



Prevalence, patterns and predictors of diabetes complications among patients with type 2 diabetes at Jazan Diabetic Centre, Saudi Arabia

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General Note

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ABSTRACT

Background: The purpose of this study is to determine the prevalence, patterns and predictors of diabetes complications among patients with type 2 diabetes. **Method:** A cross sectional observational study. **Results:** Out of total; 214 (53.4%) were male and 187(46.6%) were female. Mean age of the participants was (54.13±13.523). Neuropathy was the most prevalent complication, found in 20.9% of cases, followed by diabetic retinopathy (16.7%), heart diseases (9.5%), and nephropathy (3.7%). Obesity was found in 51% of the participants and was also significantly associated with the female gender (P value = 0.001). Hypertension, as a comorbid disease, was found in 49% of the participants and was significantly associated with the female gender (P value = 0.001). **Conclusion:** Neuropathy was the most prevalent micro vascular complication. Hypertension and obesity were very significant predictors of diabetes complications.

Keywords: Type 2 diabetes, prevalence, pattern, diabetes complications, hypertension, and obesity.

1. INTRODUCTION

The prevalence of Diabetes Mellitus (DM) is reaching epidemic proportions in many parts of the world (Shaw JE, Sicree RA and Zimmet PZ, 2010). Type 2 diabetes, as a chronic disease, has the potential of developing long-term macro and micro-vascular complications (American Diabetes Association, 2013). Ischemic heart disease, cerebrovascular disease and peripheral vascular disease, which often lead to morbidity and mortality, are among the macro-vascular complications of type 2 diabetes (Buyken, Anette E et al., 2007; Abbott, Robert D et al., 2003; American Diabetes Association, 2003). Diabetes retinopathy, the most common micro-vascular complication of diabetes, is the leading cause of visual impairment in both developing and developed countries (Fong, Donald S et al., 2004; Ghafour IM, Allan DO and Foulds WS, 1983; Kostev V and Rathmann W, 2013; Ruta LM, Magliano DJ, Lemesurier R et al., 2013). Currently, diabetic nephropathy is the leading cause of chronic kidney diseases and end stage renal disease in different countries around the world (Bouhairie VE and McGill JB, 2016; Adler, Amanda I et al., 2003; Aldukhayel A, 2017). Neuropathy, another most common micro-vascular complication of type 2 diabetes, is considered a main risk factor for foot ulcer and amputation in diabetics (Armstrong, David G et al., 2011).

The World Health Organization (WHO) has announced that Saudi Arabia represents the second highest in the Middle East, and is seventh in the world for the rate of diabetes (Abdulaziz Al Dawish, Mohamed et al., 2016). Saudi Arabia experienced major socio-economic changes over the past four decades including technological advances, declined physical activity, increased consumption of fast foods and sugar-dense beverages, and has resulted in the dramatic increase in the diabetes prevalence (Whiting, David R et al., 2011). Incidence, prevalence, and burden of diabetes have been studied largely in central and western regions of Saudi Arabia (Elhadd TA, Al-Amoudi AA and Alzahrani AS, 2007; Alotaibi, Abdullellah et al., 2017; Alwakeel, Jamal S et al., 2008). A recent study among diabetic Saudi patients in Northern Saudi Arabia concluded high prevalence of diabetic complications among Saudis (Alshaya, Abdulrahman Khaled et al., 2017). However, data are limited regarding population-based assessment of the prevalence of various diabetic complications in Saudi Arabia (Alotaibi, Abdullellah et al., 2017; Alwakeel, Jamal S et al., 2008). To the best of our knowledge, there is no published research studying the diabetes complication in southern region of Saudi Arabia, including Jazan. Furthermore, such information is needed for planning of health services and to the distribution of health services according to diabetic complications. Hence the aim of this study is determine the prevalence and patterns of diabetic complications and to assess the predictors of diabetic complications among the diabetic patients attending the diabetic center in Jazan region.

2. MATERIALS AND METHODS

Study Design, Settings, and Population

This is an observational, cross sectional study to assess the prevalence, patterns, and predictors of diabetes complications among patients with type 2 diabetes attending Jazan Diabetes Center in Jazan Province during the year 2018.

The inclusion criteria for this study were medical records of adult more than 18 years with type 2 diabetes attending Jazan Diabetes Center.

The exclusion criteria were medical records of patients with other types of diabetes and those less than 18 years.

Sample Size and Sampling Procedures

The sample size was calculated to be 384 while assuming that 50% of type 2 diabetes have diabetes complications, and with 5% relative precision and 95% confidence interval. The final sample size was calculated to be approximately 423, accounting for a nonresponse error of 10 %.

Data collection

Data was extracted from the randomly selected medical records based on a pre-designed, semi-structured questionnaire used to collect the information pertaining to the study variables. The questionnaire has three sections. The first section consisted of questions regarding Socio-demographic data like age, gender, and body mass index. The second section consisted of questions regarding the diabetes characteristics like duration of diabetes and HbA1c level. The third section consisted of questions regarding the patterns of diabetes complications.

