Egyptian Journal of Medical Research (EJMR)

Screening For Type 2 Diabetes Mellitus In Adult Population In Beni-Suef Governorate

Heba Hamdy Mahmoud [a], *Mahmoud Farid Kamel* [b], *Amr Ragab Gomaa* [c]

[a] Assistant Professor Of Internal Medicine, Faculty Of Medicine Beni- Seuf University, Egypt

[b] Lecturer Of Internal Medicine, Faculty Of Medicine Beni- Seuf University, Egypt

[c] Internal Medicine,Faculty Of Medicine,Beni-Suef University,Beni-Suef,Egypt

Abstract:

The objective of the current study is to investigate the prevalence of undiagnosed dysglycemia and the risk for type 2 diabetes using the FINDRISC questionnaire in adult population in Beni-Suef Governorate. 500 subjects who are aged above 20 years and who are not known diabetics, who are not known on steroids and hormonal therapy and have not renal impairment. More than half of the studied population (52.8%) had low to moderate risk to developing type 2 DM, with no statistically significant difference between males and females regarding the total FINDRISC score. Total FINDRISC score was moderately positive correlated with patient's age in years with a person correlation coefficient 0.648 and p-value <0.001. Total FINDRISC score was moderately positive correlated with patient's BMI with a person correlation coefficient 0.648 and p-value <0.001. Total FINDRISC score was strongly positive correlated with blood glucose tests (FBS, 2hPP and Hb A1C) with a person correlation coefficient >0.7 and p-value <0.001.

Keywords: DM; FINDRISC; FBS;2HPPG;HBA1C.

1. Introduction:

Type 2 diabetes is a common chronic disease in the general population [1]. Approximately 7-30% of diabetes cases remain undiagnosed [2]. In addition, there is a significant number of individuals with impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), who are at risk of developing diabetes if no

actions are undertaken [3].

An important risk factor for diabetes, besides a person's genetic background, is overweight due to unhealthy life style. The use of validated risk calculators to quickly

identify and subsequently follow – up people at high risk of type 2 diabetes is recommended by several international organizations [4].

The Finnish Diabetes Risk Score (FINDRISC) questionnaire is a validated risk assessment tool to predict type 2 diabetes [5]. It estimates the probability of a person to develop diabetes within the next 10 years. The aim of the current study is to investigate the prevalence of undiagnosed dysglysemia and the risk for type 2 diabetes using the FINDRISC questionnaire in adult population in Beni-Suef Governorate.

2. Patients and Methods:

2.1 Inclusion criteria:

Subjects aged above 20 years.

2.2Exclusion criteria:

1. Subjects who are known diabetics.
2. Subjects who are known on steroids and hormonal therapy.
3. Subjects who are known have renal impairment.
4. Subjects who are known have liver disease.
5. Females who are known pregnant.

Statistical methodology

All subjects will be subjected to:

1- Through history and clinical examination.

2-Diabetes risk assessment using Finnish Diabetes Risk Score (FINDRISC) [5].

by the following items:

Risk factor		**score**
1-Age		
Unde r 45years		0
45-54 years		2
55-64 years		3
Over 64 years		4
2- Body mass index		
Lower than 25 kg/m2		0
25-30 kg/m2		1
Higher than 30 kg/m2		3
3-Waist circumference measured below the ribs		
MEN	WOMEN	
Less than 94 cm	Less than 80 cm	0
94-102 cm	80-88 cm	3
More than 102 cm	More than 88 c	4
4-Do you usually daily at least 30 minutes of physical activity at work and or during leisure time including normal daily activity?		
Yes		0
No		2
5- How often do you eat vegetables or fruits or berries ?		
Every day		0
Not every day		1
6- Have you even taken antihypertensive medication regularly ?		
NO		0
Yes		2
7-Have you ever been found to have high blood blood glucose (e.g.in a health examination,durind an illness, during pregnancy) ?		

NO	0
Yes	5

8-Have any of the members of immediate family or other relatives been diagnosed with diabetes type1 or 2 ?

