Sohag University Sohag Medical Journal Faculty of Medicine

Original Article

Risk Factors of Recently Discovered Type II Diabetic Patients at Sohag University Hospitals

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Abstract:

Introduction: The risk of major complications is greatly increased by type 2 diabetes (T2D). By 2030, it is predicted that prevalence of type 2D will be dramatically increase in Egypt. **Aim:** is to assess the risk factors for T2D in Egyptian populations and try to design a more convenient Egyptian risk score for susceptibility to T2D. **Patients & Methods**: This study was conducted at Sohag University Hospital including 377 participants divided into 2 groups; study group included 161 recently discovered diabetics & healthy group 216 person. **Results**: Certain age groups, females, steroid intake, carbohydrate or fat diets, sedentary life, hypertension, family history of T2D, HCV, BMI > 25, those with waist circumference for males ≥ 90cm & for females ≥ 85cm were independent predictors for Univariate and Multivariate regression analysis of risk factors for newely discovered DM. A score of ≥13 points indicated a high risk for DM. The (ROC) curve illustrating how well the risk score predicted DM in the population studied ((AUC) = 0.82, 95% CI 0.78:0.86) and cutoff value >13 has a sensitivity of 70% and specificity of 85%. **Conclusion**: In the current study, a more convenient DM risk scoring model is designed specifically and appropriately for Egyptians. A score > 13 indicates a high risk for DM.

Key words: Risk Factors for diabetes mellitus, Recently Discovered Diabetes, Risk Score

DOI : **10.21608/smj.2024.251858.1430**

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Received: 05 February 2024
Revised: 05 March 2024
Accepted: 06 March 2023
Published: 01 May 2024

Introduction

It is commonly recognized that type 2 diabetes (T2D) raises the chance of early death and serious consequences such heart attack, stroke, blindness, amputation, and kidney failure .[1]

By 2030, diabetes prevalence is anticipated to climb most dramatically in Egypt. Economic growth and urbanization have altered peoples' lifestyles, resulting in decreasing physical activity, increased consumption of refined carbohydrates, increasing obesity, and an ageing population. These elements have caused both the prevalence of type 2 diabetes and associated risk factors to rise quickly. As a result, diabetes has become a serious problem for public health in the area. [2]

The prevalence of type 2 diabetes has dramatically increased, and the main contributing reasons are environmental and lifestyle variables. Those who are more susceptible to these alterations are presumably identified by genetic characteristics. Additionally, research have revealed that some ethnic groups are more likely than others to develop diabetes. [3]

The relationships between various risk factors and the likelihood of developing type 2 diabetes have been extensively studied. The most often identified risk factors for type 2 diabetes include body mass index (BMI), lipids, hypertension, smoking, physical inactivity, low education, dietary habits, family history, and particular genes. (4)

Several scoring systems were suggested to identify the population at risk for diabetes development e.g.: the Dutch score ,(5) the Cambridge risk score, (6) the Danish risk score, (7) the Finnish diabetes risk score (FINDRISC), find RISK Germany, (8) Australian risk score (AUSDRIS), the German diabetes risk score, the ADA risk score, (9) and the risk assessment of Pakistani individuals for diabetes (RAPID). (10) However, these risk score models may not be valid or convenient for Egyptians with different lifestyles & different ethnicities.

Our study aimed to evaluate different risk variables for developing DM type II in Egypt & to design a more convenient risk scoring model for determining the susceptibility for developing type II diabetes mellitus in Egypt.

Patients & methods

This observational cross-sectional research was carried out in Sohag University Hospital, Internal Medicine Department between the first of September 2019 to the first of January 2021. There were 377 Egyptian participants in this study.

They divided into 2 groups:

*Study group (161 patients): included recently discovered type II diabetic patient aged 18 years and above.

*Control group (216 non-diabetics): included healthy individuals with matched age and sex.

The exclusion criteria were patients previously diagnosed as diabetics, those with serious physical or mental disabilities, people with learning disorders, the presence of severe communication barriers, and pregnant women. The Sohag Faculty of Medicine's scientific and ethical committees gave their approval to the study protocol.

