Observational Study

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Comparison of diabetes risk estimate in the cities of Riyadh and Amman

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Abstract

A significant rise in the prevalence of type 2 diabetes mellitus (T2DM) in the Middle-east and North Africa (MENA) region has seen over the last few decades. The present observational study aimed to evaluate and compare the risk of developing T2DM in the cities of Riyadh and Amman using the Arab Diabetes Risk Assessment Questionnaire (ARABRISK).

The ARABRISK was administered in a total of 1116 healthy male and female individuals in the age group of 40 to 74 years with no prior history of diabetes in the city of Riyadh (Saudi Arabia) and Amman (Jordan). ARABRISK is an Arabic version of the Canadian Diabetes Risk Assessment Questionnaire (CANRISK), which was adapted and validated for the use in Arab-speaking individuals in Saudi Arabia and Jordan.

The participants from Amman region had higher mean total ARABRISK score compared to the Riyadh region for all categories of ARABRISK. However, the difference was significant in both low- and high-risk categories ($P = .02$ and $P = .01$, respectively) but not significant for moderate category ($P = .17$). In the Riyadh population, female participants had significantly higher ARABRISK total scores compared to male in both moderate- and high-risk categories ($P = .01$). However, in the Amman population, male participants had significantly higher ARABRISK total scores compared to female in both low- and moderate-risk categories ($P = .01$).

The present study suggested an increased risk of developing T2DM in the cities of Riyadh and Amman. However, the population of Amman had a higher risk of developing T2DM compared to the population of Riyadh.

Abbreviations: ARABRISK = Arab Diabetes Risk Assessment Questionnaire, BMI = body mass index, CANRISK = Canadian Diabetes Risk Assessment Questionnaire, HBG = high blood glucose, HBP = high blood pressure, MENA = Middle-east and North Africa, T2DM = type 2 diabetes mellitus.

Keywords: ARABRISK, diabetes mellitus, MENA, prediabetes, screening

1. Introduction

The prevalence of type 2 diabetes mellitus (T2DM) in the Middle-east and North Africa (MENA) region has risen significantly over the last few decades.[1] The prevalence of T2DM in the four countries of the MENA region included among the top 10 countries with the largest prevalence of T2DM.[2] In the MENA region, as per data are given by the International Diabetes Federation, approximately 32.8 million adults are affected by diabetes, and this number is likely to be double to 59.9 million by 2030.[3] In addition, in the year 2012, around 10% of deaths caused due to diabetes and the total cost to treat diabetes was approximately USD 12 billion.[4] This increase in the prevalence is due to a variety of factors, including rapid economic growth and urbanization, lifestyle changes resulting in low levels of physical activity, high intake of refined carbohydrates, and increased obesity.[5]

However, very little is known about the risk factors, management strategies, and preventive measures to control the rapid growth of T2DM, and the consequences of this chronic condition in the MENA region.[2] In addition, there are major differences in the economic growth and urbanization, ethnicity, religious, and cultural backgrounds among the MENA countries. The presence of these heterogeneities are an important factor and could affect the epidemiology, symptoms, quality of care, and health and economic outcomes related to diabetes in the MENA region.[2]

Recently, Alghadir et al.[6] reported an increased risk of developing T2DM in the Jordanian population. Another study reported a high risk of developing T2DM in the Saudi population.[7] However, a comparison of the various risk factors for developing T2DM between these 2 countries was not reported. The cities of Riyadh and Amman were chosen to make these comparisons between 2 Arab nations. Being a capital city, both Riyadh and Amman are densely populated and has a population of more than 6 million and 4 million, respectively. The present observational study aimed to evaluate and compare the risk of developing T2DM in the cities of Riyadh and Amman using the Arab Diabetes Risk Assessment Questionnaire

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(ARABRISK). ARABRISK is an Arabic version of the Canadian Diabetes Risk Assessment Questionnaire (CANRISK), which was adapted and validated for the use in Arab-speaking individuals in Saudi Arabia and Jordan.[8]

2. Methods

The present study is a cross-sectional questionnaire-based survey using the ARABRISK screening tool to assess the risk of developing T2DM in the cities of Riyadh and Amman, which is a capital city of 2 Arab countries, Kingdom of Saudi Arabia and Jordan, respectively. Participants were recruited from randomly selected public places, such as parks and malls, from the respective capital cities of 2 Arab countries, including Amman and Riyadh, from Jordan and Saudi Arabia, respectively. The inclusion criteria were community-dwelling healthy male and female individuals in the age group of 40 to 74 years. The individual with the confirmed diagnosis of diabetes mellitus was excluded. Eligible participants completed the ARABRISK between June and September 2014. ARABRISK is a reliable and valid scale for the use in Arab-speaking individuals.[8]AR-ABRISK score is interpreted by adding up raw scores for each of the 12 items and divided into 3 risk categories: low risk < 21; moderate risk 21 to 32; and high risk ≥ 33.[8]

The ethical approval was attained from the University of Jordan ethical committee, Amman, Jordan and Rehabilitation Research Chair, King Saud University, Riyadh, Saudi Arabia to conduct this research. Each eligible participant signed a written informed consent. Interested participants instructed to complete the whole questionnaire with no missing data was allowed.

