Dubai Diabetes and Endocrinology Journal
Volume 30, Issue no. 1-2, DOI 10.18502/ddej.v30i1-2.17035
Production and Hosting by KnE Publishing

Research Article

Prevalence of Prediabetes among Adult Population of Dubai, the United Arab Emirates: Findings from Dubai Household Survey, 2019

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Abstract

Introduction: The health and social burdens of diabetes mellitus (DM) and prediabetes are steadily increasing worldwide, reflecting the impact of industrial transitions; shifting to unhealthy, sedentary life patterns; and unhealthy food consumption. In the United Arab Emirates (UAE), including the Emirate of Dubai, DM and prediabetes are considered a national public health challenge in terms of extent, impact, cost, and consequences. This study aims to estimate the prevalence of prediabetes and associated risk factors among a representative sample of the adult population in the Emirate of Dubai.

Methods: A cross-sectional household health survey was conducted with a multistage, stratified cluster. The study used a secondary data analysis from the Dubai Household Health Survey (DHHS) 2019 edition. A random sample of 2496 households was included, representing all residents of Dubai (both Emirati and non-Emirati families). The survey design and methods were taken from the World Health Survey of the World Health Organization (WHO) with some modifications. Prediabetes was considered based on HbA1C cut-off results (levels of 5.7% to 6.4%).

Results: The overall prevalence of prediabetes among all participants was 16.2% (20.5% in males and 11.6% in females). The prediabetes rate was higher in non-UAE nationals (17.1%) compared to UAE nationals (12%). There was a statistically significant association between prediabetes and some sociodemographic and behavioral characteristics. The age groups 40–49 and 60+ years showed the highest prevalence of prediabetes in this study (23.7% and 36.4%, respectively). The results of the logistic regression analysis demonstrated that males are more likely to get prediabetes than females (odds ratio; 95% CI = 1.62; 1.13–2.38). Non-UAE nationals had higher chances of developing prediabetes than Emirati nationals (OR; 95% CI = 1.53; 1.50–1.56, $P < 0.001$). Smokers were at a slightly higher risk of getting prediabetes than nonsmokers (OR; 95% CI = 1.03; 1.020–1.045, $P < 0.001$). Moreover, married participants are slightly more likely to develop prediabetes compared to single participants (OR; 95% CI =1.29; 1.28–1.33, $P < 0.001$).

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Received: July 1, 2024
Accepted: July 2, 2024
Published: September 2, 2024

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How to cite this article: Hassanein MM, Alawadi FF, Mamdouh H, Hussain HY, Khater A, Ibrahim G, et al. Prevalence of Prediabetes among Adult Population of Dubai, the United Arab Emirates: Findings from Dubai Household Survey, 2019. *Dubai Diabetes and Endocrinology Journal*. 2024;30(1-2):3–18. DOI 10.18502/ddej.v30i1-2.17035

Discussion: The present study is based on the findings from the DHHS 2019, which provides a comprehensive picture of the glycemic status of the Dubai population, whether Emirati or expats, including the prediabetes rates. The present survey revealed that the rates of prediabetes were higher among expatriates than among Emirati nationals. The expatriate community in Dubai is dynamic and could have been subjected to many changes over the past five years. In addition, our results demonstrated a higher prevalence of prediabetes among higher educational status cohorts compared to those with a lower level of education, and the same was noticed with the marital status, which revealed a higher prevalence among married or previously married groups compared to those who were single. In general, all of these associations are in coherence with the findings of other existing studies in the UAE.

Conclusion: Findings from the DHHS 2019 indicated a high burden of prediabetes among adults in Dubai. Higher rates of prediabetes were significantly reported in non-Emiratis, older age groups, males, those with high educational levels and high BMI, and smokers.