NO	0
Yes; grandparent,aunt.uncle;firstcousin	3
Yes; parent, brother,sisteror own child	5

Table (1);Ten-year risk of developing T2DM according to FINDRISC

Score	Risk	Interpretation
<7	Low	Estimated 1 in 100 will develop disease
7-11	slightly elevated	Estimated 1 in 25 will develop disease
12-14	Moderate	Estimated 1 in 6 will develop disease
15-20	High	Estimated 1 in 3 will develop disease
>20	Very high	Estimated 1 in 2 will develop disease

3-Calculation of the total risk score of the FINDRISK questionnaire for each individual of the study.

4-Laboratory investigations include FBS,2HPPG,HBA1C,Serum creatinine and blood urea.

3. Results:

The current study was conducted at Beni-Suef university outpatient clinic. A total of 500 subjects over 20 years old were randomly subjected into FINDRISC,FBS,2HPPG,BA1C, urea, creatinine.

Table (2);Age and Sex Distribution of the studied Population; (n= 500):

	Descriptive Statistics	
Age; (years)		
Mean ±SD	48.48 ±13.2	
Minimum	20	
Maximum	80	
Range	60	
Sex; N (%)		
Male	248 (49.6%)	

Female	252 (50.4%)	

As demonstrated in table (2); a total of 500 subjects recruited from Beni-Suef University hospital outpatient clinic were included in our study. They were distributed as 49.6% males and 50.4% females. Subjects' age was ranged from 20 to 80 years old with an average of 48.48 years.

Table (3); Distribution of the studied population by sex according to risk factors as assessed by FINDRISC questionnaire; (N= 500):

FINDRISC Questionnaire Items		Patient's Sex		TOTAL N= 500	*p-value*
		Female N= 252	**Male N= 248**		
Patient's Age					
	18-44 years	108 (42.9)	78 (31.5)	186 (37.2)	**0.001***
	45-54 years	82 (32.5)	64 (25.8)	146 (29.2)	
	55-64 years	38 (15.1)	52 (21.0)	90 (18.0)	
	65 years and older	24 (9.5)	54 (21.8)	78 (15.6)	
BMI					
	Normal (Lower than 25.0 kg/m2)	32 (12.7)	42 (16.9)	74 (14.8)	0.130
	Overweight (25.0-29.9 kg/m2)	70 (27.8)	80 (32.3)	150 (30.0)	
	Obese (30.0 kg/m2 or higher)	150 (59.5)	126 (50.8)	276 (55.2)	
Waist circumference					
	< 94 cm for men and 80 cm for women	32 (12.7)	40 (16.1)	72 (14.4)	0.100
	94-102 cm for men and 80-88 cm for women	72 (28.6)	86 (34.7)	158 (31.6)	
	> 102 cm for men and 88 cm for women	148 (58.7)	122 (49.2)	270 (54.0)	
Physical Activity					
	Yes	136 (54.0)	138 (55.6)	274 (54.8)	0.720
	No	116 (46.0)	110 (44.4)	226 (45.2)	
Eating Vegetables and Fruits					
	Every Day	90 (35.7)	98 (39.5)	188 (37.6)	0.216
	Not Every Day	162 (64.3)	150 (60.5)	312 (62.4)	

Medication for high blood pressure on a regular basis					
	No	140 (55.6)	110 (44.4)	250 (50.0)	**0.016***
	Yes	112 (44.4)	138 (55.6)	250 (50.0)	
High Blood Glucose					
	No	160 (63.5)	224 (91.1)	384 (77.1)	**0.001***
	Yes	92 (36.5)	22 (8.9)	114 (22.9)	
Family History (family or other relatives diagnosed with diabetes)					
	No	64 (25.4)	58 (23.4)	122 (24.4)	0.181
	Yes: 2nd degree	50 (19.8)	36 (14.5)	86 (17.2)	
	Yes: 1st degree	138 (54.8)	154 (62.1)	292 (58.4)	

p-value ≤ 0.05 is considered significant by Chi-Square (χ^2) test.

As demonstrated in table (3); the studied females were significantly in a younger age category as compared with males. Near half of females were 18-44 years old with a statistically significant p-value (0.001).

