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Cardiovascular Diseases and Diabetes Mellitus in Saudi Arabia

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Abstract

Introduction: Availability of figures about the risk of cardiovascular diseases (CVDs) could guide the planning and conduction of specific preventive programs that targeting the CVDs among diabetic patients in Saudi Arabia. Thus, this study aimed to assess the risk cardiovascular diseases in diabetic patients among population in Saudi Arabia..

Methods: This is an analytical cross-sectional observational study design conducted in people attending primary health care (PHC), in Najran city. The cases and controls were subjected to clinical examination and laboratory investigations to identify occurrence of the study outcomes including CVDs, diabetic nephropathy and retinopathy. Cases and controls was examined to ensure that both groups are comparable in regards to main demographical variables such as age and sex.

Results: The non-adjusted odds ratio of the association between CVDs and diabetes mellitus was 11.5 (P value= 0.001). The findings of logistic regression showed that diabetes mellitus and smoking were significant independent predictors for occurrence of CVDs, while age, gender, nationality, and BMI were not significant predictors for CVDs.

Conclusions: This study concluded that the diabetic patients in Saudi Arabia are at a higher risk of CVDs than that in non-diabetic persons. Hypertension and dyslipidemia were important risk factors of CVDs among diabetic patients, while gender, age, and nationality showed non-significant effect. The diabetes mellitus and smoking were considered as significant independent predictors for occurrence of CVDs.

Keywords: Diabetes Mellitus, Ischemic Heart Diseases, Myocardial Infarction, Hypertension, Saudi

Introduction

Diabetes mellitus is associated with a higher risk of ischemic heart diseases (CVDs). There is a growing evidence of a higher incidence of hypertension among diabetic patients [5]. Heart diseases are the underlying causes of death in the majority of patients with NIDDM [5, 6]. The age-adjusted risk ratio of death among NIDDM was found to be triple that in the general population [5, 7]. The high level of serum cholesterol and hypertension are shared risk factor between CVDs and NIDDM [4, 8]. The lipid-lowering treatment was found to reduce the risk of CVDs in patients with NIDDM [2]. Thus, an estimation of the risk of CVDs in diabetic patients could help in planning for reduction of the complications and risk of death among those patients.

Diabetes mellitus is a syndrome of metabolic disorders presented with chronic hyperglycemia as a result of absolute or relative insulin deficiency [1]. Diabetes mellitus has a large impact on the community and affects about 5% to 10% of the adult population world widely [2]. According to the estimations of International Diabetes Federation (IDF), there were 151 million diabetic patients in 2000. In addition, IDF calculated a projection for 2025 year. The number of diabetes is predicted to be 334 million patients in 2025, with an increase of 221% from 2000 [3]. The major contribution of this epidemic trend, particularly in NIDDM, is attributed to the shifting towards a sedentary life style that characterized by under active with overeating behavior [4].

In Saudi Arabia, several epidemiological surveys with different results have estimated the prevalence of diabetes mellitus. The prevalence of diabetes mellitus was ranged from 8.5 - 34.1% in men and 19.5 - 27.6% in women with the mean age of onset was 57.5 years old [9, 10]. The age-adjusted prevalence of NIDDM was 31.6% and also the prevalence of NIDDM was significantly higher in men than in women [11]. This discrepancy in the prevalence rates of diabetes mellitus could be attributed to the different methods and areas in which the prevalence was assessed. The obesity was significantly higher among Saudi diabetic

patients in comparison to non-diabetic persons [12], which put the diabetic patients at a higher risk of CVDs in Saudi Arabia. The age-adjusted prevalence of hypertension and CVDs in Saudi community were 32.6% and 6.9% respectively, which could be considered as high prevalence rates in such young community [11].

There is no previous study aimed to assess the risk of CVDs in diabetic patients in Saudi Arabia, although such study could provide an estimation of the magnitude of risk of CVDs risk in diabetic patients. Availability of figures about the risk of CVDs could guide the planning and conduction of specific preventive programs that targeting the CVDs among diabetic patients in Saudi Arabia. Thus, this study aimed to assess the risk of CVDs in diabetic patients among community in Saudi Arabia.