Keywords: Dubai, household survey, prediabetes, prevalence, United Arab Emirates

1. Introduction

Globally, the burden of diabetes mellitus (DM) is increasing, as it is a leading cause of cardiovascular problems, other chronic morbidities, and death [1]. Blood sugar levels that are above normal but below the diabetes cut-off threshold are referred to as prediabetes [2]. It is often described as a blood hyperglycemic intermediate state with a high potential to develop into type 2 diabetes (T2D), which accounts for 90–95% of all cases of diabetes [3]. Prediabetes is identified by laboratory measurement of fasting blood glucose (FBG), glycosylated hemoglobin (HbA1C), or 2-hr postprandial blood glucose (2hBG) [4]. The American Diabetes Association (ADA) recommends diagnosing “prediabetes” with HbA1c values between 39 and 47 mmol/mol (5.7–6.4%) and impaired fasting glucose (IFG) when the fasting plasma glucose is between 5.6 and 6.9 mmol/L (100–125 mg/dL). Characterizing the prevalence of IFG provides a more complete assessment of the global burden of prediabetes [5]. Prediabetes is associated with a high burden of cardiometabolic risk factors, and in 2021, its costs in the neighboring Middle East and North Africa Region alone were a total of USD 33 billion. Hence, early detection of the prediabetes and taking immediate action may be required to stop or at least delay the onset of T2D [6, 7].

In 2021, the International Diabetes Federation (IDF) estimated that 537 million adults worldwide (11%) had diabetes. If effective preventative strategies are not put in place, the rate is predicted to increase to 12.5% by 2030 [8, 9]. Likewise, prediabetes was predicted to impact 10% of the world’s population (541 million people), with almost half of those affected being under 50 years of age [8]. In 2021, the age-adjusted prevalence of impaired glucose tolerance (IGT) among adults aged 20–79 years worldwide was 9.1% (464 million); by 2045, this figure is projected to increase to 10.0% (638 million) [8].

In the United Arab Emirates (UAE), DM and prediabetes are a truly national public health challenge in terms of extent, impact, cost, and consequences. The 2018 prediabetes rates in the UAE were estimated at 11.7% according to the latest UAE National Health Survey [9] and at 9.1% according to the 2021 latest IDF report [10]. In particular, people from the Middle East and Asian countries are more likely to get prediabetes and diabetes [11, 12]. In the US, more than one-third of all individuals have prediabetes, and a majority of them are completely unaware of the disease [7]. Research argues that if appropriate lifestyle interventions and medications are not followed, prediabetes can turn into diabetes within five years [13]. Prediabetics are at high risk of developing T2D. Being overweight and following a sedentary lifestyle is associated with higher risks of prediabetes. Besides age, ethnic origin and family history of the individuals can influence the risk of having prediabetes [2, 14]. Accordingly, identifying people with prediabetes and encouraging them to make healthy lifestyle changes are essential to lowering their risk of developing T2D [15].

With an estimated population of 3.5 million in 2021, Dubai is one of the UAE's seven emirates with the fastest growing population [16]. Dubai has a diverse and unique population structure with 69% of its residents being male expatriates who have come to the Emirate for work and other opportunities. In addition, 65% of Dubai's population is under the age of 49 (between 25 and 10 years) [16]. As traditional nutritional habits and sedentary lifestyles become more prevalent in Dubai, rates of noncommunicable disorders including DM increase accordingly [17].

The healthcare system in Dubai is overseen by the Dubai Health Authority (DHA), a regulatory government body. In recent decades, Dubai has witnessed fast socioeconomic development, similar to other neighboring Gulf countries, which has resulted in significant changes in the patterns of health and diseases [18]. As a result, a household survey is conducted every five years. The survey looks into a wide range of health, social, and economic issues and examines the levels of diabetes and prediabetes among the adult population in Dubai [19]. Although few studies have looked into the incidence of diabetes and prediabetes in the UAE over the past few years [20–22], prediabetes in the UAE and in Dubai is a non-adequately addressed area. Therefore, the present study utilizes the latest available data from the 2019 Dubai Household Health Survey (DHHS) to estimate the prevalence of prediabetes and associated risk factors among a representative sample of the adult population in the Emirate of Dubai.

2. Methods

2.1. Study Setting and Design

This cross-sectional study used secondary analysis of data from the latest DHHS 2019 edition. Cluster sampling with a stratified multistage method was used for this population-based study. All residents of Dubai were included in the survey's sample population. The survey's design and methods were taken from the World Health Survey of the World Health Organization (WHO) with some minor modifications.