Baseline data were collected by direct questionnaire including age, sex, dietary habits, smoking, physical activity, therapeutic background of steroid, antihypertensive, and anti-diabetic medication use and previous experience with elevated blood glucose, history of SARS-- CoV-2 or HCV infection and prior experience with gestational diabetes in women, and family history of diabetes. A comprehensive clinical examination was performed on each patient, during which measurements of their height, weight, waist circumference, body mass index (BMI), and blood pressure (BP) were taken. Laboratory investigations included testing fasting blood samples for glycosylated hemoglobin assay (HbA1c) and blood sugar.

Because they are relatively prevalent in Egypt and are thought to be closely related to acquiring type II diabetes, smoking prior history of HCV infection was added. Also, we considered the presence of SARS-CoV-2 infection which is an international pandemic commonly associated with high blood glucose measures and has a great impact on the development of diabetes.

Statistical analysis:

To conduct the statistical analysis, SPSS (SPSS Inc., 2009) was used. Version 18.0 of PASW Statistics for Windows. Chicago, Illinois, USA Frequency and percentages were used to characterize the qualitative data. To evaluate the statistical variances between values, the chi- square test and independent t-test were utilized. Analyses of multivariate and univariate logistic regression were done to find the risk factors for diabetes mellitus. Statistical significance was defined as a P value of ≤ 0.05.

Results

The study included 377 Egyptian participants, with the mean ± SD of the diabetic and nondiabetic categories was 47.60±12.76 and 51.19±11.37 respectively. Female patients and age ≥65 years were significantly increased in diabetics than non-diabetics. Also, worker patients were significantly decreased in diabetics. The residence was insignificantly different between both groups (Table 1).

Regarding clinical data of the population studied, we found that patients taking antihypertensive and steroid were significantly increased in diabetics than non- diabetics (P = 0.002 and <0.0001, respectively). Patients with balanced diet and physical active lifestyle were significantly decreased in diabetics (P <0.0001). Also, patients with hypertensive patients, those with positive family history and history of HCV were increased significantly in diabetic group than non- diabetics (P = 0.006, 0.005 and 0.01, respectively). However, smokers and patients with COVID 19 infection were insignificantly different in both groups (Table 2).

Considering blood pressure (BP) and anthropometric measures, systolic BP, diastolic BP, weight & BMI, they showed a significant increase in the diabetic group than non- diabetics (P > 0.001, > 0.001, > 0.001 and > 0.001 respectively). However, BMI group <25 expresses a significant decrease in diabetic group than non-diabetics(P > 0.001). Also, waist circumference of the patients showed a significant increase in diabetic group than non- diabetics (P > 0.001). Height of the patients was insignificantly different in both groups (Table 3).

Regression analysis, both multivariate and univariate, evaluated risk factors for individuals with newly diagnosed diabetes showed that age group 35 - <65 & ≥65 years, female gender, patients taking steroid, higher carbohydrate or fat diet, sedentary lifestyle, history of HCV, BMI group 25 - <30 & ≥30, high waist circumference (≥ 90 cm for males and ≥85 cm for females) were independent predictors for Univariate and Multivariate regression analysis of the risk variables for patients with recently discovered diabetes. Each variable received points based on the odds ratio. [10] High risk of getting type II diabetes was indicated by a total score of more than 13 points (Table 4).

Receiver-operating characteristic (ROC) curves with a cutoff value of >13 and sensitivity of 70% and specificity of 85% demonstrate the risk score's performance in predicting diabetes in the population under study (AUC=0.82, 95% CI 0.78:0.86). (Figure 1)

