Coronary artery disease and its predictors in a tertiary hospital, Bangladesh

Md. Anayet Ullah[a], Shirajul Islam[b], Mahbuba Khanum[b], Md. Golam Rabbani[c]

Abstract

Background: Coronary artery disease (CAD) poses a massive challenge globally. CAD is also a major health problem and the most common cause of premature morbidity and mortality in Bangladesh. In the global combat against CAD, Bangladesh is a country 'missing in action. **Objective:** To determine the status of coronary artery disease and its predictors of the patients performed successfully coronary angiogram (CAG) in the Cardiac Unit, Rajshahi Medical College Hospital, Bangladesh. **Methods:** This was a descriptive cross-sectional study conducted at Cardiac Unit of Rajshahi Medical College Hospital, Bangladesh. Total 400 patients, who successfully completed CAG in Cath Lab of Rajshahi Medical College, were selected in this study. Data were collected by pretested structured Patient Record (PR) Card by interview of the patients and from their respective coronary angiogram (CAG) reports in their treatment files. This PR card was designed to record patient's socio-demographic status, life style, history of systemic diseases and the angiographic findings. Chi-square test was applied to find out the association between the coronary artery disease, and the socio-demographic characteristics, life style and history of systemic disease of the patients. Multiple logistic regression was applied to identify the predictors of CAD. **Results:** Out of 400 study subjects, 275 (69%) patients had coronary artery disease. Of the total 275 patients who had CAD, more than 80% had single artery disease. Hypertension {odds ratio (OR): 8.11(95% CI 3.57 – 18.38)}, tobacco consumption {OR: 3.36 (95% CI 1.85 – 6.09)}, diabetes mellitus {OR: 3.10 (95% CI 1.61 – 5.97)} and higher monthly family income{OR: 2.82 (95% CI 1.55 – 5.11)} were identified as important predictors of CAD. **Conclusion:** Clinicians should consider hypertension, diabetes Melitus and tobacco consumption to predict the risk of CAD during patient selection for angiogram for improvement of precision. Existing health education program regarding screening and treatment of high blood pressure and diabetes mellitus, and avoidance to tobacco consumption should be promoted for the prevention and control of CAD at the individual and community level.

Key words: coronary artery diesase, predictors, Bangladesh.

[a]Department of Community Medicine, Barind Medical College, Rajshahi, Bangladesh.

[b]Department of Cardiology, Rajshahi Medical College, Rajshahi, Bangladesh.

[c]Department of Medicine, Barind Medical College, Rajshahi, Bangladesh.

Correspondence to :
M A Ullah
md.anayet_u@yahoo.com

Introduction

Coronary artery disease (CAD) is the narrowing or blockage of the coronary arteries by more than 50% of the diameter usually caused by atherosclerosis. Atherosclerosis is a chronic condition that narrows arteries by building fat-filled bulges in the arterial walls.[1] As atherosclerosis progresses, fibers begin to grow into and around the fatty layers of atheroma, causing the blockage to harden and turn into a plaque (pronounced plak). The enlarging plaque (above) increases the encroachment into the inner channel of the coronary artery. When the channel is reduced by more than 50% (of the diameter) the artery may become obstructed enough to decrease blood flow to the heart muscle during times of increased need (exercise, emotional stress, etc.).[2]

Coronary artery disease (CAD) posseses a massive challenge globally.[3,4] It is the cause of 25-30% of deaths in developed countries. The WHO has drawn attention to the fact that CAD is our modern epidemic.[4]

Epidemics of CAD began at different times in different countries. In USA, epidemics began in the early 1920[5], in Britain in the 1030s[6], in several European countries, still later. And now the developing countries are catching up. For example, in Singapore, the standardized death rate from CAD doubled in last 20 years. Similar trends have been noted in some other developing countries, specially South Asian countries e.g. Malaysia, Mauritius, India, Bangladesh and Sri Lanka.[7,8] Where the coronary artery disease rates four times higher than any other race. Since the 1950's, physicians and scientists have observed that South Asians have a significantly higher incidence of coronary artery disease.[5]

CAD is also a major health problem and the most common cause of premature morbidity and mortality in Bangladesh.[9] In a study by Mahmood et al (2008) in a private consultation practice at Daka, 14% of the referred patients were related to the heart and circulatory system.[10] Bangladesh has the highest rate of urbanisation and population density in South Asia, and is facing the worst threats of climate change globally. Factors associated with such extraordinary circumstances may have influenced the population's massive shift in epidemiology towards increased CVD. Equally, it could be linked to suboptimal nutrition, widespread environmental contaminants such as arsenic in ground water and plants, or

specific vulnerabilities in the genetic or metabolic make-up that have yet to be discovered. In the late 1990s it was estimated that there would be a 100% increase in CVD across South Asia by 2020. But, in Bangladesh, there has already been a 3,500% increase. In the global combat against CVD, Bangladesh is a country 'missing in action'.[11]

Of all South Asian countries, Bangladesh probably has the highest rates of CVD and yet is the least studied.[11] This study attempted to determine the status of coronary artery blockage of the admitted patients in the Cardiac Unit, underwent coronary angiogram (CAG) and its association with their socio-demographic characteristics, life style and systemic dideases, which are very much essential for preventive measures at the individual and community level.