In each population stratum, clusters were the main sample units that were chosen at random. A three-stage cluster sampling technique was used inside each stratum. In the first stage, a predetermined number of beginning units from each stratum were withheld, and in the second stage, a predetermined number of households were withheld from each enumeration unit, resulting in the random selection of families. A sample weight that was inversely correlated with the selection probability was given to each participant. The exact specifications of the research approach followed by this survey have been published and detailed elsewhere [19].

A total of 2247 families were included in the DHHS. Both Emirati and non-Emirati families were included in the survey's target demographic. Only adults above the age of 18 who gave blood samples were considered for this analysis. In this investigation, a total of 2142 adults (+18 years) were included. Individuals were interviewed to complete the questionnaire about sociodemographic data, health history, and behavioral risk factors.

2.2. Variables and Measures

Age, marital status, nationality, and education were among the sociodemographic factors that were examined. The three categories of marital status were married, divorced/widowed, and single. Nationality had two categories – Emirati nationals and non-nationals. No education, primary, secondary, and higher education (for a university/bachelor's degree or above) were the four categories used to describe educational attainment for this sample.

Standard operational definitions of variables were chosen from internationally acknowledged best practices, and clear inclusion and exclusion criteria were closely adhered to in order to avoid potential biases. DM status was determined using a hemoglobin A1c (HbA1c) test. The cut-off values for the test were defined according to the WHO criteria, and individuals with HbA1c levels of 5.7–6.4% were defined as prediabetes, and considered as the main outcome variable for this study [23].

Body mass index (BMI) was determined by dividing body weight (in kg) by the square of the height in meters (kg/m^2). Obesity and overweight were defined as per the WHO guidelines [24]. BMI values between 25.0 and 30 kg/m^2 were classified as overweight. A BMI of >30 kg/m^2 was considered obese. In addition, blood pressure (BP) was measured three times, at 10-minute intervals, on the right arm using an electronic BP reader. The average of three measurements were used. The latest American College of Cardiology's definition of hypertension was followed for this study [25]. Accordingly, a systolic BP of ≥140 mm Hg and a diastolic BP of ≥90 mm Hg were considered to be indicative of hypertension or high BP, and those with systolic/diastolic hypertension were then considered hypertensive participants. Taking the previously mentioned cut-offs, hypertension was then dichotomized as having/not having the condition.

The study also looked into behavioral risk factors, such as healthy eating, smoking, and physical activity. Individuals were categorized as having consumed enough fruit and/or vegetables if they ate at least five

servings per day. According to the WHO's recommendations of at least 30 minutes of regular, moderate-intensity physical effort for at least five days a week, or 150 minutes total, physical activity status was classified as active or inactive in this study [26]. Smoking status was known by asking if participants mentioned that they had used any kind of tobacco in the previous 30 days. Depending on whether a risk factor was present or not, the aforementioned behavioral risk variables were then dichotomized as either Yes or No.

2.3. Statistical Analysis

Using the IBM-SPSS for Windows version 25.0 (SPSS Inc., Chicago, IL, USA), data entry, coding, cleaning, weighing, and analysis were completed. Each participant was assigned a sampling weight that was inversely proportional to the selection probability. Accordingly, using sample weights, percentages were calculated as descriptive statistics for categorical variables to represent the population of Dubai. Statistical analyses were performed using the Chi-square (χ^2) and Fisher's exact tests for testing associations. A logistic regression analysis was performed to evaluate significant risk factors for prediabetes. The potential predictors were gender, nationality, BMI, marital status, education attainment, and smoking status. Odds ratios (OR) were reported to reflect the strength of the association. All statistical tests were two-sided. A *P*-value of 0.05 was used as the level of significance to test the data, and confidence intervals (CIs) were calculated with a 95% level. Complex weighted computation was used to report the weighted prevalence of prediabetes in this analysis.

