

RISK CALCULATION AS A TOOL TO PREDICT TYPE 2 DIABETES MELLITUS AMONG THE EMPLOYEES AT EL-MINIA UNIVERSITY

By

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ABSTRACT:

Background: Finding effective means to prevent type 2 diabetes (T2D) is a critical public health priority. The recent clinical trials show that prevention of T2D with lifestyle intervention is possible, there is increasing interest in the development of tools to identify high-risk individuals who might benefit from interventions.

Aim of the study: to identify individuals at increased risk for T2D among El-Minia University employees with a trial carried out to motivate people at high risk to adopt healthy lifestyles by delivering information about healthy diet and physical activity.

Research hypothesis:

Subjects and methods: This is a descriptive cross-sectional study which carried out in El-Minia University during the period from September 2010 to March 2011. This study was conducted among 240 employees who were successfully approved to be interviewed and to participate in the study. Data were collected by a questionnaire included demographic data, questions regarding knowledge about ideal weight, healthy diet, exercise complications of diabetes and risk factors. The Finnish Type 2 Diabetes Risk Score (FINDRISC) questionnaire was used for assessment of person's probability of developing type 2 diabetes over the following 10 years.

Results: About 35% of the study sample had score less than 7 out of 26 and categorized as at low risk, 26.2% at slightly elevated risk, 16.3% at moderate risk, 20.8% were categorized as at high risk and 1.7% at very high risk of developing diabetes within the next 10 years of life

Conclusion: About 22.5% of the studied employees were categorized as at high risk of developing diabetes within the next 10 years of life. The females had higher risk scores than males.

Recommendation: All individuals at high risk of developing T2D should be identified through opportunistic screening. FINDRISC questionnaire should be easily implemented into the medical office routine in primary health care units. Creating healthy public policy in workplaces and facilitating physical activity at work sites.

KEY WORDS:

Type 2 Diabetes

FINDRISC questionnaire

Risk score

Risk factors.

INTRODUCTION:

Diabetes Mellitus (DM) is a chronic disease associated with multiple morbidities and reduced life expectancy. Type 2 diabetes (T2D) is the predominant form of diabetes worldwide, accounting for 90% of cases. It has become a global public

health crisis that threatens the economies of all nations, particularly developing countries (Frank, 2011).

According to the International Diabetes Federation diabetes affects at least 366 million people worldwide in 2011, and that number is expected to

reach 552 million by the year 2030, with two-thirds of all diabetes cases occurring in low- to middle-income countries (International Diabetes Federation, 2012). Egypt was among the top 10 countries in number of people with DM in age group between 20-70 years. According to the Diabetes Atlas survey, the incidence of diabetes in Egypt in 2010 was 10.4 and estimated to increase by 2030 to 12.8%. (International Diabetes Federation, 2010).

Fortunately, several large clinical trials now provide evidence that T2D can be delayed or prevented by changes in these lifestyle factors (Gillies et al., 2008 and Li et al., 2008).

An important step in preventing or delaying T2D and its complications is to identify people with pre-diabetes and undiagnosed diabetes so that they can be given appropriate care (Kenneth et al., 2008). Thus, identifying people at high risk of developing T2D through a simple method that could be used by individuals themselves to assess their risk profile may contribute to preventive efforts of public health magnitude (Aekplakorn et al., 2006).

Recent years have seen the publication of a number of studies that searched for a risk score able to simplify and facilitate the detection of diabetes in patients who are unaware that they may have the disease, or able to predict who will develop T2D mellitus (Aekplakorn et al., 2006 and Schulze et al., 2007).

Against the above background, it was decided to undertake a study with the aim of identifying individuals at increased risk for T2D by using the Finnish Diabetes Risk Score (FINDRISC) among El-Minia University employees and with a trial carried

out to motivate people at high risk to adopt healthy lifestyles by delivering information about healthy diet and physical activity.

SUBJECTS AND METHODS:

Study design: This is a descriptive cross-sectional study which carried out in El- Minia University during the period from September 2010 to March 2011.

Administrative and ethical

consideration: An approval was taken from the Dean of each faculty in addition; permission from the vice president of the university was obtained to interview the employees. Following the ethical guidelines of epidemiological research, a written informed consent was taken from each participant.

Study population and sample size:

Inclusion criteria: The employees of El-Minia University aged ≥ 45 years old.