Materials and Methods

This was a descriptive cross-sectional study conducted at Cardiac Unit of Rajshahi Medical College Hospital, Bangladesh. The patients, who underwent coronary angiogram (CAG) and successfully completed the CAG, in this unit constituted the study population. Total 400 patients were selected consecutively in the cardiac unit from the date of starting the data collection. The purpose and procedure were fully explained to the targeted patients before requesting to be volunteers, if they agreed and signed in written consent form were included in this study. Data were collected by pretested structured Patient Record (PR) Card by interview of the patients and from their respective CAG reports in their treatment files. This PR card was designed to record patient's socio-demographic status, life style, history of systemic diseases and the angiographic findings. Data were analysed in the computer using SPSS for windows. Descriptive analytical techniques involving frequency distribution, computation of percentage etc were done. Chi-square test was applied to find out the association between the coronary artery disease, and the socio-demographic characteristics, life style and history of systemic disease of the patients. Multiple logistic regression modeling was used to identify the important predictors (socio-demographic characteristics, life style and history of systemic disease of the patients) of CAD among the study subjects.

Results:

Out of 400 patients who successfully completed coronary angiogram (CAG) in Cath Lab of Rajshahi Medical College, 275 (69%) patients had coronary artery disease (coronary artery blockage > 50%) and

the rest 125 (31%) patients had no CAD. Of the 400 patients, highest number of the patients, 154 (38.5%) had coronary artery blockage 71 – 95% and lowest number of the patients, 40 (10.0%) had coronary blockage 96 – 100% (Figure 1). Of the total 275 patients who had coronary artery disease, more than 80% had single artery disease. Left anterior descending (LAD) artery was blocked alone in case of 45.8 % (Table 1).
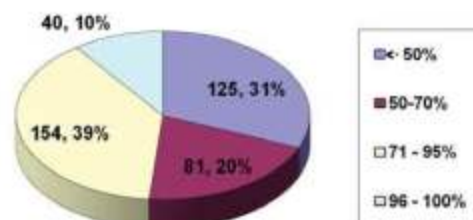

Figure 1 Distribution of the patients by the proportion of blockage of the coronary arteries

Of the total 400 patients, 285 (71.3%) patients complained of only chest pain and 53 (13.2%) patients complained of only respiratory distress during admission. Only 22 (5.5%) patients complained both chest pain and respiratory distress. Rest of the patients complained either chest pain or respiratory distress with palpitation or nausea (Table 2).

Table 1 Coronary artery disease and involvement of coronary arteries

Status of coronary artery disease	Coronary artery involved	FrequencyN (%)	
Single coronary artery disease	Left Anterior Descending (LAD) Artery	126 (45.8)	
	Right Coronary (RC) Artery	53 (19.3)	
	Circumflex (Circ) Artery	50 (18.2)	229 (83.3)
Double coronary artery disease	LAD and RC Artery	14 (5.1)	
	LAD and Circ Artery	10 (3.6)	28 (10.2)
	RC and Circ Artery	4 (1.5)	
Triple coronary artery disease	LAD, RC and Circ Artery	18 (6.5)	18 (6.5)
	Total	275 (100.0)	275 (100.0)

Table 2 Chief complaints of the patients during admission

Chief complaints	Frequency (N)	Percentage (%)
Chest pain	285	71.3
Respiratory distress	53	13.2
Chest pain with respiratory distress	22	5.5
Chest pain with palpitation	19	4.8
Respiratory distress with palpitation	17	4.2
Chest pain with nausea	02	0.5
Respiratory distress with nausea	02	0.5
Total	400	100.0

Age, gender, monthly family income, smoking habit, and history of hypertension and diabetes mellitus of the patients were identified as significant correlates of CAD (Table 3). History of hypertension was identified as the most important predictor of CAD. Hypertensive patients had a 8.11(95% CI 3.57 – 18.38) times greater chance to have CAD than the patients without hypertension. Other important predictors of CAD identified in this study were tobacco consumption {odds ratio (OR): 3.36 (95% CI 1.85 – 6.09)}, history of diabetes mellitus {OR: 3.10 (95% CI 1.61 – 5.97)} and higher monthly family income{OR: 2.82 (95% CI 1.55 – 5.11)} (Table 4).