2.1. Statistical analysis

A statistical power analysis was performed to estimate the sample size needed from each city based on an effect size of 0.10, alpha = 0.05, and power = 0.80.[9] The necessary sample size needed from each city was approximately n = 393.

The participants' characteristics were described using the descriptive statistics including measures of central tendency and variability. The percentages of the ARABRISK items' categories were represented and compared between Jordan and Saudi population. Mann–Whitney *U* test for 2 independent samples was performed between Jordan and Saudi population to explore significant differences between both nationalities on the ARA-BRISK total score among categories. Statistical analysis was conducted using SPSS statistics for Windows version 20. A value of $P < .05$ was considered significant for all the statistics.

3. Results

A total of 1116 subjects including 603 in Riyadh (Saudi Arabia) and 513 in Amman (Jordan) were recruited from the public places. The total ARABRISK score for the whole sample ranged from 8 to 76 with a mean total score of 35 (standard deviation = 12). The results of ARABRISK specific items and total score between Jordan and Saudi participants are presented in Table 1. By using Mann–Whitney *U* test for 2 independent samples, we found that the Jordanians had higher ARABRISK total scores than did Saudis for all categories of ARABRISK. However, the difference was significant in both low- and high-risk categories but not significant for a moderate category, as presented in Table 2. In the Riyadh population, female participants had significantly higher ARABRISK total scores compared to male in both moderate- and high-risk categories ($P = .01$). However, in the Amman population, male participants had significantly higher ARABRISK total scores compared to female in both low- and moderate-risk categories ($P = .01$), as presented in Table 3.

Table 1

Results of ARABRISK specific items and total score between Jordanian and Saudi Arabian (SA) participants.

Q	ARABRISK items	Jordan, n (%)	SA, n (%)	Total, n (%)
1	Age			
	40–44	156 (30)	247 (41)	403 (36)
	45–54	172 (34)	265 (44)	437 (39)
	55–64	98 (19)	79 (13)	177 (16)
	65–74	87 (17)	12 (2)	99 (9)
2	Gender			
	Male	333 (65)	438 (73)	771 (69)
	Female	180 (35)	165 (27)	345 (31)
3	BMI			
	<25	244 (48)	98 (16)	342 (31)
	25–29	130 (25)	284 (47)	414 (37)
	30–34	65 (13)	164 (27)	229 (20)
	≥35	74 (14)	57 (10)	131 (12)
4	Waist circumference			
	Male < 94/Female < 80	155 (30)	128 (21)	283 (25)
	Male 94–102/Female 80–88	74 (15)	149 (25)	223 (20)
	Male > 102/Female > 88	284 (55)	326 (54)	610 (55)
5	Daily physical activity ≥ 30 min			
	Yes	309 (60)	194 (32)	503 (45)
	No	204 (40)	409 (68)	613 (55)
6	Daily consumption of fruits/vegetables			
	Every day	268 (52)	278 (46)	546 (49)
	Not every day	245 (48)	325 (54)	570 (51)
7	HBP			
	Yes	190 (37)	198 (33)	388 (35)
	No	323 (63)	405 (67)	728 (65)
8	HBG			
	Yes	146 (29)	110 (18)	256 (23)
	No	367 (71)	493 (82)	860 (77)
9	History of gestational diabetes			
	Yes	6 (1)	45 (7)	51 (5)
	No, do not know, or not applicable	507 (99)	558 (93)	1065 (95)
10	Positive family history of diabetes (mother, father, siblings, and children)			
	One of them	28 (5)	128 (21)	156 (14)
	Two of them	68 (13)	144 (24)	212 (19)
	Three of them	143 (28)	106 (18)	249 (22)
	All of them	254 (50)	59 (10)	313 (28)
	Others or no/do not know	20 (4)	166 (27)	186 (17)
11	Ethnicity of parents Arab	513 (100)	603 (100)	1116 (100)
12	Education			
	Some high school or less	165 (32)	218 (36)	383 (34)
	High school diploma	152 (30)	119 (20)	271 (24)
	College or university degree	196 (38)	266 (44)	462 (42)
	Total score points			
	Low risk (<21)	37 (7)	89 (15)	126 (11)
	Moderate risk (21–32)	166 (32)	193 (32)	359 (32)
	High risk (≥33)	310 (61)	321 (53)	631 (57)

ARABRISK = Arab Diabetes Risk Assessment Questionnaire, BMI = body mass index, HBG = high blood glucose, and HBP = high blood pressure.

