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Acute Coronary Syndrome in an Intensive Care Unit of a Tertiary Care Centre: The Spectrum and Coronary Risk Factors

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ABSTRACT

Introduction: Acute coronary syndrome is the major leading cause for coronary care unit admission. Its spectrum comprises a variety of disorders including unstable angina, non ST elevation and ST elevation myocardial infarction. Its spectrum and incidence is crucial as a part of need assessment of cardiac catheterization laboratories.

Methods: An observational study was designed to study the spectrum of acute coronary syndrome and associated coronary heart disease risk factors in subjects admitted in intensive care unit of College of Medical Sciences Teaching Hospital, Bharatpur, Nepal from August 2009 to September 2010. Details including coronary risk factors and the categories and outcomes of acute coronary syndrome were analyzed.

Results: A total of 57 subjects were included in the study. The majority 36 (63.16%) were males. The mean age was 64.54±13.8 years. Five (8.8%) patients were ≤45 years and 29 (50.88%) patients were ≥65 years. The major coronary heart disease risk factors were smoking 29 (50.88%), diabetes 25 (43.85%), hypertension 21 (36.87%), and previous history of coronary heart disease 18 (31.58%). ST elevation myocardial infarction was the major category 24 (42.11%) followed by non-ST elevation myocardial infarction and unstable angina 18 (31.58%) and 15 (26.32%), respectively. Myocardial infarction complicated with cardiogenic shock had very high mortality (83.33%).

Conclusions: The ST elevation myocardial infarction was the major clinical form of acute coronary syndrome admitted in intensive care unit. Prevention should be targeted on modifiable risk factors such as the management of hypertension, dyslipidemia, diabetes and obesity. In addition, the improvement in cardiology service with the establishment of CCU and cathlab might improve the mortality and morbidity in such cases.

Keywords: *acute coronary syndrome; coronary risk factors; intensive care unit.*

INTRODUCTION

Coronary Heart Disease (CHD) is one of the most common causes of preventable death and ranks second and third in male and female over 15 years of age respectively in terms of disease burden as judged by Disability-Adjusted Life Years lost.[1] There is a remarkable rise in CHD burden in low-income and middle-income countries.[2] The South Asians; India, Pakistan, Bangladesh, Sri Lanka, and Nepal account for about a quarter of the world's population and contribute the highest proportion of the burden of cardiovascular diseases as compared with any other region globally.[2-4]

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It was estimated that two-thirds of the 14 million cardiovascular fatalities in 1990 had occurred in the developing countries.[5-7] Moreover, the deaths related to CHD disease also occur 5 to 10 years earlier in South Asian countries than they do in Western countries.[5,8]

Acute Coronary Syndrome (ACS), a common condition for Intensive Care Unit (ICU) admission, refers to a spectrum of clinical presentations ranging from those for ST-segment Elevation Myocardial Infarction (STEMI) to presentations found in Non–ST-segment Elevation Myocardial Infarction (NSTEMI) or in unstable angina (UA). Although the data on the prevalence of various coronary risk factors and pattern of ACS is paramount of importance for the future planning of cardiology services in the country, such data are lacking from Nepal. A study from Eastern Nepal showed the prevalence rate of CHD 5.7%.[9] The available data are mostly focused on particular risk factor or particular disease spectrum and do not reflect overall scenario. We have tried to fill this gap from a hospital-based study and have attempted to estimate the patterns of various categories of ACS in ICU admitted subjects and analyze the associated CHD risk factors.

This study was conducted with an objective to study the spectrum of ACS and associated CHD risk factors in subjects admitted in intensive care unit of College of Medical Sciences Teaching Hospital (CMS-TH). This information was also crucial for the need assessment of cardiac catheterization laboratory (cathlab) and coronary care unit (CCU).

METHODS

An observational study was designed and conducted in College of Medical Sciences Teaching Hospital, Bharatpur, Nepal.Informed consent was taken from all the subjects and the study was approved by the Institutional Review Board. All the patients presenting to the Emergency Room (ER) with chest pain, shortness of breath or angina equivalent symptoms from August 2009 to September 2010 were included first in surveillance group. The standard case definition of the American Heart Association (AHA) was used for classifying patients into categories of UA, NSTEMI and STEMI. Once the diagnosis of ACS was confirmed and admitted in the ICU, the subjects were included in the study. Any patient not meeting the above mentioned requirement and those who were unable to give consent were excluded from the study. A comprehensive validated questionnaire related to various CHD risk factors was used. An informal informed consent of the patients was obtained for the participation in the study. The patients were followed during the hospital stay till their discharge. Details on demographic data including various coronary risk factors and clinical parameters, investigations, and complications were entered in a designated performa. The patterns of CHD risk factors, both modifiable and non-modifiable, were calculated. The patterns of various forms of ACS and associated coronary risk factors were analyzed. The SPSS package version17.0 was used to carry out the statistical analysis. Continuous data were presented in the form of mean.

