Association of Cardiovascular Risk Factors and Coronary Artery Lesion Among Coronary Artery Disease Patients

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ABSTRACT

Background

Coronary artery disease (CAD) is associated with the numbers of risk factors causing coronary atherosclerosis. Coronary artery stenosis is mostly caused by coronary atherosclerosis.

Objective

This study aims to analyze the association between coronary artery stenosis and cardiovascular risk factors.

Methods

An observational study was conducted among CAD patients. The diagnostic coronary angiogram was performed from femoral approach using standard catheters and techniques to find out any abnormalities.

Result

A total 73 patients (44 male and 29 female) with coronary artery disease undergoing diagnostic coronary angiography was included with the documented cardiovascular risk factors. The coronary stenosis was found in 40 patients on the basis of stenosis grading. Among the established cardiovascular risk factors, sex, diabetes mellitus and smokers show are significantly associated with coronary stenosis among CAD patients. The present study shows the significant association of coronary stenosis among male CAD patients (OR 2.47; CI 0.94 – 6.48, p <0.05) and similar association has been observed in diabetes mellitus (OR 3.32; CI 1.12 – 9.84, p <0.05) and smoking (OR 4.10; CI 1.45 – 11.61, p <0.01).

Conclusion

The prevalence of CAD is increased with numbers of presence of cardiovascular risk factors. Male gender, diabetes mellitus and smoking are significantly associated with coronary stenosis among CAD patients. However, hypertension and dyslipidemia are comparable between coronary stenosis and no significant stenosis group.

KEY WORDS

Acute coronary syndrome, coronary angiography, coronary artery disease, stable angina

INTRODUCTION

One of the leading causes of death, the Coronary Artery Disease (CAD) is increasing globally.[1] Each year, approximately 3.8 million men and 3.4 million women die from CAD.[2] Most of the low-income countries are experiencing increasing trends of Coronary Artery Diseases.[3] The predominant Cardiovascular Disease (CVD) cause of disability-adjusted life years (DALYs) lost in South Asia is Ischemic Heart Disease (IHD) and also responsible for over 50% of CVD burden by 2010.[4] The CVD DALYs has increased by 10-20% in last 2 decades in Nepal.

The prevalence of CAD in Nepal is found to be 5.7%.[5] The number of cardiovascular diseases is increasing in major hospitals in Nepal. CAD has become one of the leading cause of morbidity and mortality. This can be accounted to the fact that the risk factors of CAD, i.e., smoking, hypertension, diabetes mellitus, dyslipidemia and obesity, have been increasing rapidly. The prevalence of hypertension in urban population is 29%, smoking 31%, diabetes mellitus 19%, metabolic syndrome is 22.5%.[6,7,8]

The predicted >30% risk of 10-year fatal and nonfatal cardiovascular events according to total risk factors: age, high blood pressure, high plasma glucose, high cholesterol, smoking is 2.6% population of more than 40 years whereas 10 - 20% in 9.5% population and less than 10% in 87.2% population in Nepal.[9]

Coronary artery disease burden is associated with the numbers of risk factors causing coronary atherosclerosis. High low density lipo-protein (LDL), smoking, hypertension, diabetes mellitus, advance ages are established independent causes of atherosclerosis. The extent of raised fatty streaks – transitional or intermediate lesion is associated with the major established risk factors for coronary artery disease, and these risk factor effects appear in the mid-teens, whereas the effects of the risk factors on raised lesions do not appear until >25 years of age.[10] Diabetes is significantly correlated with multi-vessel, multi-lesion, extensive disease of coronary arteries.[11,12]

This study aims to analyze the associations of established cardiovascular risk factors with coronary artery stenosis.