Exclusion criteria: Persons with previously diagnosed DM, age less than 45 years, pregnant females, history of sever psychic trauma or recent surgery and Chronic use of several medications, including high-dose glucocorticoids, some chemotherapy agents, as well as some of the antipsychotics and mood stabilizers (especially phenothiazines and some atypical antipsychotics).

Sample size: Sample size calculation is based on the objective of the study. The primary outcome is the performance of the Diabetes Risk Score. Receiver operating characteristic (ROC) curves are used to summarize the accuracy of diagnostic tests.

Collection of data: Data were collected by a designed well-structured questionnaire include demographic

data: name, age, sex and questions regarding knowledge about ideal weight, healthy diet, exercise complications of diabetes and risk factors. The dependent variable, diabetes was assessed by using special questionnaire "Finnish Type 2 Diabetes Risk Score test (FINDRISC)".

Body weight and height were measured. The Body Mass Index (BMI) was calculated by the use of the following equation: $BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$ Waist circumference was measured by using non stretchable measuring tape at the smallest horizontal circumference between the 12th rib and the iliac crest, the person stand with abdomen relaxed, arms at sides, and feet together.

All participants taking part in the study should be made aware of the risks of developing diabetes through health educational message and be given appropriate advice according to their individual needs, persons with FINDRISC score of 15 or more (high risk); their number was 54 persons. Forty of them accepted to be included in a trial for lifestyle reinforcement that focuses on empowerment of the participants to change their lifestyle. After two weeks; initial assessment was done by measuring weight and waist circumference. Two weeks later another assessment for weight and waist circumference was done.

STATISTICAL ANALYSIS:

Data entry and analysis were all done using software called SPSS for windows version 19. Graphics were done by Excel Microsoft office 2010. Quantitative data were presented by mean and standard deviation, while qualitative data were presented by frequency distribution. Chi square test was used to compare between proportions. Student t-test was used to

compare between two means. A p value <0.05 was considered significant.

RESULTS:

In table (1) it was shown that 76.6% of the studied group lied in the age group between (45- 54) years old, 34.2% and 45.8% had body mass index (between 25–30 kg/m^2 and more than 30 kg/m^2) respectively. Waist circumferences were high ($>88\text{cm}$ for females; $>102\text{cm}$ for males) in 55.1% of the females and 17.6% of the males. Individuals who were physically inactive represented 47.9%. On other hand, 52.1% were physically. Irregular vegetables and fruits intake was reported by 43.3% of the employees and 24.6% of them reported that they use regular medication for management of hypertension. Furthermore, 10.8% of the participants had history of previous episode of high blood glucose. About 36.3% and 9.2% had family history of diabetes, first degree and second degree relative respectively.

About 35% of the study sample had score less than 7 out of 26 and categorized as at low risk, 26.2% at slightly elevated risk, 16.3% at moderate risk, 20.8% were categorized as at high risk and 1.7% at very high risk of developing diabetes within the next 10 years of life (table2).

Females were categorized as either at moderate (21.7%) or at high risk (29%) of developing diabetes within the next 10 years of life. These figures were more than that found for males (8.8%) and (9.8%) respectively, and these differences were statistically significant ($p= 0.0003$ for moderate risk and $p= 0.0001$ for high risk). While (52.9%) of males were categorized as low risk compared to 21.7% of females and the difference was

statistically significant ($p= 0.0002$). (table3) there was a minimum reduction after first two weeks in weight from 94.90 ± 14.2 to 94.49 ± 14.3 , body mass index from 103.22 ± 10.9 to 102.97 ± 11.1 and waist circumference

from 36.39 ± 5.8 to 36.26 ± 5.8 before and after intervention, and this difference was statistically significant ($p= 0.0001, 0.005, 0.005$) respectively (table 4).

Table (1): Frequency distribution of the risk factors according to the elements of Finnish Diabetes Risk Score among studied employees of El-Minia University, September 2010 to March 2011