RESULTS

Over three hundreds consecutive patients presented with chest pain or angina equivalent symptoms at the ER of the hospitals of which 57 patients were evaluated. Non-evaluable patients were those who did not meet the inclusion criteria, refused to be part of the study or were not able to admit the patient in ICU because of various reasons. Majority, 36 (63.1%) patients were males. The mean age at presentation was 64.54 ± 13.8 years. More than half of the study population,29 (50.88%) were elderly subjects (≥65 years), and 23 (40.35%)were in 46–64 years age group. Only five (8.8%) were 45 years or younger (Table 1.).

Table 1. Patient baseline characteristics (n = 57).

Parameters	n (%)
Mean age (years)	64.54±13.8
Male: Female	1.7:1
Proportion of subjects	
≤ 45 years	5 (8.8%)
46 – 64 years	23 (40.35%)
≥ 65 years	29 (50.88%)
CAD Risk factors	
Smoking (Current and past)	29 (50.88%)
Diabetes	25 (43.85%)
Hypertension	21 (36.87%)
Previous CHD	18 (31.58%)
Dyslipidemia	15 (26.32%)
Family history of CHD	15 (26.32%)
Obesity (BMI ≥ 27)	9 (15.78%)

More than half of the study subjects, 29 (50.88%) were either current 15 (26.32%) or past smokers 14 (24.56%). Diabetes 25 (43.85%) was the next prevalent risk factors followed by hypertension 21 (36.87%). Nearly one-third of study subjects 18

(31.58%) had previous episode of coronary artery disease, more than one-quarter of study subjects 15 (26.32%) had dyslipidemia. Fifteen subjects (26.32%) also had family history of CHD. Obesity was present in small number of subjects 9 (15.78%).

Majority of ICU admissions with ACS had STEMI 24 (42.11%). NSTEMI and UA were diagnosed in 18 (31.58%) and 15 (26.32%) subjects respectively (Table 2). Regarding the wall involvement in these 42 cases of myocardial infarction (24 cases of STEMI and 18 cases of NSTEMI), anterior wall was the most common, it was involved in 15 (62.5%) and seven (38.89%) cases of STEMI and NSTEMI respectively. Involvement of inferior wall was more common in NSTEMI cases, it was involved in six (33.33%) and five (20.83%) cases of NSTEMI and STEMI respectively. Few NSTEMI cases also had involvement of right wall (6.25%). Some of the cases also had LBBB on presentation (7%), however their appearance as new onset were not established. One case in UA categories had Prinzmetal's angina.

Table 2. ACS categories among admitted subjects and final outcome.

Parameters	n (%)
ACS categories	
1. STEMI	24 (42.11%)
2. Non-STEMI	18 (31.58%)
3. Unstable angina	15 (26.32%)
Cardiogenic shock	12 (21.05%)
Outcome of the ACS subjects	
1. Mortality	14 (24.56%)
2. Left Against Medical Advice	3 (5.26%)
3. Improved	39 (68.42%)
4. Referred	1 (1.75%)

The overall outcome in these ACS subjects admitted in ICU was not good. Thirty-nine subjects (68.42%) had improved and were discharged successfully. Despite the best effort and management in ICU, 14 (24.56%) subjects had died, three (5%) patients had left hospital against medical advice and one patient (1.75%) was referred to another centre for further needful management.

Total of 12 (21.05%) had developed cardiogenic shock. Among cardiogenic shock cases, the two-third had it at the time of admission and remaining had developed within 48 hours of admission. Majority of cardiogenic shock subjects had STEMI eight (66.66 %). Total three (25%) had NSTEMI and only one (8.3%) had UA associated with cardiogenic shock. Anterior wall involvement nine (75%) was the commonest among these subjects followed by inferior and right wall in each one (8.33%) (Table 3.).

Table 3. Subjects with cardiogenic shock (n = 12).

