Prediabetes Risk Assessment among Nurses Recruited in a Dubai Local Government Hospital: A Cross-Sectional Study

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Keywords

Prediabetes risk · Risk factors · Dubai · United Arab Emirates · Dubai Health Authority

Abstract

Background: Nurses constitute half of the health workforce; their health could be at risk for chronic diseases, such as prediabetes and diabetes, as well as other occupational hazards, such as nurses' stress. Health promotion, possibly workplace based, presents opportunities to safeguard the health of nurses. Using a prediabetes risk assessment tool for screening the nurses is important to ensure that they remain physically and mentally fit to perform their work and to comply with various health and safety regulations. **Objective:** The aims of this study were to determine the prevalence of prediabetes and its risk among nurses in Dubai Hospital and to study risk factors associated with prediabetes status. **Methodology:** A cross-sectional study was carried out in Dubai Hospital-Dubai Health Authority. A convenience sample was selected including 674 nurses estimated using OpenEpi software. Data was collected using a standardized diabetes risk assessment tool (The Finnish Diabetes Risk Score [FIND-RISC]). Inclusion criteria were staff nurses working in Dubai

Hospital in the age group from 25 to 64 years and nondiabetic staff in Dubai Hospital; an operational definition of prediabetes was used. The data were coded, and data entry and data analysis were made using SPSS 20 software version. The data were tested at a level of significance of 95%. **Results:** The study revealed that 42.7% of the participants had a low prediabetes risk, 38.4% had a slightly elevated prediabetes risk, 10.8% had a moderate prediabetes risk, 7.6% had a high prediabetes risk, and 0.5% had a very high prediabetes risk. Age, body mass index, waist circumference, history of anti-hypertensive drug treatment, history of high blood glucose, family history of diabetes, daily consumption of fruits, berries, or vegetables, and daily physical activity had a significant relationship with the prediabetes test ($p < 0.01$). **Conclusions:** Frequent testing is recommended to follow the risk score. Since we cannot control unmodifiable factors, such as age and family history, we can control modifiable factors, such as having a healthy lifestyle with healthy food and exercise to decrease the risk of developing type 2 diabetes. Health promotion and education can decrease the risk of developing type 2 diabetes.

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Introduction

Nurses constitute half of the health workforce; their health could be at risk for chronic diseases, such as prediabetes and diabetes, as well as other occupational hazards, such as nurses' stress. Health promotion, possibly workplace based, presents opportunities to safeguard the health of nurses [1]. Using a prediabetes risk assessment tool for screening the nurses is important to ensure that they remain physically and mentally fit to perform their work and to comply with various health and safety regulations. Figures from the International Diabetes Federation (IDF) revealed that, in 2015, 19.3%, almost 1 in 5 people, of the UAE population between the ages of 20 and 79 years had type 2 diabetes mellitus (T2DM). In 2015, there were over 1 million people living with diabetes in the UAE, placing the country 13th worldwide for age-adjusted comparative prevalence [2]. Trends in 2015 also indicate that the prevalence of diabetes in the UAE is rising at a faster rate than both in the MENA region and the rest of the world. Rapid economic growth, sedentary lifestyles, and unhealthy diets characteristic of the UAE are all risk factors, leading to the number of people with diabetes being expected to double to 2.2 million by 2040. However, an increasing population and a greater understanding of the condition in the communities have also contributed to the increase in patients diagnosed with diabetes [2].

Prediabetes is a high-risk state for diabetes that is defined by glycemic variables that are higher than normal but lower than diabetes thresholds. 5–10% of people per year with prediabetes will progress to diabetes, with the same proportion converting back to normal glycemia. The prevalence of prediabetes is increasing worldwide, and experts have projected that more than 470 million people will have prediabetes by 2030. Prediabetes is associated with the simultaneous presence of insulin resistance and β -cell dysfunction abnormalities that start before glucose changes are detectable [3].

Lifestyle risk factors for prediabetes include overweight and physical inactivity. Increasing awareness and risk stratification of individuals with prediabetes may help physicians understand potential interventions that may help decrease the percentage of patients in their panels in whom diabetes develops. If untreated, 37% of the individuals with prediabetes may have diabetes in 4 years [4]. DM affects around 8.3% of the adult population worldwide, and the total number of cases is predicted to rise from 371 million in 2012 to 552 million in 2030 [4]. This increase may be due to the rising prevalence of over-

weight and obesity, a generalized decrease in physical activity, and changes in the demographic structure of the population [5]. Over 90% of patients with DM have T2DM, and over 50% of cases are undiagnosed [6]. Patients with T2DM can remain asymptomatic for a long time with elevated blood glucose levels, blood pressure, and cholesterol. In fact, diagnosis is often not confirmed until the development of serious complications, whose management is more difficult and expensive.