3. Results

The DHHS 2019 included a sample of 9630 participants, of whom 44.2% were Emirati (UAE nationals) and the remaining were non-nationals (55.8%). The gender split was almost equal, as males represented 51.2% and females represented 48.7% of the survey sample. Meanwhile, 55.7% of the population were <40 years old, while those with no or just primary education were a minority (3.5%). Similarly, single people constituted 17.6% of the surveyed sample, while the rest were currently or previously married (Table 1).

Table 2 reveals the prevalence of prediabetes in Dubai according to sociodemographic characteristics and nationality groups. Prediabetes rates were higher in non-nationals than in UAE nationals (17.1% vs 12.0%, respectively). Consequently, the estimated prevalence of prediabetes among the Dubai population was 16.2%. Meanwhile, prediabetes prevalence in Dubai showed a statistically significant association with the patient's age ($P < 0.000$). However, this relationship was not uniformly present in all groups, as in UAE nationals, those aged 30–39 and 60+ years had a lower prevalence of prediabetes compared to their counterparts of the lower age group. Similarly, non-nationals aged 50–59 years had a lower prevalence

Table 1: Sociodemographic characteristics of the surveyed population, DHHS 2019.

Variable		Weighted percentage*
Age group (yrs.)	18–29	20.0%
	30–39	35.7%
	40–49	24.0%
	50–59	13.1%
	60+	7.2%
Education attainment	No education	1.8%
	Primary	1.7%
	Secondary	25.2%
	Higher education	71.4%
Nationality group	Emirati nationals	44.2%
	Non-nationals	55.8%
Marital status	Married	78.1%
	Divorced/Widowed	4.3%
	Single	17.6%
Total prevalence		16.2%

*Participants were assigned sampling weights that were inversely proportional to the selection probability.

of prediabetes compared to those aged 40–49 years. In DHHS 2019, the prevalence of prediabetes in males was higher than in females regardless of nationality ($P < 0.000$).

Social parameters, including marital status and level of education, were also related to the prevalence of prediabetes in DHHS 2019. Those who were currently or previously married had higher rates of prediabetes compared to those who were single. However, among Dubai Emiratis, those who were currently married had higher levels of prediabetes than those who were separated, divorced, or widowed. The opposite pattern was seen in non-nationals. The differences in prediabetes rates according to marital status and nationality groups were statistically significant ($P < 0.000$). Emirati nationals with no education and those with higher education had similarly high levels of prediabetes. In non-nationals, the highest rates of prediabetes were seen in those with secondary education. The differences in prediabetes rates according to education and nationality groups were statistically significant ($P <0.000$).

Figure **1** shows the rates of prediabetes by BMI and nationality groups. Normal BMI (<25 kg/m^2) was associated with low rates of prediabetes across both Emirati nationals and non-nationals. The highest rates of prediabetes were observed among overweight individuals (BMI between 25 and 29.9 kg/m^2), and it was significantly higher in non-nationals.

The prevalence of prediabetes in DHHS 2019 showed a significant association with hypertension status. Figure **2** demonstrates this relationship which was present in both Emirati nationals and non-nationals in Dubai. The rate of prediabetes in hypertensive participants was almost three times higher than in normotensive individuals ($P < 0.000$), and this rate was higher in non-nationals than Emirati national participants.

Table 2: Total prevalence of prediabetes among Dubai population according to sociodemographic characteristics and nationality groups, DHHS 2019.

Variable	Emirati-nationals[#]"	Non-nationals[#]"	Total [#]"
Age group (yrs.)			
18–29	9.10%	4.30%	5.40%
30–39	6.10%	12.40%	11.50%
40–49	10.80%	26.10%	23.70%
50-59	25.40%	19.20%	20.60%
60+	15.80%	44.20%	36.40%
^*P*-value	<0.001	<0.001	<0.001
Gender			
Female	8.90%	12.40%	11.60%
Male	17.60%	20.90%	20.50%
^*P*-value	<0.001	<0.001	<0.001
Education			
No education	13.80%	0.00%	10.80%
Primary	7.50%	12.30%	10.00%
Secondary	11.00%	19.10%	15.90%
Higher education (University and above)	13.70%	16.80%	16.50%
^*P*-value	<0.001	<0.001	<0.001
Marital status			
Currently married	13.30%	19.10%	18.20%
Divorced/Widowed	9.50%	24.20%	18.10%
Single	10.00%	5.30%	6.60%
^*P*-value	<0.001	<0.001	<0.001
Total	**12.0%**	**17.1%**	**16.2%**

[#]The results are presented as weighted numbers and proportions for categorical variables.
^χ^2 test; *P*-value significant at <0.05.