Table 1 shows the Social and demographic characteristics of the studied subjects

Variable	Non diabetics group N=216	Diabetics group N=161	P value
Age in years Mean ± SD	47.60±12.76	51.19±11.37	0.005
Age group			<0.0001
≥65 years	26 (12.04%)	35 (21.74%)	
35-<65 years	141 (65.28%)	115 (71.43%)	
<35 years	49 (22.69%)	11 (6.83%)	
Gender			0.01
Male **Female**	150 (69.44%) 66 (30.56%)	91 (56.52%) 70 (43.48%)	
Residence			
Urban **Rural**	121 (56.02%) 95 (43.98%)	101 (62.73%) 60 (37.27%)	0.19
Occupation			<0.0001
Worker	133 (61.57%)	56 (34.78%)	
Housewife	66 (30.56 %)	64 (39.75%)	
Farmer	5 (2.31%)	5 (3.11%)	
Employee	5 (2.31%)	20 (12.42%)	
Teacher	2 (0.93%)	3 (1.86%)	
No work	5 (2.31%)	13 (8.07%)	

Table 2 shows the clinical data of studied subjects.

Variable	Non diabetics group N=216	Diabetics group N=161	P value
Anti-hypertensive			
Yes	63 (29.17%)	72 (44.72%)	0.002
No	153 (70.83%)	89 (55.28%)	
Steroid			
Yes	6 (2.78%)	21 (13.04%)	<0.0001
No	210 (97.22%)	140 (86.96%)	
Diet			
Carbohydrate or fat	132 (61.11%)	128 (79.50%)	<0.0001
Balanced	84 (38.89%)	33 (20.50%)	
Lifestyle			
Sedentary life	144 (66.67%)	142 (88.20%)	<0.0001
Physical active	72 (33.33%)	19 (11.80%)	
History of hypertension			
Yes	63 (29.17%)	69 (42.86%)	0.006
No	153 (70.83%)	92 (57.14%)	
Family history of DM			
First degree	87 (40.28%)	92 (57.14%)	0.005
Second degree	9 (4.17%)	5 (3.11%)	
No Family Hx	120 (55.56%)	64 (39.75%)	
Smoking status			
smoker	73 (33.80%)	57 (35.40%)	0.75
Non smoker	143 (66.20%)	104 (64.60%)	
History of HCV			
Yes	5 (2.31%)	13 (8.07%)	0.01
No	211 (97.69%)	148 (91.93%)	
COVID-19 infection			
Yes	35 (16.20%)	21 (13.04%)	0.39
No	181 (83.80%)	140 (86.96%)	

Table 3 shows the anthropometric measures & BP values of investigated subjects

Variable	**Non-diabetics**	**Diabetics**	**P value**
	N=216	**N=161**	
Systolic BP			
Mean ± SD	123.09±13.73	137.67±21.83	<0.0001
Diastolic BP			
Mean ± SD	76.92±7.72	82.92±9.70	<0.0001
Height /m Mean ± SD	1.67±0.10	1.67±0.08	0.65
Weight /kg Mean ± SD	78.55±22.35	88.05±15.86	<0.0001
BMI Mean ± SD	28.28±7.83	31.62±5.60	<0.0001
groups of BMI			
≥30	65 (30.09%)	93 (57.76%)	
25-<30	27 (12.50%)	38 (23.60%)	
<25	124 (57.41%)	30 (18.63%)	<0.0001
Waist circumference/cm Mean ± SD	94.35±17.74	106.02±17.32	<0.0001
Waist circumference groups			
≥90 cm for males and ≥85 cm for females	99 (45.83%)	134 (83.23%)	
<90 cm for males and <85 cm for females	117 (54.17%)	27 (16.77%)	<0.0001

Table 4: shows different risk variables for newly discovered diabetes: multivariate regression analysis (included significant variable in univariate analysis):

Variable	Odds ratio (95% confidence interval)	P-value	Score
Different age groups			
≥65 years	5.73 (2.04:16.12)	0.001	6
35-<65 years	3.33 (1.47:7.52)	0.004	3
<35 years	1		0
Gender			
Female	2.53 (1.45:4.40)	0.001	3
Male	1		0
Steroids use			
No	1		0
Yes	4.20 (1.21:14.53)	0.02	4
Dietary habits			
Carbohydrate or fat	1.99 (1.10:3.60)	0.02	2
Balanced	1		0
Lifestyle			
Sedentary lifestyle	2.88 (1.47:5.62)	0.002	3
Physically active	1		0
Family history			
First degree relatives	2.22 (1.30:3.81)	0.003	2
Second degree relatives	1.40 (0.37:5.38)	0.62	0
No family Hx	1		0
The presence of History of HCV			
Yes	4.32 (1.30:14.32)	0.02	4
No	1		0
BMI groups			
≥30	2.20 (1.01:4.83)	0.047	2
25-<30	3.10 (1.41:6.76)	0.005	3
<25	1		0
Waist circumference groups			
≥85 cm for females and ≥90 cm for males	3.20 (1.51:6.77)	0.002	3
<85 cm for females and < 90 cm for males	1		0