4. Discussion

The outcomes of the ARABRISK questionnaire were useful in drawing a picture of the risk of getting diabetes in the residents of

Table 2

Mean and standard deviation of ARABRISK total score between Jordanian and Saudi Arabian (SA) participants.

Total score categories	Jordanian (Mean ± standard deviation)	SA (Mean ± standard deviation)	*P-value
Low risk (<21)	17.27 ± 2.70	15.72 ± 3.42	.02
Moderate risk (21–32)	27.34 ± 3.35	26.87 ± 3.41	.17
High risk (≥33)	45.11 ± 9.37	41.93 ± 6.85	.01

ARABRISK = Arab Diabetes Risk Assessment Questionnaire.
* Mann–Whitney for 2 independent samples was significant at *P*-value < .05.

Table 3

Gender-wise distribution of ARABRISK total score in Jordanian and Saudi Arabian (SA) participants.

		Jordanian (Mean ± standard deviation)	SA (Mean ± standard deviation)
Male	Low risk (<21)	18.64 ± 1.50	15.73 ± 3.32
	Moderate risk (21–32)	38.93 ± 12.13	32.06 ± 11.18
	High risk (≥33)	45.22 ± 9.66	41.18 ± 6.70
Female	Low risk (<21)	16.43 ± 2.95	15.64 ± 4.03
	Moderate risk (21–32)	34.42 ± 12.55	36.39 ± 11.26
	High risk (≥33)	44.83 ± 8.66	43.55 ± 6.91

ARABRISK = Arab Diabetes Risk Assessment Questionnaire.

Riyadh and Amman. The present study investigated the possible justifications of high-risk factors and the degree to which modifiable risk factors, such as body mass index (BMI) and a sedentary lifestyle, supports our study outcomes. It is a known fact that the number of diabetic patients in Saudi Arabia and Jordan are high.[10,11] Also, the number rises significantly and rapidly over the last few decades due to changes in the lifestyle behaviors. The completion of the questionnaire gives participants an overall ARABRISK score that indicates their risk of having T2DM. The majority of items in ARABRISK questionnaire are from the domain of lifestyle; therefore, the use of ARABRISK would be more appropriate compared to race/ethnicity or cultural differences.

Our study outcomes indicated that one-third of the participants in Amman and two-thirds of the participants in Riyadh represent BMI between overweight and obesity. Many longitudinal studies have reported that BMI is one of the strongest predictors for T2DM.[12–14] About one-third of the participants in the present study suffered from hypertension and scored high in ARABRISK. Similarly, previous studies have reported that the hypertension progression is an independent predictor of T2DM.[15–17] The present study reported that more than two-thirds of the Jordanian participants have a direct relative who has been diagnosed with diabetes. For Saudi Arabian subjects, less than 25% of the participants have a family history of diabetes. Such outcomes would support the notion of increasing their risk of developing diabetes as several studies have found that genetic components play a crucial role in the pathogenesis of T2DM.[18–20]

The study participants in Riyadh were not physically active, more than two-thirds of men and women participants reported that they are not physically active. Additionally, nearly half of the women and men participants reported not eating vegetables or fruits every day. However, in the Jordanian participants, less than two-thirds of men and more than half of the women participants reported that they are physically active. In addition, more than half of the women and men participants reported eating vegetables or fruit every day. Indeed, the type or frequency of physical activity, as well as types of vegetables and fruits, were not considered in ARABRISK. Longitudinal studies revealed that physical inactivity has a direct relationship with the risk of developing T2DM.[24–27] Furthermore, prolonged television watching, a marker of a sedentary lifestyle, had a direct relationship with diabetes risk in both men and women.[21–23]

This study had several limitations. The present study did not consider the HbA_1C level to diagnose diabetes mellitus in order to exclude them instead we just relied on a participant declaration of not being diagnosed with diabetes mellitus. Since, in the surveys, the data being collected at a single time point, it is not possible to assess changes in the population unless 2 or more follow-up surveys are done at various time points. In addition, the present study did not report any causal relationship, as the data were collected at a single time point. Moreover, adding other questionnaires that measure the level of physical activity would have added more information about our participants' physical level.

5. Conclusions

The present study suggested an increased risk of developing T2DM in the cities of Riyadh and Amman. However, the population of Amman (Jordan) had a higher risk of developing T2DM compared to the population of Riyadh (Saudi Arabia). Therefore, it is vital to encourage physical activity and reduce sedentary lifestyle in Jordanian and Saudi Arabian population. In addition, there is a need to develop an effective obesity prevention program to minimize the risk of developing obesity and ultimately, the risk of developing diabetes in Saudi Arabia and Jordan.

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