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Assessment of some risk factors for angiographically defined coronary artery disease in the Erbil Cardiac Center

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Abstract

Background and objective: There are many modifiable risk factors that are closely associated with coronary artery disease. The aim of this study was to assess the association between some coronary risk factors and the angiographically documented coronary artery disease.

Methods: This descriptive cross-sectional study was based on review of hospital records of 310 consecutive patients who underwent coronary angiography in Erbil Cardiac Center. A questionnaire was used to record patient's demographic profile, coronary risk factors and the severity of stenosis in percentage.

Results: Of the 310 patients, 69.4% had evidence of coronary artery disease on coronary angiography. Male gender, age, diabetes, and smoking habit were strongly associated with angiographically documented coronary artery disease, while the association of hypertension and family history were not statistically significant. Only male gender was strongly associated with severity of coronary artery disease.

Conclusion: The angiographic extent of coronary artery disease was found to have the strongest positive correlation with male gender and the weakest with hypertension. The most important predictive factors for coronary artery disease positivity were age, diabetes and smoking status. Hypertension and family history of premature coronary artery disease did not prove to be either a significant predictor of coronary artery disease at coronary angiography or an important determinant of coronary artery disease severity.

Keywords: Coronary Disease, Risk Factors, Angiography.

Introduction

Cardiovascular disease (CVD) is common in the general population, affecting the majority of adults after the age of 60 years. The prevalence of coronary artery disease (CAD), which could be manifested by myocardial infarction, angina pectoris, heart failure, and coronary death, is approximately one-third to one-half that of total CVD.[1] No other life-threatening disease is as prevalent or expensive to society, and persons with CVD are likely to die from their disease. Longevity has increased and age-specific death rates from CVD, CAD, and stroke have declined since 1975, although at a slower rate since 1990. The number of CVD deaths remains high.[2] Many of the important risk factors for CVD are modifiable by specific preventive measures. These include smoking, dyslipidemia, hypertension, diabetes, abdominal obesity, psychosocial factors, daily consumption of fruits and vegetables, regular alcohol consumption, and regular physical activity.[3] Atherosclerosis is responsible for almost all cases of CAD. This insidious process begins with fatty streaks that are first seen in adolescence; these lesions progress into plaques in early adulthood, and culminate in thrombotic occlusions and coronary events in middle age and later life.[3] A variety of factors, often acting in concert, are associated with an increased risk for atherosclerotic plaques in coronary arteries and other arterial beds.[4] Risk factor assessment is useful in adults to guide therapy for dyslipidemia, hypertension, and diabetes,

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and multivariate formulations can be used to help estimate risk for coronary disease events.[5,6] Based upon the absolute, relative, and attributable risks imposed by the various risk factors, concepts of "normal" have evolved from usual or average to more optimal values associated with long-term freedom from disease. As a result, optimal blood pressure, blood glucose, and lipid values have been revised downward in the past 20 years.[7-9] It has been asserted that approximately one-half of all patients suffering a CAD event have no established risk factors other than age and gender, a claim that has contributed to efforts to identify other markers of cardiovascular risk.[10,11] The accuracy of this assertion was tested in two retrospective analyses.[12-14] Cardiovascular disease is a major cause for mortality and morbidity in the world. The disease in Iraq is responsible for significant morbidity and mortality, and according to annual report of Ministry of Health at 2009 both the number of patients admitted and those visiting clinics for cardiovascular disease is increasing.[15] All risk factors, including family history, hypertension, tobacco abuse, age, sex and diabetes also have been found to be associated with an increased risk of coronary artery disease. Limited information is available concerning the predictive value of these variables and their relationship to angiographically defined coronary artery disease.[16-18] The purpose of this study was to determine the relationship between angiographically defined coronary artery disease and some of the known risk factors, and to determine the value of risk factors in predicting the presence of coronary artery disease in patients who undergo coronary angiography.

