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Prevalence of diabetes and its relation with age and sex in Turaif city, northern Saudi Arabia in 2016-2017

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Abstract

Background: The prevalence of diabetes in Saudi Arabia has increased dramatically during the last decades. This increase has been attributed to significant changes in cultural and socio-economic factors.

Objective: The aim of this study was to determine prevalence of diabetes and its relation with age and sex in Turaif city, northern Saudi Arabia.

Methods: This was a cross-sectional study carried out during the academic year 2016-2017 over a period of 6 months (October 01, 2016 to March 30, 2017). A total of 1,287 Saudi national individuals of both sexes, aged from 1 year to more than 65 years were included in the study. Data were collected by a predesigned questionnaire covering medical history of diabetes, age and sex.

Results: Mean age (± SD) was 24.29 (±13.96) years with the minimum age at 1 year and the maximum age at 93 years, male to female ratio was 42.5% to 57.5%. The total prevalence of DM among the studied population was 5.8% and pre-diabetic cases were 6.8%. There were significant relationships between age/sex, and the occurrence of diabetes among the studied population ($p<0.05$).

Conclusions: The total prevalence rate of DM among the studied population of Turaif city, northern Saudi Arabia was 5.8% and pre-diabetic cases were 6.8%. Awareness campaigns and prevention programs about diabetes should be instituted and the existing ones must be strengthened. Adequate commitment from the Ministry of Health is also advocated.

Keywords: Diabetes mellitus; Total prevalence; Different age groups; Turaif, Saudi Arabia; Random blood sugar

1. Introduction

Diabetes mellitus (DM) is a major public health problem worldwide. It is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period (1). Diabetes is due to either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced (2). There are three main types of diabetes mellitus; Type 1 DM, known as juvenile diabetes, results from the pancreas's failure to produce enough insulin, type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly and gestational diabetes is the third main form, and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels (3). Following an extensive international study gathering and analyzing worldwide data on diabetes, results revealed that the number of adults with diabetes reached 347 million in 2008, which is double that of the amount reached 1980 (4). In 1987, diabetes prevalence was at 4.3%, but by 2004 it had increased to 23.7% (5). Analysis of data from 91 countries to calculate age- and sex-specific diabetes prevalence was carried out and applied to national population estimates to determine prevalence of diabetes for all 216 countries between 2010 and 2030. The world prevalence of diabetes among adults (aged 20-79 years) was estimated as 6.4%, affecting 285 million adults by 2010 and this figure will increase to 7.7% and 439 million adults by the year 2030. It is estimated that between 2010 and 2030, the number of adults with diabetes in developing

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countries will see an increase of 69% and there will be an increase of 20% in developed countries (6). A study on diabetes in Saudi Arabia (7) revealed that a total of 4,004 subjects (23.7%), out of 16,917 were diagnosed as having DM. Thus, in Saudi Arabia, the total prevalence of DM obtained from this study is 23.7%. The prevalence in males and females were 26.2% and 21.5% respectively ($p<0.00001$). The estimated age-adjusted prevalence for the Saudi population for the year 2000 is 21.9%. Diabetes mellitus was shown to be more prevalent among Saudis living in urban areas which was 25.5%, compared to Saudis living in rural areas which was 19.5% ($p<0.00001$). Another study conducted in Arar, Saudi Arabia, showed that the prevalence of diabetes mellitus among adult educated and employed males of Arar city was 14.8 %. There is a high statistically significant difference between different age groups of the participants as regards diabetes ($p<0.001$), but here is no statistically significant difference between obese and non-obese ($p>0.05$). There is also a highly significant relation between the family history of diabetes and diabetes ($p<0.001$). Diabetes was found in 17.8% and 9.8% of physically inactive and physically active participants respectively, and there is statistically significant relation between diabetes and physical activity ($p<0.05$) (8). The aim of this study is to measure prevalence of diabetes and its relation with age and sex in the studied population of Turaif city, northern Saudi Arabia.

2. Material and Methods

This cross-sectional study was carried out among both sexes of a Turaif population in northern Saudi Arabia. The study was carried during the academic year 2016–2017 over a period of 6 months (October 01, 2016 to March 30, 2017). The formula sample size was estimated based on the formula $n=z^2p\ (1-p)/e^2$, considering the prevalence of stunted growth in Turaif is 50%, target population more than 10,000, and study power 95%, absolute error 5%, and a nonresponse rate 20%. A total of 1,287 individuals of both sexes who are Saudi nationals aged from 1 year to more than 65 years were included in the study. Data were collected by means of personal interview with the sampled population using a predesigned questionnaire covering the following items: 1) Socio-demographic characteristics including age and sex; 2) Blood sample drawn under complete septic conditions to determine random blood glucose level. A person was considered diabetic if random blood sugar was ≥200 ml/dl. Collected data were coded and analyzed by SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The Chi-square test was used as a test of significance, and differences were considered significant at P value 0.05 or less. Permission to conduct the study was obtained from the Research and Ethics Committee of the Northern Border University, Kingdom of Saudi Arabia. The questionnaire had a brief introduction to the students by explaining the aims and benefits of the study. Anonymity and confidentiality of data were maintained throughout the study. There was no conflict of interest.

3. Results

Mean age (± SD) was 24.29 (±13.96) years with the minimum age at 1 year and the maximum age at 93 years, male to female ratio was 42.5% to 57.5%. About 58.7% of the diagnosed cases were aged between 36-65 years old while 30.7% were aged between 17-35 years old. The highest percentage of pre-diabetics was at the 36-65 years old (42.5%). Table 1 illustrates the socio-demographic characteristics of studied cases, in Turaif city, northern Saudi Arabia, 2016-2017. Table 2 illustrates prevalence of DM in Turaif city among studied cases in Turaif city, northern Saudi Arabia in 2017.