Regarding taken medication for high blood pressure on a regular basis; males had reported significantly higher usage of medication for high blood pressure on a regular basis (55.6% vs. 44.4%) in males and females significantly with a statistically significant p-value (0.016).

Female patients who had ever been found to have high blood glucose (e.g. in a health examination, during an illness, during pregnancy) were significantly higher than males (36.5% vs. 8.9%) in females and males respectively with a significant p-value (0.001).

Other studied risk factors (BMI, Waist circumference, physical activity, Eating Vegetables & Fruits and Family History) showed no statistically significant differences between males and females; (p-values>0.05).

Table (4);Total FINDRISC score among the Studied Population; (N= 500):

FINDRISC score	Risk	Patient's Sex		TOTAL	*p-value**
		Female N= 252	Male N= 248	N= 500	
0-7 Points	Low Risk	26 (10.3)	28 (11.3)	54 (10.8)	0.566
7-11 Points	Slightly Elevated	50 (19.8)	56 (22.6)	106 (21.2)	
12-14 Points	Moderate Risk	58 (23.0)	46 (18.5)	104 (20.8)	

15-20 Points	High Risk	64 (25.4)	72 (29.0)	136 (27.2)	
21+ Points	Very High Risk	54 (21.4)	46 (18.5)	100 (20.0)	

Total FINDRISC score Mean ±SD= 13.88 ±5.8

****p-value ≤ 0.05 is considered significant by Chi-Square (χ^2) test.***

Table (4) illustrated that more than half of the studied population (52.8%) had Low to Moderate Risk to developing type 2 DM, with no statistically significant difference between males and females regarding the total FINDRISC score.

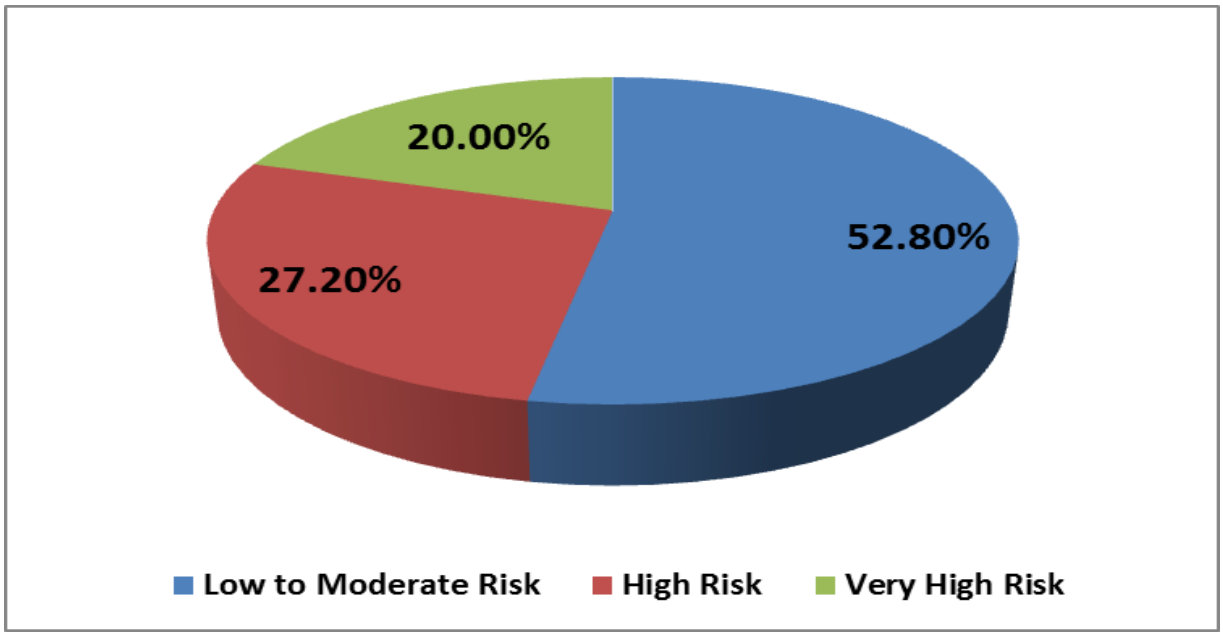

Figure (6): Distribution of the Studied Population by Total FINDRISC score Risk Factors.

