). There are highly significant difference between the studied sample age and their risk of diabetes (P-Value ≤ 0.005). About one quarter (21.2%) of male had a high risk for diabetes while only (14.8%) from women had high risk of it. There are significant differences between sex and diabetic risk (P-Value ≤ 0.005). It was found that, 20.2% from illiterate persons at high risk for diabetes and 18.0% from those who graduated from Jouf university had moderate risk of it. There are significant differences between Level of education and diabetic risk (P-Value ≤ 0.005).

Table (4): Relation between physical activities, hypertension and diabetic risk

Scores / Items	low risk		Moderate risk		High risk		Total
	No.	%	No.	%	No.	%	No.
Daily Activity: Do you usually have at least 30 minutes of physical activity every day? a- Yes	9	8.8	10	9.5	2	2.1	21
b- No	22	23.4	29	27.4	34	32.3	85
X2 (P- Value)	**2.080 (0.09)**						**106**
High Blood Pressure: Have you ever taken anti-hypertensive medication regularly? a- Yes	40	29.9	29	27.4	18	19.1	77
b- No	1	1.1	10	9.5	18	19.1	29
X2 (P- Value)	**5.360 (0.001)**						**106**

Table (4) shows clear Relation between hypertension and diabetic risk scores. It was found that, there are statistically significant differences between hypertension and diabetic risk (P-Value ≤ 0.005). While, there aren't statistically significant differences between physical activities and diabetic risk (P-Value > 0.005).

IV. DISCUSSION

Type 2 diabetes is associated with increased risk of cardiovascular disease and premature mortality and is the leading cause of blindness, kidney failure, and non-traumatic amputations resulting from micro-vascular complications. The present study aimed to Identify Saudi people who at risk for Type 2 diabetes as a key strategy in prevention or delaying the onset of this disease in KSA.

In this study screening for diabetes was conducted for 106 Saudi out of these (36.8% and 34% respectively) had moderate and high & very high risk for diabetes. These observations made in our study were very close to that made by other authors.[9,10,11] This shows that a large number (moderate and high risk) of the study subjects had some kind of risk of developing diabetes in future. This is the group where active interventions in the form of health education, counseling and further work up is urgently required. The earlier the interventions are started the later will be the onset of disease and its subsequent complications.

The present study found that, Saudi men are more risky for diabetes mellitus than women with statistical significant differences, this result agree with the study of Wild, et al., 2004,[4] who found that the prevalence of diabetes in urban population higher in men than women. On the other hand, Austin et al., 2004, [11] found that, thirty per cent (95) of the volunteers were at risk of developing Type 2 diabetes mellitus (41 men; 54 women). However, in other study [12] showed low risk category had a higher number of individuals. This difference may be due to the study area being rural where less proportion of study subjects had high risk.

Family history was positive in 33% of our study participant, this result is less than the study of Austin, et al., 2004[11] which found it positive in 54% of their volunteers. Based on the ADA questionnaire in Austin, et al., 2004[11] 82% of volunteers were at high risk for developing Type 2 diabetes mellitus, it's more than our study results 32.10%. This reflect Saudi awareness toward the risk factors and trying to avoid them.

Our research results estimated a statistically significant difference between age and risk of diabetes, this result agree with Choi and Shi, 2001,[13] study results which done in Canada. While Choi and Shi study results in 2001,[13] found that the prevalence of diabetes was not be related to level of education, this result disagree with the present study result.

The present study confirmed that, there are a positive relation between hypertension and risk of diabetes. This agree with Bakris, et al., 2012. [14]

Kriska, Marrero, and Yanovski, (2012),[15] mentioned that physical activity plays an important role in preventing type 2 diabetes. This disagree with our study results which show that there aren't significant differences between daily livings and diabetes risk.

Our study results confirm that, there was a significant differences association of diabetes risk with sex (P=0.014), it's disagree with the study of Anita et al., 2017[2] which estimate no significant differences between men and women according diabetes risk in India (P=0.24). While, poor educational status was statistically significant as seen in table 4 (p=0.000), it's the same results of study of Anita et al., 2017[2] .

According to, diabetes risk and hypertension, table 5 shows that there was a statistically significant between them (P=0.001), it's agree with Anita et al., 2017[2] (P=0.00).

A highly significant statistical association was observed between diabetes risk and level of education (p=0.000) which was similarly seen by Anita et al., 2017,[2] and Shrivastava, 2014 [16] These findings, however do not corroborate with those of Ram, 2013 [17] and Bharati, 2011.[18]

Our study results agree with a cross-sectional study conducted among adults in Bangladesh revealed that, aging, hypertension and obesity are significantly correlated to the development of type 2 DM.[19] Likewise, the prevalence of diabetes mellitus was found to increase with age in the Al Kharj area of Saudi Arabia as 23% of the diabetic patients belonged to the age group more than 65 years whereas, only 0.3% remained in the age group below 24 years.[20]

V. CONCLUSION

Screening and early identification of high risk individuals would help to take appropriate intervention like lifestyle modification. It would also help in early diagnosis and treatment to prevent or to delay the onset of diabetes mellitus and its complications.

Saudi nation at risk for diabetes mellitus. They need life modifications. A national prevention program required to prevent diabetes and address the modifiable risk factors at the community level, targeting high-risk groups, should be implemented soon. The risk of developing type 2 diabetes increases with family history, age, obesity, hypertension, and lack of knowledge.

In summary, the current study reemphasize the need for devising a nationwide awareness program about a lifestyle modification including increased physical activity (30-45 min/day), weight reduction, improved eating habits as well as early detection of diabetes. Health care providers in Saudi Arabia have the responsibility for an immediate action to save the country from this alarming condition before it exceeds the capacity of adjustment.

VI. RECOMMENDATIONS

1. Providing Saudi risky people with a quality-assured, evidence-based, intensive lifestyle change programme to prevent or delay the onset of type 2 diabetes.
2. Offer follow-up sessions at regular intervals.

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