Furthermore, findings in the literature suggest that every year around 5–10% of individuals with prediabetes, those with impaired fasting glucose and impaired glucose tolerance, have a high risk of being diagnosed with T2DM [7]. It seems that earlier detection of this population and follow-up with intervention strategies could delay or prevent T2DM, improve glycemic control, and even decrease the incidence of DM and the development of associated complications [8].

As the incidence of prediabetes is rising and it is associated with increased complications [9], the aim of this study was to estimate the prevalence of prediabetes among nurses in Dubai Hospital using different screening methods. As such a study has not previously been conducted in nurses/healthcare providers in Dubai, there is also a lack of awareness about the importance of detecting prediabetes early and about the nurses' lifestyle, which might predispose them to prediabetes and diabetes. Prediabetes is defined as impaired fasting glucose and/or impaired glucose tolerance [8].

This study investigates to what extent prediabetes status is common among certain occupational risk groups, such as nurses, and it is testing the hypothesis that if we are practicing a nonhealthy lifestyle, this would be a risk factor for developing prediabetes status.

Objectives

This study aimed to determine the prevalence of prediabetes and its risk among nurses in Dubai Hospital. In addition, the aim was to study the risk factors associated with prediabetes status and, also, to identify the efficacy of lifestyle health promotion intended to improve health risk factors, such as weight, body mass index (BMI), physical activity, and lifestyle, which may lead to conditions such as prediabetes and diabetes, affecting the health of the nurses and their work performance.

Table 1. Sample demographical data

Variables	Group	<i>n</i>	%
Gender	Male	110	17.0
	Female	536	83.0
Age	<45 years	510	78.9
	45–54 years	99	15.0
	55–64 years	37	5.7
BMI	<25 kg/m ²	289	44.7
	25–30 kg/m ²	277	42.9
	>30 kg/m ²	79	12.2
WC	<80 cm	204	31.6
	81–88 cm	163	25.2
	89–94 cm	232	35.9
	95–102 cm	34	5.3
	>102 cm	12	1.9
Exercise	Yes	519	81.0
	No	125	19.0
Healthy diet	Yes	437	67.6
	No	209	32.4
BP medications regularly	Yes	41	6.3
	No	605	93.7
High BG or GDM	Yes	73	11.3
	No	573	88.7
Family history of diabetes	Yes	192	29.7
	No	453	69.3

BMI, body mass index; WC, waist circumference; BP, blood pressure; BG, blood glucose; GDM, gestational diabetes mellitus.

Methodology

A cross-sectional study was carried out in Dubai Hospital-Dubai Health Authority. A convenience sample was selected including 674 nurses estimated using OpenEpi software. The margin of error measures the maximum amount by which the sample results may differ from the full population (margin of error: $\pm 3.775\%$, $z = 1.96$, $p = 0.5$, $n = 674$). Data were collected using a standardized diabetes risk assessment tool (The Finnish Diabetes Risk Score [FINDRISC]). Prediabetes was calculated based on a simple questionnaire with 8 questions, including age (years), BMI (kg/m²), waist circumference (WC; cm), history of antihypertensive drug treatment, history of high blood glucose, family history of diabetes, daily consumption of fruits, berries, or vegetables (consumed every day vs. not), and daily physical activity [10]. The questionnaire was completed without any laboratory tests. To the answer of every question, differently weighted scores were assigned according to the risk increase associated with the respective values in the regression model in the original cohort. The final score is the sum of the scores from 8 questions and ranges from 0 to 20 [11]. The cut points to determine the participants at risk are mentioned clearly

Fig. 1. Staff at prediabetes risk.

in the tool: a score of <7 is considered as low, 7–11 as slightly low, 12–14 as moderate, 15–20 as high, and >20 as very high.

A fasting blood sugar level of 100–125 mg/dL (5.6–7.0 mmol/L) is considered as prediabetes. This is sometimes called impaired fasting glucose. A fasting blood sugar level of 126 mg/dL (7.0 mmol/L) or higher indicates T2DM [11]. Inclusion criteria were staff nurses working in Dubai Hospital in the age group from 25 to 64 years and nondiabetic staff in Dubai Hospital; an operational definition of prediabetes was used. The data were coded, and data entry and data analysis were made using SPSS 20 software version. The data were tested at a level of significance of 95%. Descriptive statistics (mean and standard deviation, frequency and percentage) were used to describe the sample.

Results

The study sample consisted of 646 members of staff; 82.3% were female and 17.7% were male. Age was classified into categories according to the survey. 78.9% were aged <45 years, 15% were aged 45–54 years, and 5.7% were aged 55–64 years. 44.7% had a BMI of <25 kg/m², 42.9% had a BMI of 25–30 kg/m², and 12.2% had a BMI of >30 kg/m². The majority (31.6%) had a WC of <80 cm and the minority (1.9%) had a WC of >102 cm. The vast majority had a healthy-pattern lifestyle and were doing exercise (81.0%), and 19.0% did not do exercise. 67.6% had a healthy diet, and the vast majority (93.7%) were not taking blood pressure-lowering medications regularly, while 88.7% did not have high blood sugar or gestational DM. In the light of the family history, 69.3% did not have a history of DM, while 29.7% had (Table 1).

The study revealed that 42.7% of the participants were at low prediabetes risk, 38.4% were at slightly elevated risk, 10.8% at moderate risk, 7.6% at high risk, and 0.5% at very high risk (Fig. 1).

Table 2. Factors associated with staff at prediabetes risk (χ^2 test)

Variables	Group	Low, %	Slightly elevated, %	Moderate, %	High, %	Very high, %	<i>p</i> value
Gender	Male	60.4	33.6	7.3	0.9	0.0	<0.001
	Female	39.6	39.4	11.6	9.0	0.6	
Age	<45 years	48.4	36.5	8.2	6.7	0.2	<0.001
	45–54 years	23.2	45.5	19.2	11.1	1.0	
	55–64 years	16.2	45.9	24.3	10.8	2.7	
BMI	<25 kg/m ²	65.4	29.1	3.8	1.7	0.0	<0.001
	25–30 kg/m ²	29.6	48.0	11.9	9.7	0.7	
	>30 kg/m ²	6.3	38.9	32.9	21.5	1.3	
WC men	<94 cm	80.6	19.4	0.0	0.0	0.0	<0.001
	94–102 cm	41.2	50.0	8.8	0.0	0.0	
	>102 cm	0.0	50.0	41.7	8.3	0.0	
WC women	<80 cm	71.6	22.5	4.4	1.0	0.5	<0.001
	80–88 cm	27.6	55.2	9.2	7.4	0.6	
	>88 cm	10.3	45.5	23.0	20.6	0.6	
Exercise	Yes	46.6	36.4	10.8	5.8	0.4	<0.001
	No	26.4	47.2	11.2	14.4	0.1	
Healthy diet	Every day	41.6	38.7	12.4	7.1	0.2	<0.001
	Not every day	45.0	37.8	7.7	8.6	1.0	
High BG or GDM	Yes	9.8	41.5	19.5	24.4	4.9	<0.001
	No	45.0	38.2	10.2	6.4	0.2	
Family history	No	74.5	21.9	3.1	0.5	0.0	<0.001
	Second relatives	51.7	37.1	6.3	4.2	0.7	
	First relatives	19.0	49.4	17.4	13.5	0.6	

BMI, body mass index; WC, waist circumference; BG, blood glucose; GDM, gestational diabetes mellitus.

The χ^2 test showed that the different categorical variables (gender, age, BMI, WC, exercise, healthy diet, high blood sugar or gestational DM, and family history) were associated with a statistically significant ($p < 0.001$) prediabetes risk. 60.4% of males had a low prediabetes risk, while 33.6% had a slightly elevated risk. 39.6% of females had a low prediabetes risk, and some of the female staff (0.6%) had a very high risk ($p < 0.001$). The highest percentage of staff had a slightly elevated risk, i.e., 36.5, 45.5, and 45.9% in the age groups of <45, 45–54, and 55–64 years, respectively ($p < 0.001$).

Prediabetes risk was high in the BMI group >30 kg/m² (21.5%); 9.7% had a high risk in the group with 25–30 kg/m² and 1.7% in the group with <25 kg/m² ($p < 0.001$). We studied the prediabetes risk associated with WC: 41.7% in the >102 cm group were at moderate prediabetes risk, while the risk was slightly elevated in 55.2% of the 80–88

cm group ($p < 0.001$). The staff who were practicing exercise (46.6%) had a low prediabetes risk, and 5.8% were at high risk, while the staff who were not practicing exercise had a higher prediabetes risk: 14.4% were at high risk, 26.4% at low risk, 47.2% at slightly elevated risk, and 1.0% at very high risk ($p < 0.001$). Concerning diet, 0.2% of staff at very high prediabetes risk had a healthy diet compared to 1.0% with an unhealthy diet ($p < 0.001$). The results demonstrated that 4.9% with high blood sugar or gestational DM were at a very high risk to develop diabetes, and 0.2% of staff who were not taking medication had a very high risk to develop the disease ($p < 0.001$). Finally, 13.5% of staff with a first-relative history of diabetes and 4.2% of staff with a second-relative history of diabetes had a high prediabetes risk, while the lowest percentage of the staff with a high prediabetes risk did not have a family history of diabetes ($p < 0.001$) (Table 2).