Methods

The study was conducted at the Erbil Cardiac Center located in Erbil City, Iraqi Kurdistan Region. This Cardiac Center was established in 2007 and receives around 25 patients daily for assessment of cardiovascular disease. It includes two fully equipped cath labs, where 5 to 10 diagnostic and interventional catheterization procedures are carried out by expert cardiologist on daily basis. The center receives patients from all parts of Iraq. This study was a descriptive cross-sectional study based on review of hospital records. The study was extended from mid February 2010 to June 2011.The study included 310 consecutive patients (male and female) who underwent cardiac catheterization for evaluation of suspected coronary artery disease from October 2008 to October 2010 in the Erbil Cardiac Center. Six independent variables were assessed including age, gender, hypertension (yes or no), smoking (current, past or never), diabetes (yes or no), and family history of CAD. This study included review of hospital records of 310 patients who were consecutively referred to our tertiary care medical center for angiographicevaluation of their typical or atypical clinical symptoms during Jun 2008 to December 2009. All patients underwent a diagnostic coronary angiography according to standard techniques. Before angiography, a detailed coronary risk profile was obtained for every patient. Those patients smoking at least one cigarette per day were defined as current smokers, whereas the 'ex-smokers' category included former smokers who had quit smoking for at least one year and the 'not smokers' category included those without any current or past history of smoking. Patients with mean blood pressure level greater or equal to 140/90 mmHg or those reported taking antihypertensive medications were classified as hypertensive.[19] The diagnosis of diabetes was established when the fasting plasma glucose levels were higher than 126 mg/dL or the patient reported receiving hypoglycemic treatment.[19] The family history for premature CAD was regarded positive, when the patient reported having a male first-degree relative with an acute coronary event before the age of 55 years

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or a female first-degree relative with a coronary manifestation before the age of 65.[18] As the data on patient's height, weight and lipid profile were not complete or not reliable, obesity and dyslipidemia were not included in the results as risk factors of CAD. In Cardiac Center, coronary angiography is usually performed by the Judkins or Sones technique. Multiple views of the right and left coronary arteries are recorded. The presence and severity of coronary artery disease is determined by consensusopinion of two experienced interventional cardiologists to ensure reliability of the findings. The coronary circulation is divided into 29 segments and the degree of stenosis is coded for each segment. Angiograms were assessed independently by experienced interventional cardiologists. Normal vessels/mild CAD was defined as <50% stenosis in all epicardial vessels. Significant CAD was defined as angiographic atherosclerotic involvement of more than 50% in at least one major coronary artery or its major branches.[18] The severity of CAD was assessed from the number of involved coronary vessels with significant luminal obstructions. Based on specific angiographic findings, patients were divided into two distinct groups, CAD positive and CAD negative groups, and the CAD positive group were sub classified into severe, or obstructive (two or more vessels diseased or more than 70 % luminal narrowing) and non severe or non-obstructive groups. To identify risk factors associated with the presence, severity and extent of coronary artery disease discovered at angiography, comparison was made between those with significant CAD and those without significant coronary artery disease (i.e., the presence of any segment with > 70% stenosis of the luminal diameter).

Statistical analysis

Data analysis was made through the statistical package for the social sciences (version 15). Data were reported as means±SD, or proportions as appropriate. Comparison between categorical variables was performed by using contingency tables and chi square test. Logistic regression analysis was made for controlling for potential confounders where the factors found to be significantly associated with positive CAD were entered to the logistic regression model. The difference was considered significant when P-value ≤0.05. The study proposal was approved by the scientific committee at the College of Medicine of Hawler Medical University. The approval of the Cardiac Center was also obtained for accessing the patients' records

Results

Of the 310 patient who referred for coronary angiography for the possibility of having coronary artery disease, 175 (56.5%) were male and 135 (43.5%) were female. Their age±SD was 57.9±11.2; 63.8±9.3 for male patients and 52.3.7±9.7 for female patients. Details of participants' socio-demographic characteristics and presence of risk factor for CAD are showed in Table 1.

