

Original Article

Risk Factors for Coronary Heart Disease among Diabetic Patients

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ABSTRACT

Objective: To assess the prevalence of risk factors for coronary heart disease (CHD) and to calculate a 10-year CHD risk among diabetic patients in Kuwait.

Design: Cross-sectional study.

Setting: Fahaheel Specialty Clinic, Ahmadi Health District, Kuwait.

Subjects and Methods: Two hundred adult diabetic patients of either sex (type 2) were included in the study. Data was collected on patients' demographic background and different clinical investigations.

Main Outcome Measures: The calculated Framingham global risk estimate of a 10-year risk of CHD.

Results: The data showed a high prevalence of multiple

risk factors for CHD among diabetic patients. Among men 28% had low risk for CHD ($\leq 10\%$ 10-year risk), 29% had moderate risk for CHD (between a 10 and 20% 10 year risk), and 45% had high risk for CHD (greater than 20% 10 year risk). Forty percent of women had low risk, 33% had moderate risk and 27% had high risk for CHD.

Conclusions: Multiple risk factors for CHD are prevalent among the studied patients with type 2 diabetes. This illustrates the need for more in-depth research on this subject. It is also an imperative that primary health care for diabetic patients in Kuwait involves an increased awareness on how to mitigate such common risk factors for CHD.

KEY WORDS: coronary heart disease, diabetes, risk factors

INTRODUCTION

Coronary heart disease (CHD) is one of the leading causes of death. According to the World Health Organization, in 2002, there were 7.22 millions deaths from CHD globally^[1]. It predicts 11.1 million deaths from CHD in 2020^[2]. Diabetes mellitus (DM) is well-established as one of the strongest risk factors for CHD^[3]. Though an association between these two diseases was recognized as early as the late 1800s, CHD was an infrequent cause of death in diabetic patients in the pre-insulin era. Since 1922, mortality rates from infections, gangrene, and coma have fallen with consequent proportional rise in vascular diseases^[4].

Obesity is a strong risk factor for CHD^[5]. It has been shown to be a major health problem and it is associated with many conditions such as DM, CHD, gall bladder disease, hypertension, osteoarthritis and cancer^[6]. The majority of type 2 diabetic patients are overweight and the prevalence of diabetes is increasing in parallel with that of obesity^[7]. Both hypertension and diabetes are common conditions and the prevalence of hypertension is higher in

diabetic subjects than in those without diabetes^[8]. Both high cholesterol and high triglycerides levels are common in DM^[9,10].

Both type 1 diabetes and type 2 diabetes increased the risk for CHD^[11,12]. Type 2 diabetes is of a particular concern since it is so common and usually occurs in individuals of advancing age, when multiple other risk factors co-exist^[13]. An estimated 150 million people have type 2 diabetes globally. This figure is expected to double by 2025^[14].

A study has shown that cigarette smoking is a risk factor for hypertension and smokers have a five fold increased risk of hypertensive crisis^[15]. Cigarette smoking also has been shown to affect lipid levels by lowering HDL cholesterol and raising LDL and triglycerides levels. In addition, nicotine stimulates the release of epinephrine, which can make hypertension more difficult to control^[16].

Researchers found that the prevalence rate of DM in Kuwait was 15% in 1997^[2]. It was found in 41% of the total hospital patients in Kuwait^[17]. A recent study has shown an increased prevalence of obesity^[18] and it was found to be the most common

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Appendix 1: CHD risk prediction sheet for women

Step 1			Step 4		Step 7	
Age (Years)	Points		Diabetes	Points	(determine CHD risk from point total)	
30-34	-9		No	0	Point Total	10 year CHD Risk
35-39	-4		Yes	4		
40-44	0				≤-2	1%
45-49	3				-1	2%
50-54	6		Step 5		0	2%
55-59	7		Smoker	Points	1	2%
60-64	8		No	0	2	3%
65-69	8		Yes	2	3	3%
70-74	8				4	4%
Step 2			Step 6 (sum steps 1-5)		5	4%
Total Cholesterol			Adding up the points		6	5%
(mg/dl)	(mmol/l)	Points	Age	----	7	6%
< 160	≤ 4.14	-2	Total Cholesterol	----	8	7%
160-199	4.15-5.17	0	Blood Pressure	----	9	8%
200-239	5.18-6.21	1	Diabetes	----	10	10%
240-279	6.22-7.24	1	Smoker	----	11	11%
≥ 280	≥ 7.25	3	Point Total	----	12	13%
Step 3					13	15%
Blood Pressure					14	18%
Systolic			Diastolic		15	20%
(mmHg)	<80	80-84	85-89	90-99	16	24%
< 120	-3 pts				17	≥27%
120-129		0 pts				
130-139			2 pts			
140-159				3 pts		
≥ 160				0 pts		