Table 3 Factors associated with coronary artery disease. n = 400

Factors	Coronary artery disease status		p-value
	Stenosis ≥ 50% N (%)	Stenosis < 50% N (%)	
Age of the patients			
< 50 years (n=249)	158 (63.5)	91(36.5)	0.003
50 years or above (n=151)	117 (77.5)	34 (22.5)	
Gender			
Male (n=335)	238(71.0)	97 (29.0)	0.025
Female (n=65)	37 (56.9)	28 (43.1)	
Religion			
Islam (n=352)	243 (69.0)	109 (31.0)	0.161
Hindu (n=42)	30 (71.4)	12 (28.6)	
Christian (n= 6)	2 (33.3)	4 (66.7)	
Educational Status			
< SSC (n=329)	163 (71.2)	66 (28.8)	0.225
SSC or above (n=171)	112 (65.5)	59 (34.5)	
Monthly family income			
Up to Tk. 10000/- (n=94)	50 (53.2)	44 (46.8)	0.001
Tk. 10001/- to 20000/- (n=171)	126 (73.7)	45 (26.3)	
Above Tk. 20000/- (n=135)	99 (73.3)	36 (26.7)	
Smoking			
Non smoker (n=147)	81 (55.1)	66 (44.9)	0.000
Ex-smoker (n=118)	85 (72.0)	33 (28.0)	
Smoker (n=135)	109 (80.7)	26 (19.3)	
History of hypertension			
Present (n=93)	85 (91.4)	8 9 (8.6)	0.000
Absent (n=307)	190 (61.9)	117 (38.1)	
History of diabetes mellitus			
Present (n=80)	48 (78.8)	29 (21.2)	0.032
Absent (n=320)	227 (66.2)	96 (33.8)	

Chi-square test applied

Table 4 Multiple logistic regression analysis: Predictors of coronary artery disease. n = 400

Variables	Adjusted odds ratio [95% confidence interval (CI)]	p-value
Age		0.037
< 50 years (n=249)*	1.00	
50 years or above (n=151)	1.72 (1.03 - 2.89	
Gender		0.05
Male (n=335)	1.88 (1.00 – 3.54)	
Female (n=65)*	1.00	
Monthly family income		0.001
Up to Tk. 10000/- (n=94)*	1.00	
Tk. 10001/- to 20000/- (n=171)	2.82 (1.55 – 5.11)	0.001
Above Tk. 20000/- (n=135)	2.71 (1.45 – 5.08)	0.002
Habit of Smoking		0.000
Non smoker (n=147)*	1.00	
Ex-smoker (n=118)	1.85 (1.04 – 3.30)	0.036
Smoker (n=135)	3.36 (1.85 – 6.09)	0.000
History of hypertension		0.000
Present (n=93)	8.11 (3.57 – 18.38)	
Absent (n=307)*	1.00	
History of diabetes mellitus		0.001
Present (n=80)	3.10 (1.61 – 5.97)	
Absent (n=320)*	1.00	

*Reference group

Discussion

Sixty nine percent of the patients who successfully completed CAG in Cath Lab of Rajshahi Medical College, having coronary artery blockage. It reflects the satisfactory precision of existing referral system in Cardiac Unit of Rajshahi Medical College for angiogram, but there is a space of improvement.

In a study of Brscic et al.(2000)[12] in America, 57% of CAD patients had single artery blockage. In Bangladesh, Patwary et al. (2008) [9] found 72.73% of acute myocardial infarction patients in National Institute of Cardiovascular Diseases (NICVD), Dhaka had single artery blockage. In the present study it was also more than 80%. Previous studies[9,12] suggests that in CAD, most frequently involve artery is LAD. It is consistent with the finding of present study.

Angina is the most common clinical presentation of CAD, which is often referred to as chest pain due to stimulation of nerve endings near the endocardium by factors such as adenosine, lactate, and H^+.[13] In the present study also more than 82.0% of the patients complained of chest pain during admission. For some patients, dyspnoea is the only sensation experienced during CAD.[13] Same observation also found in this study.

The chance of developing CAD increases with age. In USA Coronary artery disease is a common disease of the elderly people.[14] This study also suggested that blocking of the coronary artery remarkably higher among the elderly people.

Studies[1,7] suggested that males suffer more CAD than females, due to protective effect of female sex hormone before menopause. In this present study there was also a significant gender difference in developing CAD.

When CAD emerged as the modern epidemic, it was the disease of the higher social classes in the most affluent societies. Fifty years later the situation is changing; there is a strong inverse relation between social class and CAD in developed countries.[3,4] Now CAD is the commonest cause of death and affects poorer people more in these countries. This time-trend has not been explained satisfactorily.[3] But it may be due to epidemiological transition of CAD. The findings of the study suggests still it is the disease of the higher social classes in Bangladesh and Bangladesh is in still at the early stage of the epidemiological transition of the disease.