Lifestyle behavior parameters represented by physical activity (categorized as active or not) were related to the prevalence of prediabetes, as shown in Figure **3**. The results show no statistically significant difference between Emirati nationals and non-nationals in the prevalence of prediabetes according to physical activity levels, whereas in both, significantly higher rates of prediabetes were associated with being physically inactive ($P < 0.000$).

Statistically significant differences were observed in the rates of prediabetes by smoking status (4.8% in nonsmokers vs 19.3% in smokers [$P < 0.000$]). However, further analysis of the relationship between prediabetes and smoking status was not feasible due to missing data (data were not shown in tables or figures).

Table 3 shows a logistic regression analysis of the potential risk factors associated with prediabetes among the adult population of Dubai. The results reveal that males are more likely to get prediabetes than females (odds ratio; 95% CI = 1.62; 1.13–2.38). Non-UAE nationals had higher chances of developing

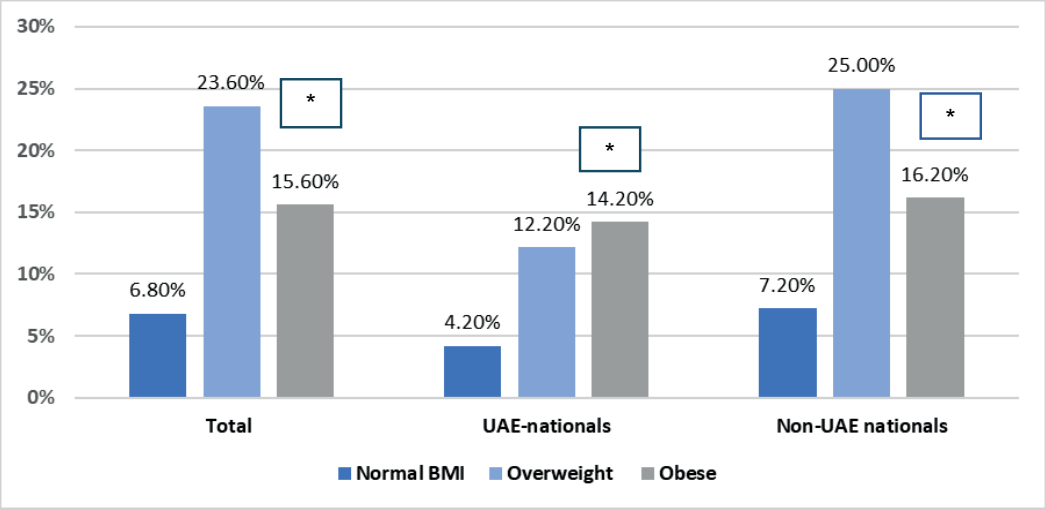

Figure 1: Prevalence of prediabetes among Dubai population according to BMI and nationality group, 2019.
*Significant differences were detected at $P < 0.001$ using the Chi-square test.
BMI, Body Mass Index.

