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Risk Factors and Clinical Presentation of Cardiac Chest Pain Pattern in Admitted Patient of a Tertiary Care Hospital from Low Socioeconomic Condition

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ABSTRACT

Background: The principal cause of mortality of cardiovascular condition is prevalent in low and middle-income nations. Study revealed that pooreconomic condition is a risk factor. Therefore, the study done to detect the association of risk factors in acute coronary syndrome (ACS) with Low socioeconomic condition.

Methodology: Thiscross sectional study conducted in a Multi-disciplinary hospital of Bangladesh. ACS patient were the target population. After written informed consent, a total 100 individuals were included. