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PREVALENCE OF CARDIOVASCULAR RISK FACTORS; OBESITY, HYPERTENSION, DYSLIPIDEMIA AND PHYSICAL INACTIVITY AMONG TYPE 2 SAUDI DIABETIC PATIENTS.

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ABSTRACT

Purpose: To estimate the prevalence and determinants of cardiovascular risk factors among diabetic patients in Qassim, Saudi Arabia. **Methods:** This cross sectional study was performed in 2017 and evaluated diabetic patients. Data were collected on patient demographics including marital status, education and occupation, history of hypertension and hyperlipidemia. Data were collected on body mass index (BMI) blood pressure, lipid levels and HbA1c levels from their last primary healthcare center visit. Physical activity (PA) levels were measured using self-administered International Physical Activity questionnaire. The prevalence of hypertension (based on history, physical assessment) and risk factors were evaluated for an association. Hypertension was defined as a systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. **Results:** The study sample was comprised of 395 diabetic adults. The prevalence of hypertension was 51.6% (95% CI, 46.7 - 56.6). 25.1% of diabetics were overweight. The prevalence of obesity was 65.6%, hyperlipidemia was 78.2% and uncontrolled diabetes was 63.8%. Seventy five (19%) diabetics engaged in moderate grade of PA. Illiterate and school graduates (*P*=0.08), married individuals (*P*=0.03) had a higher risk of hypertension. There were 150 (39%) diabetics with systolic hypertension and 25 (6.5%) with diastolic blood pressure. BMI (P = 0.46), hyperlipidemia (P = 0.06), hyperglycemia (P = 0.2) and PA (P = 0.26) were not correlated to the hypertension. **Conclusions:** A large proportion of adult diabetics have hypertension and cardiovascular risk factors. Public health strategies urgently required for addressing these ailments, improve PA and prevent a further increase in the burden of disease.

KEYWORDS: Diabetes, Hypertension, Hyperglycemia, Obesity, Physical inactivity.

INTRODUCTION

Chronic life style related diseases are a global priority and member countries of United Nations have endorsed initiatives to address these diseases.[1,2] Physical inactivity and unhealthy food habits are main factors responsible for increasing the burden of obesity, diabetes and hypertension.[3] Prevalence of these diseases is high in the Gulf countries and MEANA region of the Middle East.[4,5]

The prevalence of hypertension, diabetes and obesity in adults and children have been evaluated in Saudi Arabia.[6,7,8] In the Qassim region, a Primary Health Center (PHC) based prevalence study was performed in 2001.[9] The prevalence of hypertension was 30% in this study. In 2016, Sheikh et al[10] reported 58% of school children in Qassim were obese. To the best of our knowledge, current magnitude and determinants of cardiovascular risk factors among adult residents in Qassim has not been published. Qassim is an administrative area in the central Saudi Arabia with a population of 1,387,996. (Mid 2016).[11] With city and many governorates, the study area has both an urban and semi-urban population.

In this study, we present the prevalence and determinants of cardiovascular risk factors among diabetic patients in the Qassim region of Saudi Arabia.

METHODS

The research committee of the primary health center of the National Guard in Qassim approved this study. Adult diabetics registered at randomly selected healthcare institutions were invited to participate in 2017. Patients who agreed to participate, were included in the study. A written informed consent was required from all study subjects. This study adhered to the tenens of the declaration of Helsinki.

We assumed that the prevalence of hypertension among the adult Saudi population was 47%.[6] To achieve 95% confidence interval (CI) and 5% acceptable margin of error, at least 383 randomly selected diabetic patients were required.

Seven family physicians were the field investigators for this study. Data were collected on patient age, gender, educational level, marital status, current occupation, history of hypertension, history of diabetes and other ailments or medications. The blood pressure (BP) was measured in sitting position using a digital sphygmomanometer. The measurements were repeated twice and the mean value was documented. The average systolic and diastolic blood pressure (in mmHg) were noted for each patient. If the patient was taking medications for hypertension, he/she was classified as hypertensive irrespective of BP readings. Hypertension was defined as systolic pressure ≥140 mmHg and/or diastolic BP ≥ 90 mmHg.[13,14]

The height and weight measured within the last month at the clinic was used as the index for calculating the body mass index (BMI) of each participant. The formula for calculation BMI was:
BMI = weight in Kg/ height (in meter^2)

BMI was further graded as normal (18.5-24.9 Kg/M^2), overweight (25 to 29.9 Kg/M^2), obese (30 to 39.9 kg/M^2) and extremely obese (>40 Kg/M^2). The HbA1c test report was used to define glycemic control. If HbA1c was greater than 7%, it was defined as poorly controlled diabetes.

A self-administered International Physical Activity questionnaire was used to determine the level of physical activity (PA) of the participant.[15,16] The Microsoft XL IPAQ spreadsheet was used to automatically calculate the metabolic equivalent (MET) and three grades of PA; mild (<600 MET), moderate (600 to 3000 MET) and high (>3000 MET).

The data were recorded in and Excel spreadsheet (Microsoft Corp., Redmond, WA, USA) and transferred to Statistical Package for the Social Sciences (SPSS – 25) (IBM Corp., Armonk, NY USA). The frequency and percentage proportions were calculated for qualitative variables. If the data were normally distributed, the mean and standard deviation was calculated. If the distribution of data was non-normal, the median and 25% quartile was calculated. The hypertension status was associated to other factors using Odd's ratio (OR), its 95% CI and two sided *P* value. *P* values < 0.05 were considered statistically significant. The hypertension was correlated to BMI, age, etc. by estimating the difference of mean, its 95% CI and two sided *P* values.

RESULTS

The study sample was comprised of 395 adult diabetic patients. Their mean age was 55.1 ± 10.7 years. There were 59.7% females, 51.9% illiterates, 86.8% married, 57% housewives and 26.8% retired individuals.

Two hundred and four diabetics were undergoing management for hypertension. The prevalence of hypertension was 51.6% (95% CI 46.7 - 56.6). Among them, 150 (39%) diabetics had systolic hypertension and 25 (6.5%) had diastolic hypertension. None of the hypertensives were detected for the first time when BP was measured for this research study.

There were 309 participants with dyslipidemia. The prevalence of dyslipidemia was 78.2% (95% CI 74.1 - 82.3). The mean serum cholesterol level was 4.44 ±1.0 mmol/dl and the mean serum Low Density Lipid (LDL) was 2.8±1.8 mmol/dl.

The presence of hypertension was correlated to patient demographics and other cardiovascular risk factors. **Table: 1.** Marriage was significantly associated to hypertension among diabetics. No other cardiovascular risk factors were associated to hypertension.

Table: 1 Demography, cardiovascular risk factors and hypertension among adult Saudi diabetic patients.

		Hypertension		OR (95% CI)	Validation
		Yes	No		
Gender	**Male** **Female**	**85** **119**	**71** **117**	**1.2 (0.8 – 1.8)**	***P* = 0.4**
Education	Illiterate/school College/higher education	170 64	120 29	0.64 (0.4 – 1.1)	*P* = 0.08
Occupation	Unemployed Employed Housewife Retired	1 14 71 116	2 39 35 109	χ^2 = 3.0 Df = 4	*P* = 0.08
Marital status	Married Unmarried/ other	171 171	28 13	0.5 (0.2 – 0.9)	*P* = 0.03
Obesity	No Yes Missing	19 182 3	13 173 2	0.7 (0.35 – 1.5)	*P* = 0.4
Glycemic control	Adequate (≤7%) Poor (>7%) Missing	68 133 3	66 118 4	0.9 (0.6 – 1.4)	*P* = 0.7
Physical activity	Low Moderate High	165 39 0	154 34 0	0.9 (0.6 – 1.6)	P = 0.8

OR denotes odd ratio; CI denotes confidence interval; Df denotes degrees of freedom; χ^2 denotes Chi-square; P<0.05 is statistically signficant.

There were 358 diabetics with BMI > 25 kg/$M^{2.}$ Among these individuals, 99 (25.1%) diabetics were overweight. The prevalence of obesity was 65.6%; 223 (56.5%) were obese and 36 (9.1%) were extremely obese. The glycemic control was poor in 252 (63.8%) diabetics. **(Figure: 1).**

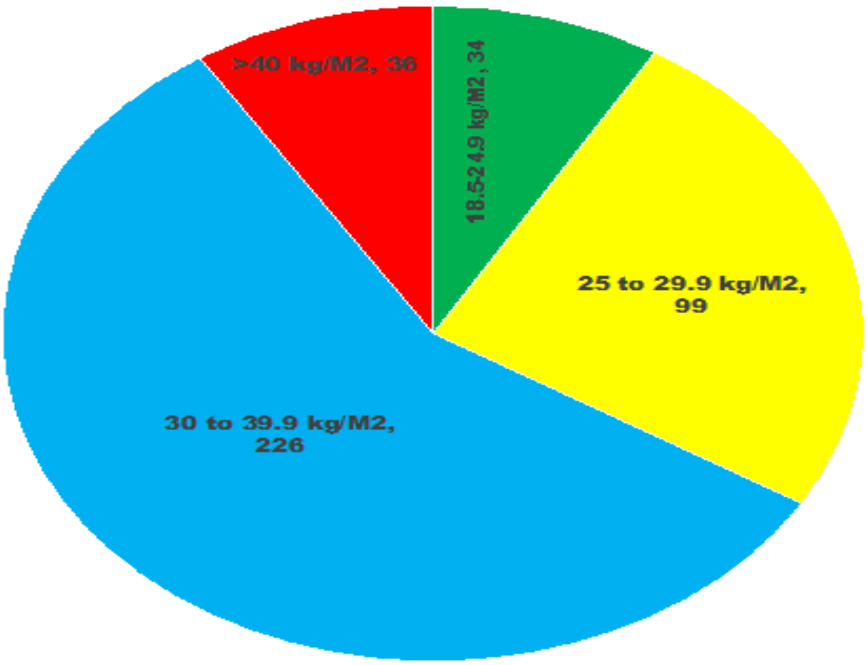

Figure: 1 Distribution of body mass index grades among persons with diabetes.
18.5-24.9 Kg/M^2 = normal; 25 to 29.9 Kg/M^2 = overweight; 30 to 39.9 Kg/M^2 = obese; 40 and more = extreme obese.

The grades of PA suggested that 75 (19%) of participants had moderate PA while 320 (81%) diabetic had low PA. None of them had high PA grade. Among 75 diabetic with moderate grade of PA, 40 were hypertensive while 166 had hypertension among 320 diabetic with low PA. Hypertension was not associated to the grade of PA (P = 0.78), hyperlipidemia (P = 0.87) and grades of obesity (P = 0.38).

DISCUSSION

The outcomes of the current study indicated that half of the diabetic patients had hypertension as a comorbidity and all of them were detected and managed through existing health services. The presence of hypertension was not associated to other cardiovascular risk factors such as obesity, glycemic control, dyslipidemia, gender, age and level of PA among adult Saudi diabetics in Qassim. In this study, the high prevalence of all cardiovascular risk factors among diabetics could be the underlying cause of the lack of association of risk factors.

Public health personnel should note the very high prevalence of different cardiovascular risk factors such as hypertension, obesity, poor glycemic control, low level of physical activity, hyperlipidemia among diabetics. If these risk factors are not addressed, diabetes related complications could result in substantial mortality and morbidity in the study area.

The 57% prevalence of hypertension among diabetics in our study is significantly higher than 32.6% reported in the adult Saudi population of central KSA by Al Dighri et al.[6] Their cohort was aged 7 to 80 and nearly two-thirds were non-diabetic. Hypertension was noted in 55.1% of adult Saudi population by Ahmed et al.[8] This difference between our study and the previous studies could be due varying ages and the study area of the sample population.

Hypertension did not differ by gender in the current study. A study in southern Saudi Arabia of adolescent participants reported that males had a higher risk of hypertension.[17] Greater stress among adolescent males for job and family support could cause greater hypertension in males compared to female diabetics. It may be possible that males in study area are less prone to stress and hypertension.

Both Hypertension and obesity rates were high in the study area. However, the presence of obesity was not significantly associated to hypertension. In a study, Sousa et al[18] noted significantly more obesity among hypertensive diabetics compared to non-hypertensive

diabetics. Further studies are recommended to review the relationship of obesity and hypertension.

Higher rates of hypertension and obesity is linked to physical inactivity.[19] Since the overall amount of physical activity done by all diabetics with and without hypertension in our study was lower, we did not find an association of PA to hypertension, obesity and hyperlipidemia. An adequate sample and suitable study design could help in evaluating cardiovascular risk.

Hypertension was significantly lower in married diabetics. A US study also reported this association.[20] Proper care to abide strict diet protocols and timely medications for hypertensives and diabetes seems to be better among married diabetics than individuals who are unmarried or divorced.

There are some limitations to this study. As this is a cross-sectional study, a causal association should be interpreted with caution. The study was performed at primary health center and may not represent the profile of asymptomatic and early diabetics who can be identified through a community-based survey.

All the cardiovascular risk factors among diabetics were of higher among Saudi diabetics from semirural areas. A comprehensive approach to address hypertension, hyperlipidemia and poor glycemic control is urgently needed in Qassim. The existing health services were able to detect hypertension among diabetics implying that the work up of diabetics at health centers is conducted in a comprehensive manner along with documentation of blood pressure. Strict adherence of preventive and therapeutic measures to address hypertension, obesity, hyperlipidemia and poorly controlled diabetes are recommended for adult diabetics in this region of Saudi Arabia.

Conflict of Interest

The author declared no conflict of interests.

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