Appendix 2: CHD risk prediction sheet for men

Step 1			Step 4		Step 7	
Age (Years)	Points		Diabetes	Points	(determine CHD risk from point total)	
30-34	-1		No	0	Point Total	10 year CHD Risk
35-39	0		Yes	4		
40-44	1				≤-1	2%
45-49	2				0	3%
50-54	3		Step 5		1	3%
55-59	4		Smoker	Points	2	4%
60-64	5		No	0	3	5%
65-69	6		Yes	2	4	7%
70-74	7				5	8%
Step 2			Step 6 (sum steps 1-5)		6	10%
Total Cholesterol			Adding up the points		7	13%
(mg/dl)	(mmol/l)	Points	Age	----	8	16%
< 160	≤ 4.14	-3	Total cholesterol	----	9	20%
160-199	4.15-5.17	0	Blood pressure	----	10	25%
200-239	5.18-6.21	1	Diabetes	----	11	31%
240-279	6.22-7.24	2	Smoker	----	12	37%
≥ 280	≥ 7.25	3	Point Total	----	13	45%
Step 3					14	≥53%
Blood Pressure						
Systolic			Diastolic			
(mmHg)	<80	80-84	85-89	90-99		
< 120	0 pts					
120-129		0 pts				
130-139			1 pts			
140-159				2 pts		
≥ 160				3 pts		

risk factor among diabetic patients in Kuwait^[19]. A previous study showed that obesity and physical inactivity were documented in diabetic Kuwaiti adults^[20].

Various studies have been carried out in the United States, notably the Framingham heart study in Massachusetts to provide a simple way of classifying the overall risk level for CHD using a set of risk factors^[21,22]. The objectives of this cross-sectional study were to assess the prevalence of risk factors for CHD and to calculate a 10-year CHD risk among diabetic patients in Fahaheel area in Kuwait.

PATIENTS AND METHODS

Fahaheel Speciality Clinic provides health care to a total population of 63,487 in Kuwait. One of its services is to deliver health care to 16,000 registered diabetic patients in four diabetic clinics^[23]. Using the Framingham heart study as a base, a convenient sample of 200 type 2 diabetic patients participated in this study to assess and determine their risk levels for CHD in the next 10 years. All patients were aged 30-74 years and they were taking medication for diabetes. The patients were asked to answer a questionnaire after taking their consent. The Ethical Committee in the Ministry of Health had approved the study.

The questionnaire was designed to include the patients' demographic data and social habits

such as cigarette smoking and physical activity. It also included the treatment and control of type 2 diabetes, the date of first diagnosis and the date of the last admission for complications. Family history of type 2 diabetes in first degree relatives, side effects of drugs taken and other illnesses was also recorded.

Results of a thorough medical examination and measurements of weight and height were all recorded and body mass index (BMI) was calculated as kg/m². A series of biochemical measurements of serum cholesterol, serum triglycerides, serum creatinine, serum protein, urea, uric acid, albumin/globulin ratio, blood urea nitrogen and urine examination were all performed. In addition, a resting 12 lead ECG, chest X-ray and examination of the optic fundi were carried out.

Regarding the clinical investigations, BMI equal or above 25 was considered overweight or obese^[24]. The fasting values of the blood cholesterol exceeding 5.2 mmol/l, were considered high. Triglycerides levels above 2 mmol/l were considered high. Chest X-ray results were considered normal when no left ventricular hypertrophy (LVH) was seen. Eye investigations were considered normal when no retinopathy, cataract, and glaucoma were found. ECG results were considered normal when no LVH, ischemia, right bundle branch block (RBBB), supraventricular tachycardia, cardiomegaly, and atrioventricular block (AV block) were observed.