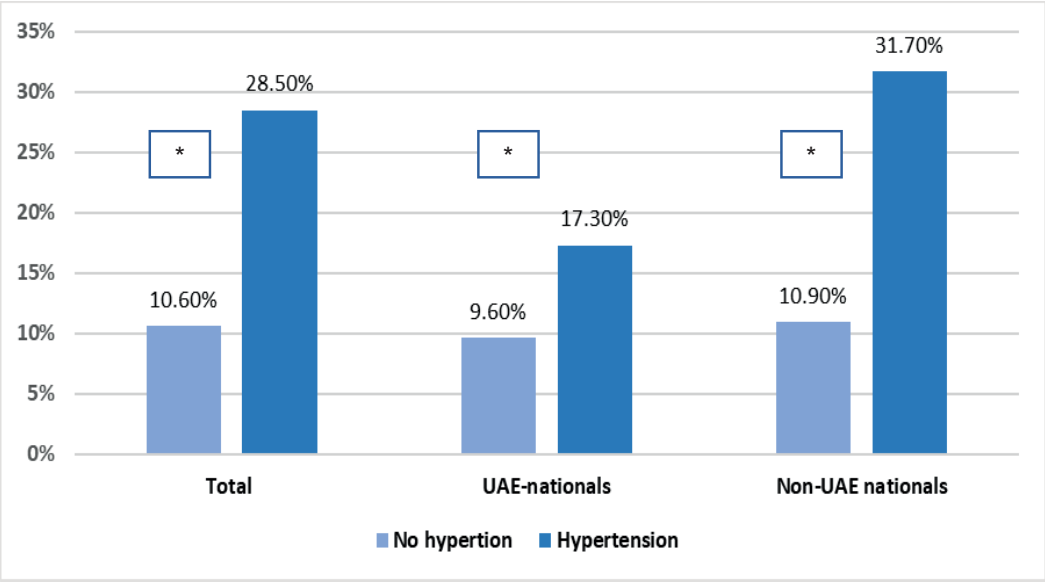

Figure 2: Prevalence of prediabetes among Dubai population according to hypertension status and nationality group, 2019.
*Significant differences were detected at $P < 0.001$ using the Chi-square test.

prediabetes than Emirati nationals (OR; 95% CI = 1.53; 1.50–1.56), $P < 0.001$). Smokers were at slightly higher risk of getting prediabetes than nonsmokers (OR; 95% CI = 1.03; 1.020–1.045, $P < 0.001$). Married women are slightly more likely to develop prediabetes compared to single women (OR; 95% CI = 1.29; 1.28–1.33, $P < 0.001$).

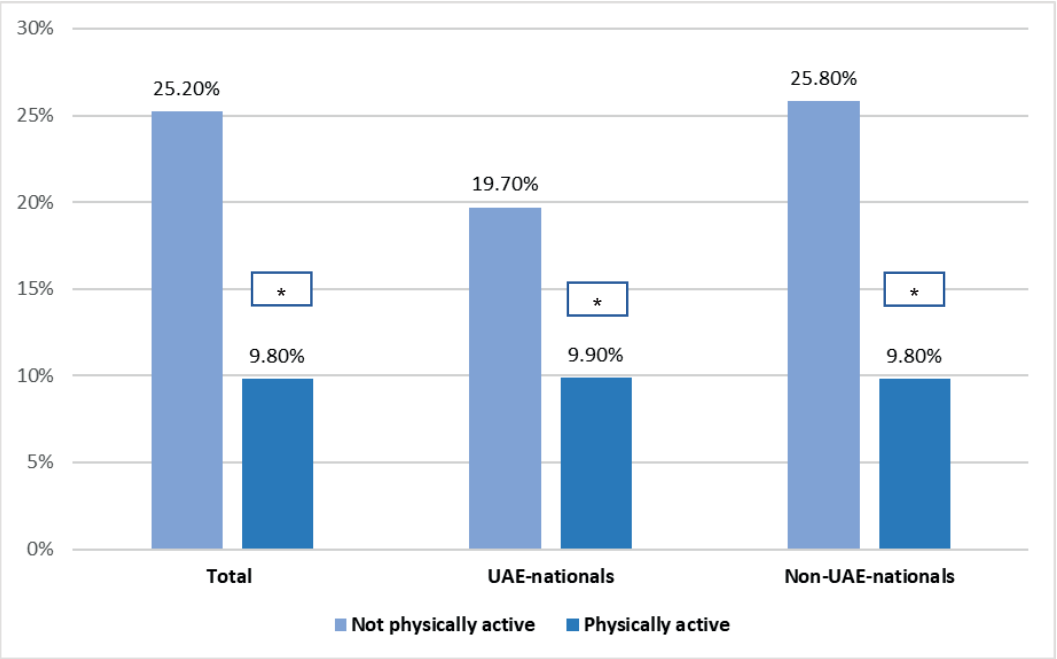

Figure 3: Prevalence of prediabetes among Dubai population according to physical activity levels and nationality group, 2019. *Significant differences were detected at $P < 0.001$ using the Chi-square test.