METHOD

An observational study was conducted at Dhulikhel Hospital, Kathmandu University Hospital from April 2012 to May 2014 after obtaining ethical approval from institutional review committee of Kathmandu University School of Medical Sciences. A total 73 patients (44 male and 29 female) with coronary artery disease undergoing diagnostic coronary angiography was the subject of an observational study that were selected among 101 angiography and interventions done in Dhulikhel Hospital. The rest of the cases were excluded because they were undergone peripheral vessels angiography and coronary interventions of critical coronary lesions. Coronary angiography was performed using Integris Phillips H5000S, Phillips Medical System (Figure 1). All coronary angiographic studies were performed from femoral approach using standard catheters and techniques. Each coronary artery was selectively viewed in at least two projections. Two separate observers analyzed the reports, imaging views and documents independently.
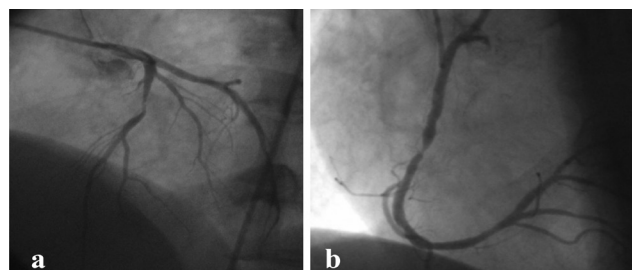

Figure 1. Coronary Stenosis in (a) left anterior descending (LAD) and (b) right coronary artery (RCA).

Grading of Stenosis was done as per the following criteria:

0 Normal	Absence of plaque and no luminal stenosis
1 Minimal	Plaque with <25% stenosis
2 Mild	25% - 49% stenosis
3 Moderate	50% - 69% stenosis
4 Severe	70% - 99% stenosis
5 Occluded	

Coronary artery disease was defined as stenosis of a coronary artery equal or more than 50%. Based on coronary artery stenosis, CAD was classified as single-, double-, or triple- vessel disease.

Patients were evaluated with clinical data of outpatient cards. Diabetes mellitus was confirmed as glycated hemoglobin (HbAIc) >6.5% or fasting plasma glucose more than 126 mg% or established diabetics who are on anti-diabetic treatment. All the hypertensive patients were diagnosed clinically and on antihypertensive medications. Dyslipidemia were confirmed with abnormal total cholesterol, LDL levels.

A software package SPSS version 16 was used to analyze the data. Data presented as numbers with percentage, odds ratio (OR), confidence-interval (CI) and mean ± standard deviation (SD) where applicable. The statistical significance of individual risk factors was analyzed by the chi-square test and Pearson correlation coefficient. P<0.05 considered statistically significant.

RESULT

A total 73 patients (44 male and 29 female) with coronary artery disease undergoing diagnostic coronary angiography was included in the present study. The mean age of study population is 59.4±10.1. The number of patients undergoing

coronary angiographies is higher with advancing ages among which more than half of the patients are male (60.3%; Table 1). Nearly two-third (65.8%) patients, who were included for coronary angiograms, are diagnosed as stable angina after evaluation (Table 1).

Table 1. Distribution of Sex, Age and Diagnosis.

Sex (n=73)	No. of patiant	Percentage
Male	44	60.3
Female	29	39.7
Age (n=73)		
Less than 50	14	19.2
50-69	47	64.3
More than 70	12	16.5
Diagnosis prior to Coronary Angiograms (n=73)		
Stable Angina	48	65.8
Acute Coronary Syndrome	25	34.2

Thirty-three patients have no significant coronary artery stenosis in coronary angiogram according to stenosis grading. Coronary angiograms show coronary artery stenosis in 40 patients, of which 18 patients have single vessel disease and rest have more than single vessel disease. Number of right coronary artery (RCA) stenosis is higher than left anterior descending (LAD) and left circumflex (LCx) arteries.

Among the established cardiovascular risk factors, hypertension is present in 75.3 % of study subjects, which is followed by dyslipidemia, smoking and diabetes mellitus (Table 2).

Table 2. Risk Factors of CAD among the patients who underwent coronary angiography.

Risk Factors	Number	Percentage
Hypertension	55	75.3
Dyslipidemia	40	54.8
Smoking	28	38.4
Diabetes Mellitus	23	31.5

Male has more coronary stenosis than female patients (OR 2.47; CI 0.94 – 6.48, p <0.05). Our result shows the significant relation between Diabetes mellitus and coronary stenosis (Table 3). Similarly, the present study also revealed a strong

Table 3. Cardiovascular Risk factors and coronary stenosis.