Table (5);Blood Glucose Tests for the Studied Population;(N=500):

	Mean ±SD	**Minimum**	**Maximum**	**Range**	**Normal BGL**	**IFF,IGT,HA1C (Prediabetes)**
FBS	101.64 ±18.5	70	185	115		
2h PP	149.62 ±28.2	105	198	93		
HbA1C	5.32 ±0.8	3.50	6.40	2.90		
Serum Creatinine	0.78 ±0.17	0.43	1.20	0.77		
Blood Urea	29.45 ±6.1	18	40	22		
Total					280	220 Males=106 Females=114

FBS= Fasting Blood Sugar, 2h PP= 2 Hours Post Prandial, HbA1C= Glycated hemoglobin.

Table (5) demonstrates the blood glucose tests of the studied population; fasting blood sugar level (FBS) was ranged from 70 to 185 with an average of 101.64. Two hours post prandial blood sugar level ranged from 105 to 198 with an average of 149.62. While Glycated hemoglobin A1Cranged from 3.50 to 6.40 with an average of 5.32.

Table (5) also demonstrates that number of studied population with normal BGL were 280(56%). Number of studied population with prediabetes (IFG, IGT and HBA1C 5.7-6.4%) were 210(44%) with 114 females and 106 males without significant difference between males and females.

Serum Creatinine level for the studied cases were ranged from 0.43 to 1.20 with an average of 0.78.

Blood Urea level for the studied cases were ranged from 18 to 40 with an average of 29.45.

Table (6);Correlation between Total FINDRISC score with Age of the Studied Population;

	Age of the studied cases	
Total FINDRISC score	*r* = 0.648	*p-value* = **0.001***

p-value ≤ 0.05 is considered significant.

r Pearson correlation coefficient

As demonstrated in table (6); Total FINDRISC score was moderately positive correlated with patient's age in years with a Pearson correlation coefficient 0.648 and p-value <0.001.

Table (7); Correlation between Total FINDRISC score with Body Mass Index (BMI) of the Studied Population;

	BMI of the studied cases	
Total FINDRISC score	*r* = 0.654	*p-value* = **0.001***

p-value ≤ 0.05 is considered significant.

R Pearson correlation coefficient.

As demonstrated in table (7); Total FINDRISC score was moderately positive correlated with patient's BMI with a Pearson correlation coefficient 0.648 and p-value <0.001.

Table (8);Correlation between Total FINDRISC score with Blood Glucose Tests of the Studied Population:

Studied Parameters	Total FINDRISC score	
	r[a]	p-value
FBS	0.742	**0.001***
2h PP	0.788	**0.001***
HbA1C	0.709	**0.001***

FBS= Fasting Blood Sugar, 2h PP= 2 Hours Post Prandial, HbA1C= Glycated hemoglobin.

p-value ≤ 0.05 is considered significant.

[a] r= Pearson correlation coefficient

As illustrated in table (8); Total FINDRISC score was strongly positive correlated with blood glucose tests (FBS, 2hPP and Hb A1C) with a Pearson correlation coefficient >0.7 and p-value <0.001.

Table (9);Correlation between Total FINDRISC score with Serum Creatinine of the Studied Population:

	Serum Creatinine of the studied cases	
Total FINDRISC score	r = - 0.135	p-value= 0.203

p-value ≤ 0.05 is considered significant.

r Pearson correlation coefficient

As demonstrated in table (9); No detected correlation between Total FINDRISC score and Serum Creatinine of the studied cases where p-value was >0.05.

Table (10);Correlation between Total FINDRISC score with Blood Urea of the Studied Population:

	Blood Urea of the studied cases	
Total FINDRISC score	r = 0.211	p-value= **0.001***

p-value ≤ 0.05 is considered significant.

r Pearson correlation coefficient

As demonstrated in table (10); Total FINDRISC score was slightly positive correlated with blood urea level with a Pearson correlation coefficient 0.211 and p-value <0.001.