Risk factor	Number	Percent
Age group		
45-54	184	76.7%
55- 60	56	23.3%
Body-mass index		
Less than 25 kg/m^2	48	20%
$25\text{--}30 \text{ kg/m}^2$	82	34.2%
More than 30 kg/m^2	110	45.8%
Waist circumference		
MEN		
Less than 94 cm	55	53.9%
94–102 cm	29	28.4%
More than 102 cm	18	17.6%
WOMEN		
Less than 80 cm	27	19.6%
80–88 cm	34	24.6%
More than 88 cm	76	55.1%
physical activity		
Yes	125	52.1%
No	115	47.9%
Daily eating of vegetables, fruit		
Every day	136	56.7%
Not every day	104	43.3%
Taking of antihypertensive drugs		
No	181	75.4%
Yes	59	24.6%
History of previous episode high blood glucose		
No	214	89.2%
Yes	26	10.8%
Family history of diabetes		
No	131	54.6%
Yes: second degree relatives	22	9.2%
Yes: parent, brother, sister or own child	87	36.3%

Table (2): Frequency distribution of the studied employees of El-Minia University according to Finnish Diabetes Risk Score, September 2010 to March 2011

Risk category	Number	Percent
Low risk (< 7)	84	35
Slightly elevated risk (7-11)	63	26.5
Moderate risk (12-14)	39	16.3
High risk (15-20)	50	20.8
Very high risk (>20)	4	1.7
Total	240	100

Table (3): Relation between sex and diabetes risk score among the studied employees of El-Minia University, September 2010 to March 2011

Finnish Diabetes Risk Score	Sex		Z	P
	Males No (%) (n= 102)	Females No(%) (n= 138)		
Low risk (< 7)	54 (52.9%)	30 (21.7%)	5.01	0.0002
Slightly elevated risk (7-11)	28 (27.5%)	35 (25.4%)	0.36	0.3
Moderate risk (12-14)	9 (8.8)	30 (21.7%)	2.68	0.0003
High risk (15-20)	10 (9.8%)	40 (29%)	3.62	0.0001
Very high risk (>20)	1 (1%)	3 (2.2%)	0.71	0.2

Table (4): Comparison between pre- and post-intervention assessment of weight, waist circumference and BMI among the studied employees of El-Minia University, September 2010 to March 2011.

variables	pre-intervention mean±SD (n= 40)	post-intervention mean±SD (n= 40)	t	P value
Weight	94.90±14.2	94.49±14.3	5.7	0.0001
Waist circumference	103.22±10.9	102.97±11.1	2.9	0.005
BMI	36.39±5.8	36.26±5.8	2.9	0.005

DISCUSSION:

Finding effective means to prevent T2D is a critical public health priority. The recent clinical trials show that prevention of T2D with lifestyle intervention is possible, there is also increasing interest in the development of tools to identify high-risk individuals who might benefit from interventions.

The age distribution of the studied persons ranged between 45-60 years old (mean age 50.7±4.6). The study group consisted of 42.5% males and 57.5% females, the urban residents were 65.8% and rural residents were 34.2%. Professional employees were 6.7%, 82% were clerks and 11.3% were manual workers.

In this study it was found that 34.2% and 45.8% classified as overweight and obese respectively (BMI 25-30 and $>30\text{kg/m}^2$), Waist circumferences were high ($>88\text{cm}$ for females; $>102\text{cm}$ for males) in 55.1% of the females and 17.6% of the males. Nearly half of the participants 47.9% classified as physically inactive. Irregular vegetables and fruits intake was reported by 43.3% of the employees.

About 24.6% of them reported that they use regular medication for management of hypertension and a previous episode of high blood glucose level was reported in 10.8% of the participants. About 45.4% had family history of diabetes (first and second degree relatives) (table 1). These findings approximate that reported by Abduelkarem et al., (2009) who conducted a study for risk calculation of developing type2 diabetes in the following 10 years in Libyan adults by using FINDRISC questionnaire and found that 74% of the sample studied had BMI $>25\text{kg/m}^2$, Waist circumferences were high in 41% of the females, 19% of the males, 57.3% were physically inactive. Irregular fruit and vegetable intake was reported by 37% of the study participants. Abduelkarems' study showed lower percentages as regard antihypertensive medication and previous episode of high blood glucose 10% and 4% respectively and higher percentage 68.3% of persons with positive family history. This difference may be due to difference in the prevalence of hypertension and DM between the two countries.

The current study found that 20.8% were categorized as at high risk and 1.7% at very high risk of developing diabetes within the next 10 years of life; this was higher than

found by Abduelkarem et al., reported that 12.3% were categorized as at high and very high risk. This difference may be attributed to the higher percentages of some important risk factors in the current study such as obesity, central adiposity and previous episode of high blood glucose.