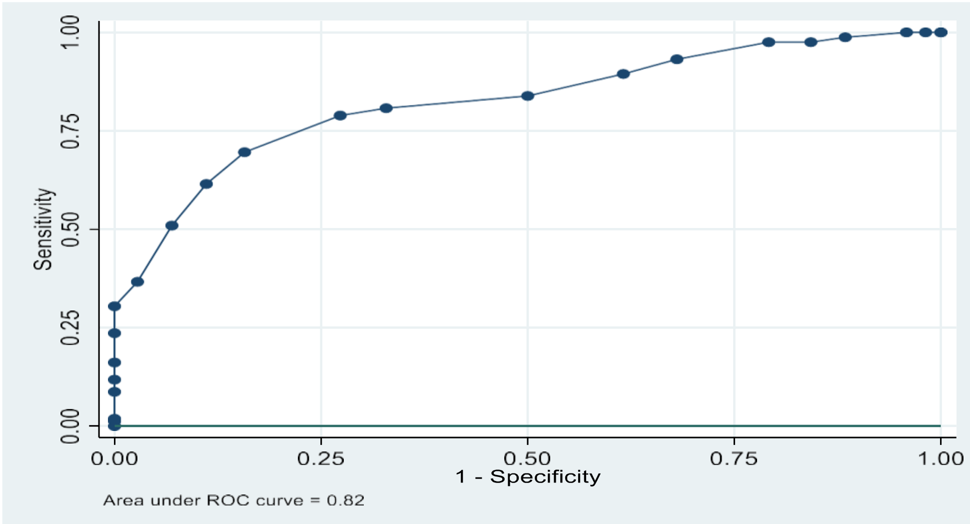

Figure 1. shows the (ROC) curve of the risk score for estimating the subjects' likelihood of developing diabetes.

Discussion

Identifying diabetics who are undiagnosed at this time or who are at a higher risk of developing type II diabetes mellitus in order to reduce the burden of diabetes and its effects. (11)

The current study revealed a statistically significant difference between diabetic and non-diabetic subjects as regards common age group as most of the diabetic patients (71.43%) were around the age group (35-65 years), age >65y were more in diabetic patients than nondiabetic subjects, which goes in line with Alva et al. In a study that looked at different age groups, it was found that risk equations are more accurately predicted in middle-aged adults (35-45y) than in young (25-30y) or elderly populations (>64y), and equations based on biomarkers are, on average, more accurate than those based only on self-reported variables. This difference emphasizes the importance of applying age-specific risk equations to determine whether type 2 diabetes screening is required in order to improve individual level prediction accuracy. (12)

In our study, sedentary lifestyle was significantly increasing with diabetics than in non-diabetic groups with p-value <.0001. There was a statistically significant difference as regards occupation between diabetic and non-diabetic groups with p-value <.0001 as patients working as employees were significantly increased in diabetic than non-diabetic groups. This goes in line with study of Ganz et al., in which employee numbers increased in a way that was statistically significant among diabetic patients than non-diabetics with p-value<.01 . (13)

Patients taking antihypertensive were significantly increased in diabetes than nondiabetic subjects with (p-value =.002). This goes in a run with study in which there was a significant difference between diabetics & non-diabetics as regards the use of antihypertensive with p-value <.01 being more with diabetic patients. (13) Hypertension prevalence is closely linked with obesity, and both increase the risk for DM. (14)