4. Discussion

4.1. Prevalence of Prediabetes among the Dubai Population

The present study is based on the findings from the DHHS 2019, which provides a comprehensive picture of the glycemic status of the Dubai population, whether UAE nationals (Emirati) or non-nationals (expats), including rates of prediabetes. Comprehensive results on diabetes status among the Dubai population were published elsewhere [20]. The present findings estimated a prevalence of 16.2% for prediabetes among the Dubai population. This finding seems to be similar to the 15.8% prediabetes prevalence that was reported by a previous Dubai household survey in 2014 [27]. While the data from Dubai cannot be generalized to the whole of the UAE, it gives a very good idea about the approximate prevalence of prediabetes in the UAE, and it seems to be higher than the global prevalence of prediabetes (9.1%) reported by the IDF Atlas in 2021 [8]. The IDF further estimated an age-adjusted prevalence of prediabetes of 18.3% in the UAE in 2021 [8]. The present findings are relevant to other UAE-published studies, as well as other neighboring Gulf countries with similar population structures [10, 12, 27–30]. The sustained high rate of prediabetes in Dubai indicates the need for updated policies and programs to address this important health issue.

Table 3: Logistic regression analysis of the potential risk factors associated with prediabetes among the adult population of Dubai, 2019.

	Adjusted odds ratio (95% CI)	^P-value
Gender		
Female	Reference	
Male	1.62 (1.13–2.38)	<0.001
Nationality		
UAE nationals	Reference	
Non-UAE nationals	1.53 (1.50–1.56)	<0.001
Education		
No education	0.49 (0.48–0.52)	<0.001
Primary	1.18 (1.16–1.24)	<0.001
Secondary	0.99 (0.97–1.10)	<0.001
Higher education (University and above)	Reference	
BMI classification		
Normal weight	Reference	<0.001
Overweight	10.18 (9.52–10.90)	<0.001
Obese	5.4 1 (5.06–5.79)	<0.001
Marital status		
Currently married	1.29 (1.28–1.33)	
Divorced/Widowed	0.78 (0.765–0.80)	<0.001
Single	Reference	<0.001
Smoking status		
Nonsmoker	Reference	
Smoker	1.03 (1.020–1.045)	

CI, confidence interval
^*P*-value < 0.05

4.2. Sociodemographic Association with Prediabetes

Various modifiable and non-modifiable risk factors are associated with higher rates of prediabetes [2, 14, 27]. The present survey revealed that the rates of prediabetes were higher among expatriates than among Emirati nationals (17.1% vs 12.0%, respectively). The expatriate community in Dubai is dynamic and could have been subjected to many changes over the past five years. It is recommended that health authorities in the UAE continue investigating ethnic-specific diabetes and prediabetes rates. The age groups 40–49 and 60+ years showed the highest prevalence of prediabetes in this study, which was supported by findings from several studies around the world [29–32]. Advanced age is a commonly known risk factor for diabetes and prediabetes by itself and after adjusting for other confounders [33, 34].

As shown in the present study, male gender was associated with a higher prevalence of prediabetes compared to females. This finding is in line with the ADA risk calculation that assumed that male gender

is a risk factor for developing diabetes [35]. On the contrary, the latest figures from the global prevalence of prediabetes study cited similar rates of prediabetes in both males and females [36].

Our results demonstrated a higher prevalence of prediabetes among higher educational status cohorts compared to those with a lower level of education, and the same was noticed with the marital status, which revealed a higher prevalence among married or previously married groups compared to those who were single. In general, all of these associations are in coherence with the findings of other existing studies in the UAE [12]. Few studies have examined the association between educational attainment and the prevalence of prediabetes. However, most of the studies found an inverse association between education and the prevalence of diabetes, which contradicts our findings [37–39]. In Dubai, where individuals with lower education (who are mostly of lower socioeconomic status) are mostly involved in jobs that require higher physical activity (like construction work), this could explain the direct association between education and prediabetes in this cohort. Moreover, higher education could be linked to obtaining more sedentary jobs with less active lifestyles.