Table 1: Details of the participants' socio-demographic characteristics and presence of risk factor for CAD

Characteristic	No.	(%)
Gender		
Male	175	56.5
Female	135	43.5
Age group		
<50	71	22.9
50-59	105	33.9
60-69	86	27.7
>70	48	15.5
Employment status		
Employed	49	15.8
Self-employed	126	40.6
Retired	20	6.5
Housewife	115	37.1
Risk factors for CAD*		
Hypertension	193	62.3
Ex-smoker[a]	43	13.9
Current smoker	43	13.9
DM**	43	13.9
Family history of CAD	79	25.5

[a] Patients who had quit smoking for at least one year
* Coronary artery disease
** Diabetes mellitus

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Of the 310 patients, 215 (69.4%) had evidence of CAD on coronary angiography, and 95 (30.6%) had normal coronary angiography. Of the 215 patients who had positive coronary angiography, 180(83.7%) had obstructive CAD while 35(16.3%) had non-obstructive CAD. The final decision following coronary angiography according to background risk factors, comorbidities and angiographic results were to offer no treatment for 37 (11.9%) patients, 98 (31.6%) patients were advised to continue on medical treatment (included those beyond intervention), 105 (33.9%) patients were candidate for percutaneous transluminal coronary angioplasty (PTCI), and 70 (22.6%) patients were referred for coronary artery bypass grafting (CABG) (Table 2). Positive coronary angiography was more common among males (84.6%) than females (49.6%). This difference was statistically significant (P <0.001). Positive coronary angiography was also statistically significant higher among smokers (93%) and ex-smokers (86.0%) than non-smokers (61.6%), P <0.001 and among patient with diabetes (85.2%) than non-diabetics (63.1%), P <0.001. Positive coronary angiography results were highest among age group 60-69 years old (81.4%) followed by 70 years and older group (77.1%), 50-59 years old group (71.4%) and below 50 years old group (46.5%). These differences were statistically significant (P<0.001). There was no statically significant difference between hypertensive and non-hypertensive patients and between those having family history of coronary health disease and those not having family history. The details of the association between coronary angiographic results and different risk factors are shown in Table 3.

Table 2: Details of the disease characteristics of the study sample.

Disease characteristic	No.	(%)
Result of coronary angiography		
Normal	95	30.6
Positive catheterization	215	69.4
Obstructed CAD	180	83.7
Non-Obstructed	35	16.3
Final decision		
No treatment	37	11.9
Continue treatment	98	31.6
Candidate for PCI	105	33.9
Referred for CABG	70	22.6

Table 3: Association between coronary angiographic results and different risk factors.

Characteristic	Result of Catheterization						
	Normal (n=95)		Positive (n=215)		Total		
	No.	(%)	No.	(%)	No.	(%)	P
Gender							
Male	27	15.4	148	84.6	175	100.0	<0.001
Female	68	50.4	67	49.6	135	100.0	
Hypertension							
No	41	35.0	76	65.0	117	100.0	0.191
Yes	54	28.0	139	72.0	193	100.0	
Smoking							
Not smoker	86	38.4	138	61.6	224	100.0	
Ex-smoker	6	14.0	37	86.0	43	100.0	<0.001
Current smoker	3	7.0	40	93.0	43	100.0	
Diabetes mellitus							
No	82	36.9	140	63.1	222	100.0	<0.001
Yes	13	14.8	75	85.2	88	100.0	
Family History							
No	71	30.7	160	69.3	231	100.0	0.953
Yes	24	30.4	55	69.6	79	100.0	
Age group							
<50	38	53.5	33	46.5	71	100.0	
50 – 59	30	28.6	75	71.4	105	100.0	<0.001
60 – 69	16	18.6	70	81.4	86	100.0	
70+	11	22.9	37	77.1	48	100.0	

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Of the 215 patients who had CAD on angiography, obstructive type was more common among male patients (89.2%) than females (71.6%) with a statistically significant difference (P <0.001. The association between severity of CAD on coronary angiography and other risk factors were not statistically significant as the details are shown in Table 4. Logistic regression analysis showed high predictive value for positive coronary angiography in male gender (OR=6.361), current smokers (OR=7.614), diabetic patients (OR=4.216) and the elder patients. The details of these associations are shown in Table 5.

Table 4: Association between severity of CAD at angiography and different risk factor.

Characteristic	Severity of disease						
	Non-obstructive (n=35)		obstructive (n=180)		Total		
	No.	(%)	No.	(%)	No.	(%)	p
Gender							
Female	19	28.4	48	71.6	67	100.0	0.001
Male	16	10.8	132	89.2	148	100.0	
Hypertension							
No	13	17.1	63	82.9	76	100.0	0.808
Yes	22	15.8	117	84.2	139	100.0	
Smoking							
Not smoker	27	19.6	111	80.4	138	100.0	
Ex-smoker	2	5.4	35	94.6	37	100.0	0.114
Current smoker	6	15.0	34	85.0	40	100.0	
Diabetes Mellitus							
No	24	17.1	116	82.9	140	100.0	0.639
Yes	11	14.7	64	85.3	75	100.0	
Family History							
No	25	15.6	135	84.4	160	100.0	0.658
Yes	10	18.2	45	81.8	55	100.0	
Age group							
<50	4	12.1	29	87.9	33	100.0	
50 – 59	13	17.3	62	82.7	75	100.0	0.692
60 – 69	10	14.3	60	85.7	70	100.0	
70+	8	21.6	29	78.4	37	100.0	

Table 5: Logistics regression for the coronary angiography and different risk factors.

Characteristic	OR	95% CI		P
Gender				
Female	Reference			
Male	6.361	3.305	12.244	<0.001
Smoking				
Not smoker	Reference			
Ex-smoker	2.242	0.775	6.487	0.136
Current smoker	7.614	2.011	28.829	0.003
Diabetes mellitus				
No	Reference			
Yes	4.216	2.011	8.836	<0.001
Age group				
<50	Reference			
50 – 59	4.740	2.143	10.486	<0.001
60 – 69	7.989	3.290	19.396	<0.001
70+	7.030	2.619	18.871	<0.001

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Discussion

Male gender, age, diabetes, and smoking habit were strongly associated with angiographically documented CAD. Hypertension has been found to be an important risk factor for the development and prognosis of coronary artery disease. The fact that hypertension does not seem to discriminate at the angiographic level in this and other studies[19] may be due to the weakness of the measure used, that is, a history of the presence or absence of hypertension. If we could measure the total impact in terms of the duration and degree of elevation of the blood pressure, the presence of hypertension might well be found to be more significant. In our study, being a male was the only risk factor associated significantly with severity of coronary artery disease. According to logistic regression analysis and in order of decreasing frequency age (OR=7.989), smoking habit (OR=7.614), male gender (OR=6.361) and diabetes (OR=4.216) have the highest predictive value for positive coronary angiography. According to this analysis that the risk in ex-smoker (OR=2.242) were not significant which should encourage smokers at risk to quit smoking. In our study, the angiographic extent of CAD was found to have the strongest positive correlation with male gender and the weakest with hypertension. In terms of CAD positivity, the most important predictive factor was smoking status. According to our findings, the CVD risk factor profile of catheterized patients is associated with coronary angiographic findings in a selective way. Furthermore, large-scale angiographic studies are required to delineate the clinical implications of such an association between clinical and angiographic features in the primary care setting. In the current study, we reported a high prevalence of hypertension, as well as a considerable prevalence of angiographically demonstrated coronary artery disease. This finding should definitely raise major concerns in terms of preventive cardiology effectiveness. The current study assessed the independent potential of every single risk factor to predict the angiographic extent of CAD and derived the following order of decreasing significance: age, smoking, male gender, diabetes, and hypertension. In an additional angiographic study, Ning et al suggested that advanced coronary damage were more likely in patients with older age,[20] confirming the significant association of age with angiographic CAD severity. An Australian study that enrolled 594 participants similarly reported male as a significant predictor of CAD severity. However, it also has shown other significant predictors including diabetes, lifetime smoking dose, ratio of total cholesterol-to-HDL-C, lipoprotein (a), age, positive family history, and hypertension.[21] In both studies, hypertension correlated weakly with the number of affected coronary arteries. Moreover, in our study, diabetes was a relatively poor predictor in terms of angiographic CAD severity, compared with other established risk factors. Contrary to our findings, Saleem et al revealed a positive linear correlation of glycosylated hemoglobin and diabetes duration with Gensini score in patients admitted with acute myocardial infarction.[22] In the same direction, Zornitzki et al concluded that diabetes was strongly associated with the extent of coronary angiographic findings in women undergoing diagnostic coronary angiography.[23] Additional information for risk assessment in patients with CAD can be provided by novel markers and proper lipid profile that serve as complementary predictors of atherosclerotic burden.[24] Numerous studies have investigated the potential use of emerging adjunctive biomarkers such as adiponectin, lipoprotein (a), tumor necrosis factor-a and interleukin 6, urinary 8-isoprostane levels, C-reactive protein, and other inflammatory markers. Biochemical data on these new markers were not available in our study. We basically evaluated the risk factors of established prognostic value of CAD, and