Discussion

Finding effective means to prevent T2DM is a critical public health priority. Given the evidence, prevention of T2DM with lifestyle interventions is possible [10]. The efficiency of risk scores may vary between populations with different ethnic backgrounds. Therefore, risk scores should be validated in each population before use.

The FINDRISC can be used as a self-administered test to screen subjects at high risk for T2DM. It can also be used in the general population and clinical practice to identify undetected T2DM, abnormal glucose tolerance, and metabolic syndrome. In the current study, more than one-third of the staff was at low prediabetes risk and around 8% at high prediabetes risk. In a study of the general population in Helsinki, Finland, 66% of men and 70% of women with a moderate or high FINDRISC score turned out to have undiagnosed T2DM [11].

The present study revealed that WC and BMI were statistically significantly different ($p < 0.001$) regarding prediabetes risk. The difference in the performance by gender or race/ethnicity could be due to the different sensitivity of the question by gender and race/ethnicity regarding BMI and WC. One study has found that central obesity is more related to non-insulin-dependent DM in women than in men [12], and another study has shown that WC has a lower impact on the metabolic syndrome in Hispanics than in non-Hispanic Whites and non-Hispanic Blacks [13]. The different performance in each subgroup even supports the rationality of an evaluation of the FINDRISC before applying it to a specific population.

Individuals with a BMI $>25 \text{ kg/m}^2$ in old age should be investigated more frequently than younger age groups with one or more risk factors for diabetes, cardiovascular risk, and metabolic syndrome. As a result of these tests, measures should be taken to prevent or delay the onset of diabetes. As the T2DM diagnosis process takes a long time, FINDRISC may be helpful in identifying diabetes and, therefore, preventing diabetes complications.

There was a significant association between diabetes status of individuals and their age (>40 years, $p < 0.001$). Age has a significant impact on diabetes prevalence and incidence. A study by Mohan et al. [14] showed that there is a significant increase in the diabetes prevalence as people advance above 40 years of age.

In the light of exercise and a healthy diet, the results showed a significant relationship with prediabetes risk ($p < 0.001$). Both factors are considered important and were primarily targeted during recent diabetes prevention trials. Unlike in the study by Lindström and

Tuomilehto [10], both daily intake of vegetables and fruits or berries and physical activity were not statistically significant.

Moreover, we found that taking blood pressure-lowering medications regularly and having no gestational DM were statistically significant ($p < 0.001$). FINDRISC may, therefore, be regarded as a useful screening instrument for the identification of high-risk individuals who are on pharmacological interventions. A study conducted by Mohan et al. [14] showed no significant relationship between family history and prediabetes risk. In contrast, in our study, family history was highly significant ($p < 0.001$).

The present study focuses on predicting future diabetes with several factors that are easy to measure with non-invasive methods, are known to be associated with risk of T2DM, and are easily comprehensible and may direct attention to modifiable risk factors of diabetes. The interpretation of the individual's diabetes risk is easy and can be expressed as a probability relatively accurately.

Conclusion

The FINDRISC is a suitable tool to identify high-risk individuals. Age, BMI, WC, history of antihypertensive drug treatment, history of high blood glucose, family history of diabetes, daily consumption of fruits, berries, or vegetables, and daily physical activity have a significant relationship with the prediabetes test. Frequent testing is recommended to follow the risk score. Since we cannot control unmodifiable factors, such as age and family history, we can control modifiable factors, such as having a healthy lifestyle with healthy food and exercise, to decrease the risk of developing T2DM. Health promotion and education can decrease the risk of developing T2DM.

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Statement of Ethics

Ethical approval was obtained from the research committee in Rashid Hospital prior to data collection.

Disclosure Statement

The authors declare that they have no conflicts of interest.

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Author Contributions

K.A. was the principal investigator; S.J. was the data collector; H.Y.H. was the supervisor and did the proofreading; and N.A.S. was the data analyst.

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