Cigarette smoking or any form of tobacco consumption is one of the most powerful predictors for the development of CAD in all age groups.[1] Some people commit suicide by hanging, but many by tobacco consumption. A uniquely human habit,

smoking has been identified as a major CAD risk factor with several possible mechanism-carbon monoxide induced atherogenesis; nicotine stimulation of adrenergic drive raising both blood pressure and myocardial oxygen demand; lipid metabolism with fall in "protective" high-density lipoprotein.[7,4] In patients who already have coronary artery disease, tobacco consumption is associated with a higher likelihood of myocardial infarction and of sudden cardiac death.[1] The present study also suggests that blockage of coronary artery is associated with tobacco consumption.

The blood pressure is the single most useful test for identifying individuals at a high risk of developing CAD. Hypertension accelerates the atherosclerotic process, especially if hyperlipidemia is also present and contributes importantly to CAD.[4,7] For example, middle-aged men with blood pressures >169/95 are 5 times more likely to have atherosclerotic heart disease than middle-aged men without high blood pressures (<140/90)[1]. In this present study, the proportion of coronary artery blockage among the hypertensive patients was also significantly higher than that of non hypertensive patients and most important predictor of CAD.

Diabetes puts a patient at high risk of developing CAD. Diabetes tends to increase the level of blood cholesterol and to worsen atherosclerosis. Eighty percent of the people with type 2 diabetes die from some form of cardiovascular disease, and people with diabetes are more likely to have myocardial infarctions or strokes than people without diabetes.[1] The risk of CAD is 2 -3 times higher in diabetics than in non diabetics.[7] CAD is responsible for 30 to 50 percent of deaths in diabetics over the age of 40 years in industrialized countries.[14] This study also suggests that diabetes mellitus is associated with the coronary artery blockage.

Our study possesses a number of methodological limitations that must be taken into consideration. First, it was not a community based study, participants represented the patients attending at the tertiary level hospital. Second, some important predictors of CAD, like lipid profile, family history of CAD and dietary habit were not consider in this study.

Clinicians should consider the hypertension, diabetes and smoking habit of patients to predict the risk of CAD for improvement the precision of selection for angiogram during their clinical practice. Existing health education program regarding screening and treatment of high blood pressure and diabetes mellitus, and avoidance to tobacco consumption should be promoted for the prevention and control of CAD at the individual and community level.

References:
1. MJ Katz. Coronary Artery Disease (CAD). Nursing CEU.com, Wild Iris Medical Education. Inc. Retrieved 4 May 2015 from http://www.nursingceu.com/courses/215/index_nceu.html.
2. Coronary artery disease. HeartSite.com. Retrieved 4 May 2015 from http://www.heartsite.com/html/cad.html.
3. Patel KCR, Bhopal RS. editors. The epidemic of coronary heart disease in South Asian populations: causes and consequences. South Asian Health Foundation 2004.
4. Park JE, Park K. Park's Text book of Preventive and Social Medicine. 20th ed. Jabalpur, India: M/S Banarsidas Bhanot publisher, 2009.
5. Rose G, Oxford Text book of Public Health 1985; 4: 133.
6. Hart JT . Practising Prevention. British Medical association 1983.
7. Rashid KM, Rahman M, Hyder S. editors. Testbook of Community Medicine and Public Health. Fourth rev ed. Dhaka: RHM publishers. 2004.
8. WHO. Sixth Report of World Health Situation, 1980.
9. Patwary MS, Reza AQM, Akanda MA, Islam A, Majumder A, Mohibullah A et. al. Risk factors and pattern of coronary artery disease in young patients with acute myocardial infarction. University Heart Journal 2008; 4(1): 20-3.
10. Mahmood M, Mahmood SA, Quayum MA, Qader A, Rahman H, Rahman KS. Cardiovascular diseases in the urban community – an analysis of 1064 referrals from Family Physicians. University Heart Journal 2008; 4(1): 30-1.
11. Danesh J. High-risk hearts: a South Asian epidemic. University of Cambridge. Retrieved 8 May 2015 from http://www.cam.ac.uk/research/features/high-risk-hearts-a-south-asian-epidemic/.
12. Brscic E, Bergerone S, Gagnor A. Acute myocardial infarction in young adults. Am Heart J 2000; 139(6): 979-84.
13. Davies SW. Clinical presentation and diagnosis of coronary artery disease: stable angina. Br Med Bull 2001; 59 (1): 17-27.
14. WHO 1985. Techn. Rep. Ser.,727.