Parameters	n (%)
ACS categories	
1. STEMI	8 (66.66%)
2. NSTEMI	3 (25%)
3. UA	1 (8.3%)
Wall involvement	
1. Anterior	9 (75%)
2. Inferior	1 (8.33%)
3. Right	1 (8.33%)
4. No wall involvement	1 (8.33)
CHD Risk factors	
1. Diabetes	8 (66.66%)
2. Smoking	7 (58.33%)
3. Previous CHD	6 (50%)
4. Dyslipidemia	5 (41.66%)
5. Hypertension	4 (33.33%)
6. Obesity	2 (16.66%)
7. Family history of CHD	2 (16.66%)
Outcomes in cardiogenic shock	
1. Death	10 (83.33%)
2. Improved	2 (16.66%)

The wall involvement in UA case was not evident. Majority of these cardiogenic shock cases had diabetes (8, 66.66%) and seven were smokers (58.33%). The rates of previous episode of CHD and dyslipidemia were also figured prominently in cardiogenic shock cases six (50%) and five (41.66%) v/s 18 (31.58%) and 15 (26.32%) in overall (57 ACS subjects). Only the rates of hypertension and obesity were similar to that of overall ACS cases; four (33.33%) and two (16.66%) in 12 cardiogenic shock cases v/s 21 (36.87%) and nine (15.78%) in overall 57 ACS cases respectively. In contrast, the rate of family history of CHD was low among cardiogenic cases; two (16.66) v/s 15 (26.32%). Death among these cardiogenic subjects was very high 10 (83.33%), only two (16.66%) were able to make improvement at the time of discharge. Majority of these cardiogenic shock cases had died within 24 hours of hospital admission.

DISCUSSION

Based on this study the typical profile of ACS patients

admitted in ICU in our scenario would be that the majority are males, with a mean age of around 64 years, presenting with chest pain and having smoking, diabetes, hypertension and previous history of CHD as the major risk factors. They are also likely to have dyslipidemia, obesity and also a family history of CHD.

Mean age of the patients in our study was 64.54 ± 13.8 years while only 8.8% were below the 45 years of age and majority (50.88%) were 65 years or older and this figure reached to 60% if age cut off level was taken at 60. This was in contrast to a study by Jafary et al,[10] from Pakistan, where they had reported the mean age of 52.5 ± 10.8 years and more than three-quarters of these study subjects were below 60 years and only 22.5% were over 60 years of age. It seems Nepali subjects with ACS were 12 years older than their Pakistani counterpart. However, other various parameters of our study were comparable to their study. As in their study, there was male preponderance in our study (63.16 v/s 68.1%). Most of the major CHD risk factors were more or less similar in both groups except for hypertension and family history of CHD which were more prevalent in Pakistani subjects. There were marked differences in mortality, our study showed high mortality in our subjects. This can be explained based on the elderly population in our series (59.65% v/s 22.5% above 60 years of age), lower number of younger subjects in our series (8.8% v/s 28.3% subjects below 45 years) and low level of referrals (2% v/s 16.5%). Moreover, 21.05% subjects were in cardiogenic shock at the time of admission in our series, the incidence of cardiogenic shock in Jafary et al, series had not been reported.

In a study,[11] conducted in Dhulikhel Hospital during 2008 and 2009, the mean age was 62.9 ± 12.78 years with youngest one with 34 years of age and male to female ratio of 1.19:1. Of them, 17.4% subjects were younger than 50 years and nearly 30% subjects were 70 years or older. Regarding CHD risk factors in these subjects, 75% male and 56% female were smokers. Similarly 27% and 5% males and 33% and 15% females had hypertension and diabetes respectively. Surprisingly 60% subjects of CHD were from rural areas in contrast to conventional belief of higher prevalence of CHD in cities. These findings especially mean age, male female ratio and patterns of smoking and hypertension were comparable with our study, however, the rate of diabetes was significantly higher in our subjects.