	No significant coronary stenosis (n=33)	Significant coronary stenosis (n=40)	OR	95% CI	P-value
Male	16	28	2.47	0.94–6.48	<0.05
Hypertension	24	31	1.29	0.44–3.75	0.4
Diabetes Mellitus	6	17	3.32	1.12–9.84	<0.05
Dyslipidemia	17	23	1.27	0.50–3.22	0.6
Smoking	7	21	4.10	1.45–11.61	<0.01

association between smoking and coronary stenosis (Table 3). This suggests diabetes mellitus and smoking as major cardiovascular risk factors. Patients having diabetes mellitus and smoking are found to have more than 50% coronary stenosis in coronary angiogram. However, hypertension and dyslipidemia are comparable among significant and non-significant coronary stenosis groups. Acute coronary syndrome (ACS) has more significant coronary stenosis.

DISCUSSION

Coronary artery disease presents with ACS and stable angina. The underlying pathology of CAD is due to atherosclerosis in majority of the case.[10,13] However, the process of atherosclerosis may vary between patients. The atherosclerotic lesion typically classified as fatty streak (fatty plaques), responsible for coronary artery disease, is significantly associated with cardiovascular risk factors - total cholesterol, smoking, hypertension and glycohemoglobin.[10,13] The number of established cardiovascular risk factors can predict the coronary artery events, as higher the risk factors higher the prediction rate.

In the present study, the greater number of coronary artery diseases is associated with the advancing age (80%) and male (60%, OR 2.47; CI 0.94 – 6.48, p <0.05) population is found to have higher association. On other hand, as diabetes mellitus, hypertension, dyslipidemia and smoking are considered to be the cardiovascular risk factors,[10-13] the current study has analyzed those cardiovascular risk factorsto see the association with significant coronary artery stenosis. Our study shows the significant association (OR 3.32, CI 1.12 – 9.84, p <0.05) between diabetes mellitus and coronary artery stenosis. In agreement with our findings, other studies have also shown that diabetes mellitus is strong predictor of complex and multiple coronary lesions.[11,12,14] In addition, glycemic control plays the pivotal role in the presence and extents of CAD in diabetic and other high CVD risk groups.[15]

Hypertension is one of the major risk factors and the prevalence of hypertension is 28.9% among adult population of Dhulikhel.[10,11] Further, hypertension has been shown the increasing trends with advancing age.[16] Hypertension is often presented in out-patient without CAD. This study shows that hypertension is comparable between both groups of significant and non-significant coronary artery stenosis. Although hypertension is one of the established independent risk factors of coronary artery disease,[10,11] the present study did not show the association between hypertension and coronary artery diseases. In contrary to our finding, it has been found that hypertension was associated with severe grade lesion.[17] This discrepancy may be due to the coronary angiography performed in those hypertensive patients without having CAD to evaluate any chest discomfort. In addition, other study has shown no difference between diabetic CAD and non-CAD group.[18]

The high LDL and low HDL areconsidered to be major key player in the development of coronary atherosclerosis though,[19,20,21] the present study revealed no association between dyslipidemia and coronary stenosis (p = 0.6). This discrepancy may be due to the limited size of the study population and is mono-centered. However, some studies have shown a strong association of high LDL and low HDL in severity of lesion though,[12,14] normoglycemic individuals had no differences between with CAD and without CAD.[18] Smoking is considered to be one of the major risk factors in CAD[22,23] and the present study has also revealed the significant relation of smoking with coronary stenosis (OR 4.10; CI 1.45 − 11.61, p <0.01), which is also supported from previous studies.[22,23]

Overall, the progression of CAD is commonly observed with history of stable angina, progression in acute presentations of acute coronary syndrome (ACS) usually evolves from a previously insignificant rather than a previously significant stenosis.[14] Our study showed that 84% of ACS had significant coronary stenosis whereas only 40% had stable angina. Previous study has shown an association of ACS with more severe stenosis than stable angina.[15]

CONCLUSION

The present study has tried to determine the association between various cardiovascular risk factors and coronary stenosis. We found that the coronary artery disease is increased with numbers of presence of CVD risk factors. In our study, male, diabetics and smokers are significantly associated with coronary stenosis among CAD patients. However, hypertension and dyslipidemia are comparable between coronary stenosis and no significant stenosis group. The study sample is relatively small size. Most of the patients were from outpatients therefore there is possibility of sample bias. Several parameters such as body mass index (BMI), family history of CAD was not limited. Studies with larger sample size including evaluation of other risk factors are recommended.

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