Table 1. Socio-demographic characteristics of studied cases, in Turaif city, northern Saudi Arabia, 2016-2017

Parameter		Frequency (n=1287)	Percent (%)
Age (year); 24.29 (±13.964)	0 - 16	428	33.3
	17 - 35	605	47.0
	36 - 65	247	19.2
	More then 65	7	0.5
Sex	Male	547	42.5
	Female	740	57.5

Table 2. Prevalence of DM among studied cases in Turaif city, northern Saudi Arabia, 2016-2017

Diagnosis	Frequency (n=1287)	%
Normal	1125	87.4
Pre-diabetic	87	6.8
Diabetic	75	5.8
Total	1287	100.0

The total prevalence of DM among studied cases was 5.8%, pre-diabetic cases were 6.8% and normal cases were 87.4%. According to our findings, 75 people (5.8%) were diabetic cases, 87 people (6.8%) were pre-diabetic cases and 1,125 people (87.4%) were normal cases. Table 3, illustrates the relationship between diabetic patients and age among studied cases in Turaif city, northern Saudi Arabia in 2017. There is significant effect of age ($p<0.05$). Finally, Table 3 illustrates the relationship between diabetic patients and sex among studied cases in Turaif city, northern Saudi Arabia in 2017.There is significant effect of sex ($p<0.05$).

Table 3. Relationship between diabetes and age among studied cases in Turaif city, northern Saudi Arabia, 2016-2017

Variable		Diagnosis			Total (n=1287)	Chi-Square	p-value
		Normal (n=1125)	Pre-diabeti(n=87)	Diabetic (n=75)			
Age (year)	0-16	399	24	5	428	1.461	0.00
		35.5%	27.6%	6.7%	33.3%		
	17-35	557	25	23	605		
		49.5%	28.7%	30.7%	47.0%		
	36-65	166	37	44	247		
		14.8%	42.5%	58.7%	19.2%		
	>65	3	1	3	7		
		0.3%	1.1%	4.0%	0.5%		
Sex	Male	494	33	20	547	9.354	0.009
		43.9%	37.9%	26.7%	42.5%		
	Female	631	54	55	740		
		56.1%	62.1%	73.3%	57.5%		

4. Discussion

Diabetes is a multifactorial disease of considerable heterogeneity (9). The prevalence of diabetes worldwide will see an increase of 42% between the years 2003 and 2025 (10). Prevalence data are important to show the effectiveness of the current health care programs. This study is a cross-sectional study, carried out in Turaif city, Saudi Arabia over a period of 6 months (October 01, 2016 to March 30, 2017). The main objective of the study was to determine the prevalence of diabetes and it's relation with age and sex. Overall, 47.0% aged between 17-35 years old with mean age (±SD) of 24.29 (±13.96). The present study revealed that the overall prevalence of diabetes was 5.8%. Our finding is less than the reported prevalence data from the Gulf region in Bahrain (25.7%) and Oman (16.1%) (11, 12). A 2010 study estimated that more than 92 million Chinese adults have the disease, with another 150 million showing early symptoms (13). In India, diabetes currently affects more than 62 million Indians, which is more than 7.1% of the adult population (14). Another study in Canada found that almost 2.4 million Canadians (6.8%) have been diagnosed with type 1 or type 2 diabetes, based on 2009 chronic disease surveillance data (15). Age is known to be an important determinant of diabetes since blood glucose concentrations tend to rise with age (16). In our study, there was high significant relation between age and number of diagnosed diabetic cases. A study conducted in Saudi Arabia (17) showed that the mean (±SD) age for onset of diabetes in males and females was 57.5 (13.1) and 53.4 (13.1) years, respectively ($p<0.0001$). Females <50 years old had a higher prevalence than males in the corresponding age range, 34.1% and 25.1%, respectively ($0<0.0001$). The prevalence of diabetes decreased in patients older than 70 years. Another study among an urban Iranian population (18) showed that the prevalence of DM increased with advancing age from 4% in subjects from 30to 39 to 22.9% in subjects ≥60 ($p<0.001$). Also, the prevalence of pre-diabetics increased from 3.1% in subjects 30 to 39 to 20.9% in the ≥60 age groups ($p<0.001$), but there was no statistical difference between age groups and prevalence of NDM. Another study in Riyadh, Saudi Arabia, revealed that the mean age of 99 type 2 diabetic patients was 57 years (19). Regarding sex, this study found that females had a higher percentage of diabetic patients than males (73.3%, 26.7% respectively). Those results did not agree with the Canadian study (16) which found a higher proportion of males than females (¬54% males, 46% females) with diabetes, studies in the United States found a higher proportion of females ¬(42% males Vs. 58% females) with diabetes (20). While Al-Nozha et al. (7) found that the prevalence in males and females were 26.2% and 21.5% ($p<0.00001$). In the Iranian study, the results showed that prevalence of diabetes mellitus was 11.6%; 11.1% in men and 12.1% in women with no significant difference between them. In another Saudi study (17) the prevalence of diabetes was 34.1% in males and 27.6% in females ($p<0.0001$).

5. Conclusions

The total prevalence rate of DM among the studied population of Turaif city, northern Saudi Arabia was 5.8% and pre-diabetic cases were 6.8%, females had the higher percentage of diabetic patients than males. Awareness

campaigns should be held more often in different neighborhoods of the city, prevention programs about diabetes should be instituted and the existing ones must be strengthened. Health education settings should be more specific and clear for the public. Adequate commitment from the Ministry of Health is also advocated.

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Conflict of Interest:
There is no conflict of interest to be declared.

Authors' contributions:
All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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