Our study is unique in the sense that it was able to characterize the features and delineate the risk factors of cardiogenic shock subjects in our scenario. Similar study for the comparison was lacking in the literature. The overall incidence of 21% in our study is very high. In a study by Goldberg et al,[12] only 7% subjects admitted to hospital with Acute Myocardial Infarction (AMI) had cardiogenic shock. Of these, about half have established cardiogenic shock at the time of admission to hospital, and most of the others develop it during the first 24 to 48 hours after admission.[13] But in our study, the majority (75%) had it at the time of admission and 25% had developed within 48 hours of admission. Majority of cardiogenic shock subjects had STEMI (66.66%), 25% had NSTEMI and only 8.3% had unstable angina associated with cardiogenic shock, possibly due to refractory arrhythmia. Anterior wall involvement (75%) was the commonest among these subjects followed by inferior wall (8.33%) and right wall (8.33%) involvement. Our rates of wall involvement is comparable to the study by Hochman et al,[14] where they had reported the higher rates of left ventricular infarction (79%) and low rates of right ventricular infarction (3%). Majority of our subjects had diabetes (66.66%) and were smokers (58.33%). The rates of previous episode of CHD and dyslipidemia were also figured prominently in cardiogenic shock cases (50% and 41.66% v/s 31.6 % and 26.31% respectively). Only the rates of hypertension and obesity were similar to that of overall ACS cases (33.33% and 16.66% v/s 36.87% and 15.78% respectively). In contrast, the rate of family history of CHD was low among cardiogenic cases (16.66% v/s 26.31%). Similar findings regarding the CHD risk factors were also reported in other study. The major risk factors for cardiogenic shock after acute MI are previous MI, diabetes mellitus, advanced age, hypotension, tachycardia or bradycardia, congestive heart failure with Killip class II-III, and low left ventricular ejection fraction (ejection fraction under 35%).[13,14] In our study the death among these cardiogenic subjects was very high (83.33%), only two cases (16.66%) were able to make improvement at the time of discharge. Majority of these cardiogenic shock cases had died within 24 hours of hospital admission. The reported mortality for people in hospital with cardiogenic shock after acute MI vary between 50% to 80%.[12,13] Most deaths occur within 48 hours of the onset of shock.[15] People surviving until discharge from hospital have a reasonable long-term prognosis (88% survival at one year).[16]

In a study by Samad et al,[17] the mortality among subjects admitted with diagnosis of acute myocardial infarction were 10.8%. This was in contrast to our study where the mortality rate was 24.7%. In another study from Pakistan, Saleheen and Frossard,[18] reported that relatively younger patients (< 45 years) represented 16.1% of total patients. These patients were more likely to be smokers and had high lipid levels. In a study by Ahmad and Shafique,[19] on risk factors for acute myocardial infarction of younger age group, 19% of their patients were under 40 years of age, majority (87%)

were males and the rates of smoking, hypertension, diabetes and dyslipidemia were 79%, 35%, 31% and 19% respectively. In comparison to our study, they have higher proportion of younger age group subjects, more prominent male preponderance, higher smoking rate and low diabetes rate. The rates of hypertension, dyslipidemia and obesity were comparable.

In our study, there was significantly higher mortality rate. That may be explained on the basis of few unique features of our study. Firstly, the mean age of our subjects was significantly higher than in other studies and majority of our study subjects were elderly people. Moreover, the proportion of younger subjects (≤45 years) in our study was very low. Secondly, the proportion of subjects admitted with cardiogenic shock was high in our study, almost one-quarter of the ACS subjects were admitted with cardiogenic shock. In additions, our study is focused only on the ACS subjects admitted in ICU, other studies had reported mortality mostly in overall CHD subjects. Lastly, the service delivery system should also be taken in consideration as our cardiology service is lacking on cathlab and dedicated CCU services.

This study was conducted before the cathlab installment and was targeted to study the case loads and possible candidates for cath procedures. It is quite informative and is the first of its kind from Nepal. It is more near to the overall scenario of ICU admissions with ACS in Nepalese context. Based on these observations, it seems there is strong need for the cathlab service in this hospital which might improve overall cardiology service and the cathlab could be sustainable. However, it is not devoid of limitations. Most of them were inherent to the design of the study. It was a single centre descriptive study and representativeness of our data could be questioned. Moreover, it was a small-sample sized study and recorded parameters might differ with increase in sample size. Despite the limitations mentioned above, it seems still reasonable to draw key notes about the profile of ACS subjects admitted in ICU in Nepal.

CONCLUSIONS

CHD is a common cause for ICU admission and is also a major cause of hospital death. Moreover, the younger groups are also equally getting CHD. This observational study showed that the ST elevation MI was the major clinical form of ACS in our subjects and nearly quarter of these ACS subjects had died. Mostly modifiable risk factors such as diabetes, hypertension, dyslipidemia, obesity, smoking and tobacco use were the major determinants. The smoking, diabetes and hypertension appear to be the most common and important risk factors for the CHD in this part of the country. So, the management of CHD should focus on prevention and modification of major coronary risk factors. Large scale effective preventive health campaign on these risk factors can help lower the incidence of CHD in the community. In addition, there is a strong need on the improvement in cardiology service delivery system such as establishment of CCU and cathlab.

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