Methods

This is an analytical cross-sectional observational study design conducted in people attending primary health care (PHC), in Najran city. The cases and controls were subjected to clinical examination and laboratory investigations to identify occurrence of the study outcomes including CVDs, diabetic nephropathy and retinopathy. Cases and controls was examined to ensure that both groups are comparable in regards to main demographical variables such as age and sex.

The frequency and percentages were shown in the frequency distribution tables as descriptive statistics. Odds ratios were used to disrobe difference in the risk of CVDs between diabetic and non-diabetic groups. The numerical variables were described by mean and standard deviations. Inferential statistics such as chi-square were used to identify the significant differences between groups. The logistic regression was used to adjust for confounding effect of other risk factors on the association between diabetes mellitus and CVDs. P value less than 0.05 indicated significant difference. The statistical analysis was performed with Statistical Package for Social Science (SPSS) version 26.

Results

This study included total of 104 study participants, of them 39 were diabetic patients and 65 were controls with a ratio of (1 case: 1.7 controls). About half of study participants were males and the majority of the study participants were above 60 years old. Approximately 41% of them were Saudi and only 3.8% were smokers. There were no significant differences between cases and controls regarding background variables (table 1).

Concerning risk factors of CVDs among diabetic patients, only hypertension and dyslipidemia showed significant effect on the risk of CVDs. While, other risk factors such as gender, age, nationality, and smoking showed no such significant differences (table 2). In regards to the main outcome of this study, the prevalence of CVDs was significantly higher in diabetic than in non-diabetic group, where 53.8% of the diabetic group had CVDs in comparison to only 9.2% of non-diabetic group (P value = 0.000).

In regards to the prevalence of hypertension, about 36% of the diabetic patients were moderately hypertensive in comparison to only 6.1% among controls. The majority of non-diabetic persons (90.8%) have only mild hypertensive in comparison to only 60.3% of diabetic patients. These differences were statistically significant with P value = (0.001). The occurrence of retinopathy was significantly higher among diabetics than among non-diabetic group (53.8% and 16.9% respectively). The dyslipidemia and level of uric acid showed no significant differences between diabetic and non-diabetic groups (table 3).

The non-adjusted odds ratio of the association between CVDs and diabetes mellitus was 11.5 (P value= 0.000). The findings of logistic regression showed that diabetes mellitus and smoking were significant independent predictors for occurrence of CVDs, while age, gender, nationality, and BMI were not significant predictors for CVDs. In addition, the logistic regression was used to adjust for age, sex, nationality, and smoking behavior, thus the adjusted odds ratio was calculated to be 14.6.

Table (1): Distribution of background variables among groups of the study

Background variable		Diabetic group		Non-diabetic group		P value
		n	(%)	n	(%)	
Gender	Male	15	38.5%	35	53.8%	0.128
	Female	24	61.5%	30	46.2%	
Age group	< 60 years old	28	71.8%	58	89.2%	0.23
	≥ 60 years old	11	28.2%	7	10.8%	
Smoking	Yes	1	2.6%	3	4.6%	0.598
	No	38	97.4%	62	95.4%	
Nationality	Saudi	21	53.8%	22	33.8%	0.052
	Non-Saudi	18	46.2%	43	66.2%	

Discussion

This study aimed to assess the risk of CVDs in Saudi diabetic patients as one entity, without any differentiation of the exact type of CVDs, while most of the studies in the literature studied specific CVDs such as myocardial infarction, atherosclerosis, or coronary artery diseases in NIDDM.