Data analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20 (SPSS Inc, Chicago, IL, USA). Descriptive statistics included a simple tabulation, frequencies, and cross tabulation. Continuous variables were presented as mean \pm standard deviation (SD). Chi-square test was used for significant comparison of the categorical variables. $P < 0.05$ was used to indicate statistical significance.

3. RESULTS

Table 1 show the demographic and disease characteristics of the participants; 401 of questionnaires were filled (coverage rate 95%). Out of total; 214 (53.4%) were male and 187(46.6%) were female. Mean age of the participants was (54.13 \pm 13.523). 16.5% of the participants classified as normal, 30.2% were overweight and 51.1% were obese, according to BMI classification. Mean duration of diabetes in years was (10.66 \pm 7.214). Only 12% of the participants achieved optimal glycemic control with HbA1c less than 7. HbA1c more than 9 was found in 55.4% of the participants.

Table 1 socioeconomic and disease characteristic of the participants

Characteristic	Frequency	Percentage
Mean Age	54.13 \pm 13.523	
BMI category at last visit (n= 401)		
obese	205	51.1
Overweight	121	30.2
normal	66	16.5
underweight	9	2.2
Mean Duration of disease	10.66 \pm 7.214 years	
Type of medication (n= 392)		
insulin	166	41.4
Oral hypoglycaemic	114	28.4
both	112	27.9
HbA1c level (n= 401)		
Less than 7%	48	12
7-9%	131	32.7
More than 9%	222	55.4

Figure 1 shows the frequency distribution of diabetes complications; Neuropathy was the most prevalent complication, found in 20.9% of cases, followed by diabetic retinopathy (16.7%), heart diseases (9.5%), and nephropathy (3.7%).

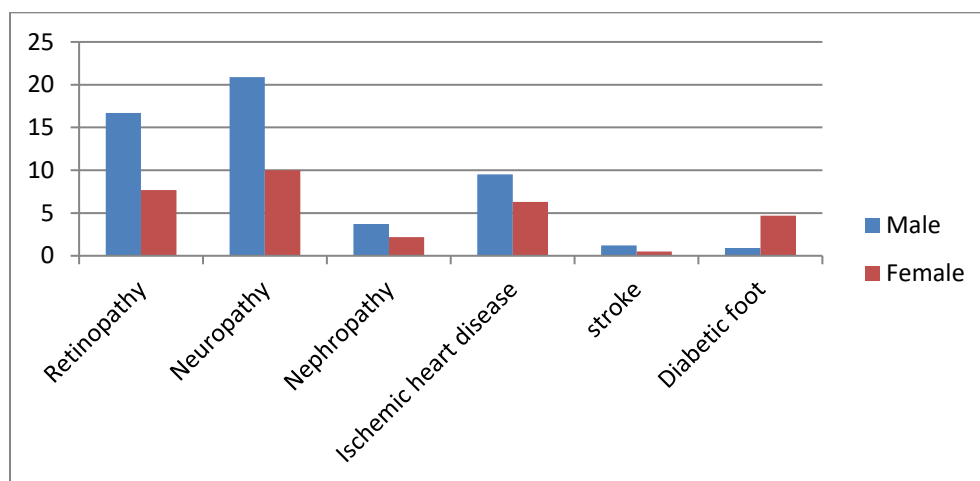


Figure 1 frequency distribution of diabetes complications

Table 2 shows the gender differences in relation to the prevalence of different diabetes complications and selected comorbidities; there were no significant gender differences in the prevalence of Neuropathy Retinopathy, Ischemic Heart Diseases, and Nephropathy (P value = 0.209, 0.245, 0.103, 0.593 respectively). Hypertension, as a comorbid disease, was found in 49% of the participants and was significantly associated with the female gender (P value = 0.001). Obesity was found in 51% of the participants and was also significantly associated with the female gender (P value = 0.001). Figure 2

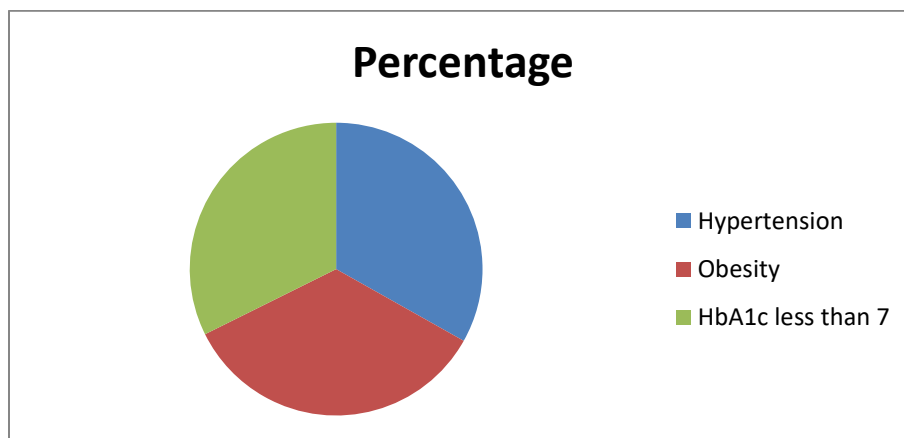


Figure 2 frequency distribution of the comorbid risk factors

Table 2 gender differences in relation to the prevalence of different diabetes complications and selected comorbidities