The results of the current survey revealed that smoking, hypertension, overweight and obesity, and physical inactivity are all associated with higher rates of prediabetes in the Dubai population. Our findings are consistent with earlier findings from research conducted in Kuwait and Saudi Arabia [30, 40]. These findings can be attributed to metabolic modifications caused by sustained exposure to these risk factors. Literature argues that individuals with prediabetes have a high burden of cardiovascular risk factors [7, 41, 42]. These results also could be related to more robust screening of those who appear to have a higher risk of developing diabetes, such as obese, smokers, or hypertensive individuals. Obese people have higher rates of T2D, with some researchers suggesting that obese are more likely to develop T2D than those with normal BMI [7, 41, 42]. A linear relationship can be described in the relationship between weight and diabetes development Thus, overweight individuals are more likely to be prediabetics [43–45]. Moreover, in agreement with the present findings, data from a series of cross-sectional surveys revealed that adults with prediabetes had a high prevalence of hypertension [41, 46].

4.3. Study Limitations and Strengths

The study has a few limitations, such as missing data, which may have led to data inadequacy and insufficiency to make a powerful subgroup analysis. The data generated from this survey for Dubai cannot be generalized to the whole of the UAE. Moreover, we opted for the HBA1c test for measuring the blood glucose level, not the gold standard FBG test or glucose tolerance test. The choice of HB1c had some logistics advantages as the survey fieldwork was done through randomized visits, hence participants were not required to be fasting. Accordingly, we chose that test for its ease and simplicity, otherwise we could have ended up with high failure rates. The test is accepted as a feasible way to assess prediabetes and diabetes in such settings. Regardless of these limitations, the strength of this study lies in that it is

based on a population survey, which allows a representative population sample. In addition, this study is one of few works trying to shed light, utilizing novel data, to point out prediabetes status among the Dubai population.

5. Conclusion

High rates of prediabetes were observed among the Dubai population in this survey. Early detection of prediabetes by truly implementing diabetes prevention policies and interventions is essential. Furthermore, the results of this study indicate that prediabetes is associated with multiple risk factors, such as older age, male gender, being overweight or obese, physical inactivity, hypertension, and high educational attainment. Many of these risk factors can be modified to reduce the burden of diabetes in the coming years. It is essential to provide robust screening of those at risk. Developing strategies for the early detection of prediabetes are also needed to control this significant health problem.

A trend analysis using results of the previous Dubai household surveys is recommended so it can be used as a database for future interventions at the prevention and curative levels, as well as developing future strategies and policies. Adopting healthy lifestyle programs that include dietary changes, weight control, and the best sort of physical activity can help patients delay prediabetes or avoid T2D. The initial steps in reducing the incidence of diabetes include identifying prediabetics and increasing their awareness about the potential risks of developing T2D.

Acknowledgment

The research team would like to express their appreciation and gratitude to the team of Dubai Statistics Centre for their significant contribution to the Household Health Survey.

Statement of Ethics

Ethical standards as per the Dubai Health Authority guidelines and regulations were applied throughout this study. The study was approved by the Dubai Scientific Research Ethics Committee, Dubai Health Authority (DSREC-GL03-2021). All participants provided written informed consent as well as verbal informed consent to take part in the study.

Conflict of Interest Statement

None.

Funding Sources

Not applicable.

Author Contributions

Mohamed Hassanein designed and initiated the study; Gamal Ibrahim and Heba Mamdouh performed the analysis; Heba Mamdouh and Ahmed Khater interpreted the results; Heba Mamdouh drafted the Introduction; Heba Mamdouh and Hamid Hussain drafted the Discussion and Conclusion; Heba Mamdouh wrote the paper with input from all the authors; and Fatheya Alawadi, Mohamed Hassanein, and El-Daw Sulieman critically reviewed the manuscript. All authors read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are from the Dubai Health Authority. However, restrictions apply to the availability of these data; thus, these data are not publicly available. Data are available from the corresponding author upon responsible request with permission from the Dubai Health Authority.

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