In a prospective study conducted by Koskinen et al., the incidence of myocardial infarction (MI) in patients with NIDDM was significantly higher than other study participants, which is consistent with the present study [13]. They found an incidence proportion of myocardial infarction 7.4% in diabetic group vs. 3.3% in non-diabetic group. In the present study, the percentage of all CVDs was 53.8% in diabetic group vs. 9.2% of non-diabetic group. This reflected the fact of different measures used in the study of Koskinen et al., since they used incidence rate, which is expected to be lower than percentage or prevalence rate. In addition, Koskinen et al. estimate only the risk of MI,

Table (2): Distribution of risk factors of CVDs in diabetic group

Risk factors		Occurrence of CVDs		P value
		n	%	
Gender	Male	8	53.3%	0.959
	Female	13	54.2%	
Age group	< 60 years old	13	46.4%	0.138
	≥ 60 years old	8	72.7%	
Smoking	Yes	1	100%	0.348
	No	20	52.6%	
Nationality	Saudi	12	57.1%	0.656
	Non-Saudi	9	50.0%	
HTN	Mild	6	25%	0.000
	Moderate	14	100%	
	Severe	1	100%	
Dyslipidemia	Yes	8	80.0%	0.045
	No	13	44.8%	

while the present study estimate the risk of all CVDs. Consistent results found by a population-based study that carried out by Haffner et al. They found the incidence of MI significantly higher in diabetic subjects rather than non-diabetic subjects with or without prior MI attacks [5]. Another study found a 17% prevalence of silent myocardial ischemia in undiagnosed diabetic males, which regarded as an alarming figure for the high risk of CVDs in undiagnosed diabetic patients [14].

In this study, the findings of logistic regression showed that diabetes mellitus and smoking were significant independent predictors for occurrence of CVDs. A study conducted by Koskinen et al. found similar significant results for diabetes and smoking and also for age and level of cholesterol [13]. In regards to the effect of gender in risk of CVDS among

diabetic patients, the present study found no such effect, while many other studies found diabetic women more affected by CVDs than men [15, 16]. However, Kleinman et al. justified this gender difference by A comparison that was conducted between diabetic women and non-diabetic men, which yield a spurious association between CVDs and female gender [17].

In another hand, this is in disagreement with the findings of another study where the incidence of MI was lower among women than among men, especially in the first 5 years of diagnosis of diabetes mellitus [18].

In the present study, only hypertension and dyslipidemia showed significant differences as risk factors influencing occurrence of CVDs, while other risk factors such as gender, age, nationality, and smoking showed no such significant differences. A similar results found by Turner et al., where dyslipidemia, hypertension, and also smoking were significant risk factors for coronary artery disease [19]. In the present study, the smokers showed higher risk of CVDs, however it was not statistically significant because of sample size issues (only four smokers found in the present study). In the literature, there are contradicting results regarding risk factors of CVDs. Dyslipidemia found to be a risk factor of CVDs in [20] and [21] studies, while other studies disagree with these results [22] and [23]. Additionally, Hypertension was considered a risk factor by [23] and [24], while regarded as not a risk factor in [22] and another study of [25].

The limitations of this study included the numbers of diabetic and non-diabetic subjects were small, which affect the statistical power of this study. The cross sectional approach would not allow for calculation for relative ratios, only odds ratios could be calculated in this study. The diagnosis of diabetes mellitus depended on hospital records without differentiation between type1 and type 2 diabetes mellitus.

Conclusions

This study concluded that the diabetic patients in Saudi Arabia are at a higher risk of CVDs than that in non-diabetic persons. Hypertension and dyslipidemia were important risk factors of CVDs among diabetic

patients, while gender, age, and nationality showed non-significant effect. The diabetes mellitus and smoking were considered as significant independent predictors for occurrence of CVDs.

Conflict of interests

The authors declared no conflict of interests.

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Table (3): Distribution of diabetic complications among groups of the study

Background variable		Diabetic group		Non-diabetic group		P value
		Frequency	(%)	Frequency	(%)	
HTN	Mild	24	61.5%	59	90.8%	0.001
	Moderate	14	35.9%	4	6.1%	
	Severe	1	2.6%	2	3.1%	
Dyslipidemia	Yes	10	25.6%	21	32.3%	0.427
	No	29	74.4%	44	67.7%	
Retinopathy	Yes	21	53.8%	11	16.9%	0.002
	Normal	18	46.2%	54	83.1%	
Uric Acid	High	4	10.3%	6	9.2%	0.846
	Normal	35	89.7%	59	90.8%	
CVDs	Yes	21	53.8%	6	9.2%	0.000
	No	18	46.2%	59	90.8%	