4. Discussion:

Chronic non-communicable diseases have become worldwide epidemic that threatens life expectancy and quality of life and increases cases of death and disability [6]. Type 2 Diabetes mellitus (T2DM) is becoming one of the most prevalent diseases in the 21st century and is a global public health challenge [7].

The World Health Organization WHO) estimated in 2014 that 422 million people had diabetes, of which 90% had T2DM [8]. It should be remembered that prediabetes increases the absolute risk for T2DM in the short term by 3 to 10 times [9].

FINDRISC is one of the most commonly used tools to determine type 2 DM risk. It includes anthropometric (BMI and WC), metabolic, and lifestyle factors that predict type 2 DM and alterations in glucose metabolism . FINDRISC may be helpful in identifying diabetes in the early stages because the type 2 diabetes diagnosis processes has taken a long time [10]. Because insulin resistance always precedes IGT, the FINDRISC may be a useful instrument to identify people at the earliest stage of disease development[11]. FINDRISC questionnaire represents a simple and cost-efficient tool with a good predictive value to

detect undiagnosed diabetes, which can be used in large-scale studies and even on a care level [5].

In this study we tried to evaluate the FINDRISC for estimating the probability of a person to develop type2 DM within the next 10 years. Use of such a scoring system is of great significance and could prove to be cost effective, reliable, valuable and easy to use screening tool for detecting risk of diabetes. In this study we use FINDRISC questionnaire in survey of 500 subjects from Beni-Suef University hospital outpatient clinic who are known not diabetic, not on steroids or hormonal therapy and not have renal impaired. They were distributed as 49.6% males and 50.4% females. Subjects' age was ranged from 20 to 80 years old with an average of 48.48 years. Female patients who had ever been found to have high blood glucose (e.g. in a health examination, during an illness, during pregnancy) were significantly higher than males (36.5% vs.

8.9%) in females and males respectively with a significant p-value (0.001). Other studied risk factors (BMI, Waist circumference, physical activity, Eating Vegetables & Fruits and Family History) showed no statistically significant differences between males and females; (p-values>0.05). We found that total FINDRISC score Mean ±SD= 13.88 ±5.8.Also we found that more than half (52.8%) of the studied population had low to moderate risk,27.2% had high risk,20% had very high risk to develop type 2 DM in the next 10 years with no statistically significant difference between males and females regarding the total FINDRISC score. Total FINDRISC score was moderately positive correlated with patient's age in years and with patient's BMI and was strongly positive correlated with blood glucose tests (FBS, 2hPP and Hb A1C). Total FINDRISC score was slightly positive correlated with blood urea level. No detected correlation between Total FINDRISC score and Serum Creatinine of the studied cases. At present, the FINDRISC, which is the most accurate and widely questionnaire used in Europe, can easily identify people with either unrecognized diabetes or impaired glucose regulation, before any blood test needs to be carried out [12]. According to a cross-sectional analytical study carried out from April 2016 to May 2017 in the nursing staff of an institution specialized in reproductive health in Mexico City the estimated risk of the FINDRISC was 59% participants with moderate to very high risk were identified. 59%of participants who were in the high risk category had prediabetes, based on fasting glucose and HbA1c [13]. The efficiency of risk scores may vary between populations with different ethnic backgrounds.Therefore, risk scores should be validated in each population before use [14].

Although the FINDRISC tool was developed and validated in European populations. It is also valid for Middle-Eastern populations, despite different lifestyles [15].

One limitation of our study is that we cannot evaluate the FINDRISC in predicting the future incident diabetes because this study is a cross-sectional study which did not provide follow-up data. Another limitation was non adjustment for hypertension but such adjustment is difficult as prediabetes would predispose for hypertension.

5. Conclusion and Recommendation:

In conclusion our data provide further evidence that FINDRISC can be a suitable, reliable, valuable and easy tool to predict type 2 DM in the next 10 years.

6. References:

1. Viitasalo K,Lindstrom J,Hemio K,Puttonen S,Koho A,Harma M.,et al (2012) . Occupational health care identifies risk for type 2 diabetes and cardiovascular disease .Prim Care

Diabetes. 2012, 6 2.95-102, http...\\dx.doi.org\10.1016\j.pcd.2012.01.003.