	All patient	Male	Female	P value
Type of Complication				
Overall	401	214(53.4)	187(46.6)	
Retinopathy	67(16.7)	31(7.7)	36(9)	0.209
Neuropathy	84(20.9)	40(10.0)	44(11.0)	0.245
Nephropathy	15(3.7)	9(2.2)	6(1.5)	0.593
Ischemic heart disease	38(9.5)	25(6.3)	13(3.2)	0.103
stroke	5(1.2)	2(0.5)	3(0.7)	0.550
Diabetic foot	36(9)	19(4.7)	17(4.3)	0.953
Co-morbidities				
hypertension	200(49)	91(22.7)	109(27.2)	0.001
obesity	204(51)	90(22.5)	114(28.5)	0.001

4. DISCUSSION

Studying macro- and microvascular complications of diabetes is crucial for effective diabetes management. It is instituted that reduction in HbA1c by 1 % can result in 37% decrease in micro vascular and a 14% decrease in macro vascular complications (Stratton, Irene M et al., 2000).

In this study neuropathy was the most prevalent micro vascular complication followed by retinopathy and nephropathy. Keeping with this finding, Neuropathy was the highest reported micro vascular complication in in the multinational study, ranging from 25% in South Asia to 83% in Russia (Litwak, Leon et al., 2013). In contrast, diabetic retinopathy was the most prevalent micro vascular complication in the Sudanese study done by Awadalla et al. (Awadalla, Heitham et al., 2017), while nephropathy was the most prevalent one in Saudi population done by Alwakeel et al. (Alwakeel, Jamal S et al., 2008). The variation could be related to differences in the duration of diabetes and magnitude of glycemic control, as with in the same country you may have variable prevalence of diabetic neuropathy (Bansal, Dipika et al., 2014; Dutta A, Naorem S, Singh TP, and Wangjam K, 2005).

The prevalence of macrovascular complications were found to be high, but lower when compared with the prevalence of microvascular complications. Ischemic heart disease was the most prevalent macrovascular complications in this study followed by stroke. Same finding was reported by Alshaya, Abdulrahman Khaled, et al. in Northern Saudi Arabia (Alshaya, Abdulrahman Khaled, et al., 2017).

Obesity is a well-known risk factor for diabetes especially in high risk groups and in diabetes complications (Badran M and Laher I, 2011; Esteghamati, Alireza et al., 2009; Kilpi, Fanny et al., 2014; Ng, Shu Wen et al., 2011). In this study obesity was the most frequently encountered risk factor. Numerous Saudis are becoming more obese because of the inactive lifestyle and the accessibility of fast foods and this enhance the terrifying diabetes complications.

Hypertension as a comorbid disease was encountered in almost half of the participants in this study. Hypertension was the most frequently encountered comorbid in Northern Saudi population (Alshaya, Abdulrahman Khaled et al., 2017). In 2005–2008, high blood pressure was found in 67% of adult with reported diabetes in United States (Zhang, Xinzhi et al., 2010). The presence of hypertension in the diabetic patients enhances both micro and macro-vascular complication of diabetes (Tseng, Li-Nien et al., 2012). The International Diabetes Federation (IDF) and joint American Diabetes Association recommend a target HbA1c of <7.0% (Federation D, 2012; Inzucchi, Silvio E et al., 2015). However, most individuals with diabetes find it difficult to achieve the recommended target (Currie, Craig J et al., 2010; Saaddine, Jinan B et al., 2006; Saydah SH, Fradkin J and Cowie CC, 2004; Vaag A and Lund SS, 2012). In this study only 12% of the participants achieved the recommended HbA1c target. This may increase the likelihood of diabetes complications.

The current study has some limitations. First, causal relationship cannot be established as it is a cross sectional study. Second, missing values related to the disease characteristics and patterns of diabetes complications make it very hard to establish significant association between diabetes complications and diabetes characteristics. Third, the result of the study cannot be generalized, as the study was conducted in one province of Saudi Arabia. However the results of this study represented a foundation for more studying diabetes complications in Southern Regions of Saudi Arabia, including Jazan, and reflected the magnitude and patterns of diabetes complications among patients with type 2 diabetes.

5. CONCLUSION

Neuropathy was the most prevalent micro vascular complication. Hypertension and obesity were very significant predictors of diabetes complications. Minority of participants achieved the recommended HbA1c target. More large population and prospective studies are needed to reduce the burden of diabetes complications.

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Authors' contributions

The authors proclaim that this work was done by the authors named in this article and all responsibilities concerning to claims relating to the content of this article will be borne by them.

Ethics approval and consent to participate

Ethics approval was obtained from the Jazan University Ethical Committee (NO. 1808). Permission was taken from the head of the diabetic Center to work on the medical records. As the study pertaining document medical records only, individual consent is not applicable in this study.

Consent for publication

Consent for publication was obtained from the research methodology committee (CLC431) at family and community medicine department, Jazan University.

Availability of data and materials

The confidentiality was maintained and the data was collected for scientific purposes. The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interests

The Authors declare that there is no conflict of interest.

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