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this does not necessarily eliminate the clinical significance of our findings because several studies have indicated that novel biomarkers are not superior but only complementary to established risk factors.[25] Potentially confounding variables, such as physical activity level and socioeconomic factors, were not readily available. The lack of a detailed quantitative severity assessment tool is an additional limitation of our study. However, the number of vessels diseased is a widely recognized severity index that reflects the anatomic extent of coronary stenosis and is best suitable for our study with 310 participants. In fact, our main interest was the established risk factors that have proven to be of greater predictive value for adverse cardiovascular outcomes, compared with the emerging risk markers. However, important risk factors like obesity and dyslipidemia could not be studied due to lack of complete data on these factors in the patients' records. The relatively small sample size is another important limitation of this study and this could be attributed to inability to establish association between well known major risk factors and CAD and its severity. Reliability of hospital records in Iraqi context is another issue of concern. These records are usually not complete and in many instances not correct. Therefore, future similar studies in Iraqi context should rely more on prospective studies with collecting data from patients directly.

Conclusion

The angiographic extent of CAD was found to have the strongest positive correlation with male gender and the weakest with hypertension. In terms of CAD positivity, the most important predictive factors were age and smoking status. Hypertension and family history of premature CAD did not prove to be either a significant predictor of CAD at coronary angiography or an important determinant of CAD severity. According to our findings, the CVD risk factor profile of catheterized patients is associated with coronary angiographic findings in a selective way. Large-scale angiographic studies are recommended to delineate the clinical implications of such an association between clinical and angiographic features in the primary care setting. Institute counselling and educational methods are recommended to encourage people to reduce their risks for developing heart disease.

Conflicts of interest

The authors report no conflicts of interest.

References

1.Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, et al. Heart disease and stroke statistics - 2011 update: a report from the American Heart Association. Circulation 2011;123:e18-209.
2. Berry JD, Dyer A, Cai X, Garside DB, Ning H, Thomas A, et al. Lifetime risks of cardiovascular disease. N Engl J Med 2012; 366:321.
3. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364:937-52.
4. Wilson PW. Established risk factors and coronary artery disease: The Framingham Study. Am J Hypertens 1994; 7:7S-12S.
5. Wilson PWF, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB, et al. Prediction of coronary heart disease using risk factor categories. Circulation 1998; 97:1837.
6. Ridker, PM. Evaluating novel cardiovascular risk factors: Can we better predict heart attacks? Ann Intern Med 1999; 130:933-7.
7. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third report of the National Cholesterol Education Program (NCEP) Expert Panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). Circulation 2002; 106:3143-421.
8. Chobanian AV, Bakris GL, Black HR, Cushman WC. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report. JAMA 2003; 289:2560-72.
9. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet 1998; 352:837-53.