2. Rey A, Thones M, Fimmers Meier C, Bramlage P (2012).Diabetes prevalence and metabolic risk profile in an unselected population visiting pharmacies in Switzerland. Vasc Health Risk Manag...2012, 8, 541-7, http..\\dx.org\10.2147\VHRM.s35896.
3. Hauner H, Hanisch J, Bramlage , Stein Hagen-Thiessen E, Schunkert H, Jokel KH., et al (2008).Prevalence of undiagnosed type 2 diabetes mellitus and impaired fasting glucose in German primary care .Data from the German Metabolic and Cardiovascular Risk Project GEMACS. Exp Clin Endocrinal Diabetes. 2008,116 1...18-25, http..\\dx.doi.org\10.1055\s-2007-985359.
4. Paul Weber P, Valensi E, Lindstrom J, lalic Greaves McKee M., et al (2010). A European evidence-based guideline for the prevention of type 2 diabetes. Horm Metabolic Res. 2010, 42 Suppl 1.,s3-36,http\\dx.doi.org\10.1055\s-0029-1240928.
5. Lindstrom J, Tuomileht J (2003).The diabetes risk score. A Practical tool to predict type 2 diabetes risk. Diabetes Care.2003.,263,72531,htp...dx.org\10.2337\diacare. 26. 3. 725.
6. Roth G, Abate D, Abate K, Abay S, Abbafati C‹Abbasi N, et al(2018). Global , regional , and national age sex-specific mortality for 282 causes of death in 195countries and territories , 1980 – 2017 : a systematic analysis for the Global Burden of Disease Study 2017.Lancet. 2018;392:173688.doi:10.1016/S01406736(18)32203-7.
7. International Diabetes Federation (2017). IDF Diabetes Atlas^.ted. 2017. doi: http://dx.doi.org/10.1016/S01406736(16)31679-8.
8. Global report on diabetes. World Health Organization (2016).Geneva. Switzerland: World Health Organization; 2016.doi: 10.1128/AAC.03728-14.
9. Bodicoat DH, Khunti K, Srinivasan BT, Mostafa S‹Gray LJ, Davies MJ, et al(2017). Incident Type 2 diabetes and the effect of early regression to normoglycaemia in a population with impaired glucose regulation.DiabetMed. 2017;34(3):396–404. doi: 10.1111/dme.13091.
10. Abbasi A, Peelen LM, Corpeleijn E, et al (2012).Prediction models for risk of developing type 2 diabetes: systematic literature search and independent external validation studyBMJ, 345 (2012), p. e5900.

11. Haffner S.M., Stern M.P., Hazuda H.P., Mitchell B.D., Patterson J.K (1990). Cardiovascular risk factors in confirmed prediabetic individuals. Does the clock for coronary heart disease start ticking before the onset of clinical diabetes? JAMA 1990; 263: 2893-2898.
12. Shaw J, Sicree R, Zimmet P (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Research and Clinical.Practice.2010; 87(1):4-14 .
13. Pérez de Celis Herrero M de la C, López Ridaura R‹Gonzalez Villalpando C, Somodevilla Garcia MJ, PinedaTorres IH, Gutiérrez Martínez MT, et al (2018). Information and communications technologies to estimate the risk of type 2 diabetes in México. Rev Comun y Salud].Internet]. 2016;6:1–14. Availablefrom:https//:dialnet.unirioja.es/servlet/articulo?codigo=5786972.
14. Griffin SJ, Little PS, Hales CN, Kimonth AL, Wareham NJ (2016). Diabetes risk score: towards earlier detection of type 2 diabetes in general practice. Diabetes Metab Res Rev2000. 16:164-171.
15. Alssema M, Vistisen D, Heymans MW, Nijpels G‹Glümer C, Zimmet PZ, Shaw JE, Eliasson M, Stehouwer CD, Tabak AG, et al (2017). The Evaluation of Screening and Early Detection Strategies for Type 2 Diabetes and Impaired Glucose Tolerance (DETECT-2) update of the Finnish diabetes risk score for prediction of incident type 2diabetes. Diabetologia 2017. 54:1004-1012.