Table 1: General characteristics of diabetic patients

Variables	Men (n = 69)		Women (n = 131)		Total (n = 200)		p-value
	n	%	n	%	n	%	
Age (years)							
30 - 55	58	84.1	88	67.2	146	73.0	0.031
56 - 60	8	11.6	26	19.8	34	17.0	
> 60	3	4.3	17	13.0	20	10.0	
Family history of CHD							
No	38	55.1	49	37.4	87	43.5	0.017
Yes	31	44.9	82	62.8	113	56.5	
Physical activities							
No	2	2.9	84	64.1	86	57.0	0.00
Yes	67	97.1	47	35.9	114	43.0	
Smoking							
No	36	52.8	127	96.9	163	81.5	0.00
Yes	33	47.8	4	3.1	37	18.5	

p < 0.05 is significant

Table 4: Framingham Global Risk Estimate

Global Risk Estimate	Men (n = 69)		Women (n = 131)		p-value
	n	%	n	%	
Low (≤ 10%)	19	28	52	40	0.061
Moderate (10 - 20%)	20	29	43	33	
High (> 20%)	30	43	36	27	

p < 0.05 is significant

Finally, blood pressure was classified as optimal (when systolic < 120 mmHg and diastolic < 80 mmHg), normal (when systolic 120-129 mmHg or diastolic 80-84 mmHg), high normal (when systolic 130-139 mmHg or diastolic 85-89 mmHg), hypertension stage I (when systolic 140-159 mmHg or diastolic 90-99 mmHg), and hypertension stage II-IV (when systolic ≥ 160 or diastolic ≥ 100 mmHg)^[25].

Absolute 10 year CHD risk was calculated using the CHD risk prediction score sheet and the Framingham global risk estimate of 10 year risk for men and women (Appendices 1 and 2). This estimate was used for each participant to determine the probability of having a heart attack or dying of CHD during a 10 year period^[3].

Data analysis was performed using the SPSS data analysis system with chi-square test to demonstrate the significance of different variables.

RESULTS

Table 1 shows the general characteristics of diabetic patients. Out of the 200 diabetic patients, the majority, 131 (65.5%) were women and the remaining, 69 (34.5%) were men. The vast majority of men and women (84.1% and 67.2% respectively) were between 30-55 years of age. Presence of family history of CHD in first degree relative was recorded in more than half (113, 56.5%) of the total patients. The physical activity level was decreased among most women (64.1%). Smoking was recorded in

Table 2: Clinical investigations of diabetic patients

Variables	Men (N = 69)		Women (N = 131)		Total (N = 200)		p-value
	n	%	n	%	n	%	
BMI							
Low	29	42.1	9	6.9	146	19.0	0.000
High	40	57.9	122	93.1	34	81.0	
Chol							
Low	34	49.0	41	32.0	87	37.5	0.016
High	35	51.0	88	68.0	113	62.5	
TGL							
Low	48	71.0	62	50.0	86	57.6	0.007
High	20	29.0	61	50.0	114	42.4	
Chest X-rays							
Normal	67	97.0	109	83.0	163	88.0	0.988
Abnormal	2	3.0	22	17.0	37	12.0	
ECG							
Normal	52	75.0	68	52.0	163	60.0	0.004
Abnormal	17	25.0	63	48.0	37	40.0	
Eye complications							
No	62	90.0	84	64.0	163	73.0	0.004
Yes	7	10.0	47	36.0	37	27.0	

p < 0.05 is significant, Chol = cholesterol, TGL = triglycerides, BMI = body mass index

Table 3: Distribution of the study subjects according to gender and blood pressure

	Blood Pressure				p-value
	Systolic (mm Hg)	Diastolic (mm Hg)	Men (n = 69) n %	Women (n = 131) n %	
Normal (incl. optimal)	< 130	< 85	15 22	6 5	0.00
High normal	130-139	85-89	18 26	24 18	
Hypertension stage I	140-159	90-99	30 43	66 50	
Hypertension stage II-IV	≥ 160	≥ 100	6 9	35 27	

p < 0.05 is significant

only 37 (18.5 %) patients. Half of men (36, 52.2%) were smokers and only four (3.1%) women were smokers. Significant differences existed between men and women in age, family history of CHD, physical activities, and smoking (p < 0.05).