10. Hennekens CH. Increasing burden of cardiovascular disease: current knowledge and future directions for research on risk factors. Circulation 1998; 97:1095-102.
11. Canto JG, Iskandrian AE. Major risk factors for cardiovascular disease: debunking the "only 50%" myth. JAMA 2003; 290:947-9.
12. Greenland P, Knoll MD, Stamler J, Neaton JD, Dyer AR, Garside DB, et al. Major risk factors as antecedents of fatal and nonfatal coronary heart disease events. JAMA 2003; 290:891-7.
13. Khot UN, Khot MB, Bajzer CT, Sapp SK, Ohman EM, Brener SJ, et al. Prevalence of conventional risk factors in patients with coronary heart disease. JAMA 2003; 290:898-904.
14. Gregg EW, Cheng YJ, Cadwell BL, Imperatore G, Williams DE, Flegal KM, et al. Secular trends in cardiovascular disease risk factors according to body mass index in US adults. JAMA 2005; 293:1868-74.
15. Ministry of Health. Annual report. Iraq: Ministry of Health; 2009.
16. Libby P. The Vascular Biology of Atherosclerosis. In:Libby P P, Bonow RO, Mann DL, Zipes DP, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 8th ed. Philadelphia: Saunder Elsevier; 2008. P. 985-1000.
17. Davidson CJ, Bonow RO. Cardiac catheterisation. In: Libby P P, Bonow RO, Mann DL, Zipes DP, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 8th ed. Philadelphia: Saunder Elsevier; 2008. P. 439-62.
18. Poma JJ. Coronary Arteriography & Cardiovascular Imaging. In:Libby PP, Bonow RO, Mann DL, Zipes DP, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 8th ed. Philadelphia: Saunder Elsevier; 2008. P. 465-508.
19. Anderson AJ, Barboriak JJ, Rimm AA: Risk factors andangiographically determined coronary occlusion. Am JEpidemiol 1978; 107(1):8-14.
20. Ning XH, Xiang XP, Lu N, Zhang YX, Wang WJ, Liu Y, et al. Relation of risk factors to coronaryartery stenosis severity in coronary atherosclerotic heartdisease. Zhonghua Yi XueZaZhi 2008; 88 (18):1267-9.
21. Wang XL, Tam C, McCredie RM, Wilcken DE. Determinants ofseverity of coronary artery disease in Australian men and women.Circulation 1994; 89 (5):1974-81.
22. Saleem T, Mohammad KH, Abdel-Fattah MM, Abbasi AH. Associationof glycosylated haemoglobin level and diabetes mellitusduration with the severity of coronary artery disease. DiabVascDis Res 2008; 5(3):184-9.
23. Zornitzki T, Ayzenberg O, Gandelman G, Vered S, Yaskil E, Faraggi D, et al. Diabetes, but notthe metabolic syndrome, predicts the severity and extent of coronaryartery disease in women. QJM 2007; 100(9):575-81.
24. O'Callaghan PA, Fitzgerald A, Fogarty J, Gaffney P, Hanbidge M, Boran G, et al. New and old cardiovascularrisk factors: C-reactive protein, homocysteine, cysteine and von Willebrand factor increase risk, especially insmokers. Eur J Cardiovasc Prev Rehabil 2005; 12(6):542-7.
25. Peer A, Falkensammer G, Alber H, Kroiss A, Griesmacher A, Ulmer H,et al. Limited utilities of N-terminal pro B-type natriuretic peptide (NT-proBNP) and othernewer risk markers compared with traditional risk factors forprediction of significant angiographic lesions in stable coronaryartery disease. Heart 2009; 95(4): 297-303.