The current study showed that females were more at risk of developing diabetes than males; this is nearly the same as reported by Abduelkarem et al., (2009). The higher risk of getting DM in females than males may be due to higher BMI in females, they were more physically inactive, had history of previous episodes of hyperglycemia and positive family history of diabetes more than males.

In this study it was found that there was a significant reduction in all anthropometric measurements (weight, BMI and waist circumference) in pre- and post-intervention assessment group after two weeks (table 28). This is in agreement with Vermunt et al., (2011) who studied the overall effect of the Active Prevention in High-Risk Individuals of Diabetes Type 2 in and Around Eindhoven (APHRODITE) lifestyle intervention on T2D risk reduction in Dutch primary care after 0.5 and 1.5 years and found that for all clinical measures, changes over time were made.

Conclusion and recommendation:

About 22.5% of the studied employees were categorized as at high risk of developing diabetes within the next 10 years of life. The main modifiable risk factors were obesity, central obesity and physical inactivity. Therefore it is recommended that all individuals at high risk of developing T2D should be identified through opportunistic screening. FINDRISC

questionnaire must be easily implemented into the medical office routine in primary health care units. The application of a questionnaire in a different setting is a cost-efficient and practical tool to identify individuals at high risk of T2D in the general population.

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حساب المخاطر كأداة للتنبؤ بحدوث النمط الثاني لداء السكري بين موظفي جامعة المنيا
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مقدمة:

لقد أصبح إيجاد وسيلة فعالة للوقاية من حدوث داء السكري من النمط الثاني من الأولويات الملحة في الصحة العامة. وقد اوضحت الدراسات الحديثة ان الوقاية من النمط الثاني من داء السكري ممكنة من خلال تغيير نمط الحياة. ولهذا فقد شهدت السنوات الاخيرة نشر عدد من الدراسات تبحث عن استخدام استبيان احراز المخاطر كوسيلة سهلة ومبسطة لاكتشاف داء السكري و التعرف على الأشخاص الاعلى في عوامل الاختطار.

الهدف من هذه الدراسة:

هو التعرف على الأشخاص الأكثر تعرضا للإصابة بداء السكري خلال العشر سنوات المقبلة بين العاملين في جامعة المنيا مع محاولة لتحفيز الأشخاص الاعلى في عوامل الاختطار لتبني أنماط الحياة الصحية من خلال تقديم المعلومات حول النظام الغذائي الصحي والنشاط البدني.

طريقة البحث:

هذه دراسة تداخلية أجريت في جامعة المنيا خلال الفترة من سبتمبر 2010 وحتى مارس 2011. وقد اشتملت العينة على 240 موظفا من الجامعة ممن ابدوا موافقتهم للمشاركة في الدراسة. وقد تم جمع البيانات عن طريق استمارة استبيان تحوى بيانات شخصية واجتماعية، واسئلة متعلقة بمعرفة الوزن المثالي، ومكونات الغذاء الصحي، وممارسة الرياضة و اخرى متعلقة بداء السكري وقد استخدم استبيان احراز مخاطر السكري الفنلندية لتقييم احتمال الإصابة بالنمط الثاني لداء السكري على مدى السنوات العشر التالية

النتائج:

صنف المشاركون تبعا لدرجة المخاطرو التعرض لحدوث داء السكري في غضون السنوات الـعشر المقبلة من الحياة الى 35% لديهم مخاطر منخفضة و 26,2% لديهم مخاطر مرتفعة قليلا و 16,3% لديهم مخاطر معتدلة و 20,8% من المشاركين لديهم مخاطر عالية و 1,7% لديهم مخاطر عالية جدا.

الخلاصة:

وجد ان 22,5% من الموظفين تحت الدراسة لديهم درجة مخاطر مرتفعة للإصابة بداء السكري في غضون السنوات الـعشر المقبلة وكانت الإناث الاعلى في عوامل الاختطار اكثر من الذكور.

التوصيات:

- 1- ينبغي تحديد الأفراد الأكثر تعرضا لحدوث داء السكري من خلال التقصي الطبي.
- 2- تطبيق استخدام استبيان احراز مخاطر السكري الفنلندية في وحدات الرعاية الصحية الأولية.
- 3- وضع سياسات عامة لتسهيل ممارسة النشاط البدني في مواقع العمل من خلال توفير فترات من الوقت لممارسة النشاط.

الكلمات الدالة:

داء السكري النمط الثاني، استبيان احراز مخاطر السكري الفنلندية، عوامل الاختطار.