The results of the various clinical investigations are shown in Table 2. The vast majority (93.1%) of women were either overweight or obese. More than half (57.9%) of men were either overweight or obese. Cholesterol levels were recorded high in 68% women and 51% of men. High triglycerides levels were recorded in half of women (50%) and 29% in men. Abnormal chest X-rays were found in 3 and 17% men and women respectively. Forty eight percent women and 25% men showed abnormal findings in the electrocardiogram (ECG). Thirty six percent women and only 10% men showed abnormal eye complications. Significant differences in all clinical investigations except chest X-ray were observed between men and women (p < 0.05).

The distribution of patients according to gender and blood pressure is shown in Table 3. Because there were relatively few subjects at the higher

stages of hypertension, stages II, III, and IV were combined into a single category. Approximately half of the subjects for both men and women had blood pressure levels in the hypertension stage I category. Blood pressure was 22% for normal (including optimal), 26% for high normal, and 9% for stage II-IV hypertension among men. The corresponding values were 5% for normal (including optimal), 18% for high normal, and 27% for stage II-IV hypertension among women. A significant difference in blood pressure was observed between men and women ($p < 0.05$).

The Framingham global risk estimation for both men and women is shown in Table 4. Among the 69 men who participated, 19 (28%) had low risk, 20 (29%) had moderate risk and 30 (43%) had high risk for CHD. Fifty two women (40%) had low risk, 43 (33%) had moderate risk and 36 (27%) had high risk for CHD. However, no significant difference in global risk estimate existed between men and women ($p > 0.05$).

DISCUSSION

The objectives of this study were to assess the prevalence of risk factors for CHD and to calculate a 10-year CHD risk among diabetic patients in Fahaheel area in Kuwait. To our knowledge, our study is the first that used the Framingham heart study to calculate a 10-year CHD risk levels among diabetic patients in Kuwait. The results of this study suggested a high prevalence of multiple risk factors for CHD among diabetic patients namely obesity, physical inactivity, smoking, family history, and elevated levels of cholesterol and triglycerides. Previous literature also showed similar findings^[26].

Our study showed that the prevalence of obesity was high among these diabetic patients. This is consistent with several studies that reported the prevalence of obesity in Kuwait to be higher than reported figures in the world^[27]. Our study also showed that most women reported a decreased level of physical activity. This is supported by previous studies that showed obesity to be high in Kuwait, especially in women and it could be a reflection of the sedentary life style and modernization^[20, 26, 28].

Smoking was prevalent among half (52.2%) the men and only in 3.1% women. This finding is consistent with a similar study done in Kuwait that showed 0.5% of women to be smokers^[29]. Approximately half of the subjects for both men and women had blood pressure levels in the hypertension stage I category. This finding is consistent with similar study done in Kuwait which showed that hypertension was seen in approximately half of the diabetic men and women^[19].

We also found that in men risks of having a heart attack or dying of heart disease in the next

10-years were 28% (low), 29% (moderate), and 43% (high) respectively. Regarding women, risks of having a heart attack or dying of heart disease in the next 10 years was 40% (low), 33% (moderate) and finally 27% (high) respectively. Although this risk estimation for both men and women was calculated using CHD prediction score and the Framingham risk estimation it does not include all risk factors for CHD which may contribute greater risk than revealed from summation of the major risk factors^[22].

We believe that the primary health care physicians, nurses, and other health professionals play a vital role in reducing the risk of CHD. This could be achieved primarily by communicating these risks to patients. This, in turn may motivate them to improve awareness and management of CHD risk factors. Consequently, this would help in reducing their weight, lowering their cholesterol level, controlling their blood pressure, and encouraging them to quit smoking.

CONCLUSIONS

Our results suggest that the multiple risk factors for CHD are prevalent among patients with type 2 diabetes in Fahaheel area in Kuwait. These factors were obesity, family history of CHD, physical inactivity, high cholesterol and triglycerides levels. Our results from the Fahaheel Clinic should not be generalized for all of Kuwait. We suggest that further studies with large samples are needed to explore the prevalence of risk factors for CHD among diabetic patients in other public and private speciality clinics in Kuwait.

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