Patients with a balanced diet were significantly decreased in diabetics than non- diabetics (P <0.0001). This goes in a run with Mountashiri et al. study in which there was a statistically significant difference between diabetics and non- diabetic groups as regards fast food (p-value<.001) being more with diabetics, and regular consumption of fruit and vegetables (p-value=.004) being more with healthy controls than diabetic group. (15)

This can be explained by the fact that antioxidant-rich foods like fruits and vegetables can lower inflammation and endothelial dysfunction .(16)

Patients with a physically active lifestyle were significantly decreased in diabetics than non-diabetics (P <0.0001). This can be explained as frequent exercise may stop or postpone the development of type 2 DM. (17)

Patients with first-degree family history were significantly increased in diabetics than non-diabetics (P = 0.005). This was similar to Dodani et al. study in which there was a significant difference between diabetics & nondiabetics as regards family history of diabetes being more with diabetic patients with p-value <.0001. (18)

Patients with COVID-19 infection were insignificantly different in both groups. This was in contrast with Alkundi et al. study which found that diabetic individuals are at higher risk of COVID-19 compared to others with p-value <.0001 which can be explained as diabetic patients are at risk of longer hospital stay and more vulnerable to associated comorbidities. (19)

Statistically significant increase in weight waist circumference and BMI among diabetics compared to non-diabetics was found with p-values (.001, <.0001, <.001 respectively), which was similar to Ali et al. study in which weight and BMI were significantly increased in diabetics more than nondiabetic subjects with p-value (0.003 &0.022 respectively) .(20)

Age group 35-<65 years (OR = 3.26 (1.43:7.40), P = 0.0001) and ≥65 years (OR = 5.60 (1.98:15.83), P = 0.0001) were independent predictors for multivariate regression analysis of the risk factors for newly diagnosed diabetes in the present study. In comparison to Sulaiman et al. study in which the age group 35-64y (OR=1.75 (1.1 to 3.38) and p-value =.037, and ≥65y (OR 3.38 (2.23 to 5.12) with p-value <.001 were independent predictor for multivariate regression analysis of the risk variables for newly discovered diabetes. (21) This can be explained as severity of diabetes increases over time; as such, it will be more challenging for glycemic control. (22)

In the present study, diet Carbohydrate or fat (OR = 2.00 (1.10:3.62), P 0.02) was an independent predictor for multivariate regression analysis of the risk variables for newly discovered type 2 diabetes. Another study by Oluma et al. reported that dietary restriction (OR=.965, (.033-.120), p-value=.033). (23)

Family history First degree (OR = 2.19 (1.27:3.76), P = 0.004) was an independent predictor for multivariable regression analysis of the risk variables for recently discovered type 2 diabetes in the present study. The same was reported by Sulaiman et al. study in which family history of 1st degree (parents-siblings) (OR=2.08 (1.47-2.96, P value <.001) was an independent predictor for Univariate regression analysis of the risk variables for recently diagnosed diabetes .(21)

The suggested current scores showed 70% sensitivity & 85% specificity in detection of undiagnosed type II diabetes with 78% positive predicted value (PPV) and 79%negative predictive value (NPV) and the area under the curve (AUC) in receiver operating characteristic (ROC) curve were 0.83.

Additional research was done throughout the Arabic world (Saudi Arabia, Oman, and Kuwait) show results that perform similarly and have a comparable number of risk variables evaluated. Additionally, although the Saudi study's sensitivity (76.6%) was close to ours, its specificity (52.1%) was lesser than ours. It's interesting that, in contrast to the majority of previous risk scores, The scoring model used in the Saudi study includes pregnant ladies with gestational diabetes. Smoking, however, did not affect our final grade. This agrees with a few previously developed type II diabetes risk scores. (15)

Our study has some limitations. The study includes only one government agency (Sohag), which may not have been representative of the entire Egyptian populace. Second, larger studies may be required to validate this risk score.

Conclusion

This research produced a risk score model appropriate for Egyptian populations and specifically created to estimate diabetes risk. It provides a non-invasive, affordable, and secure approach to identify people in Egypt who are at risk of acquiring type 2 diabetes. A score of more than 13 indicates a significant risk of acquiring diabetes.

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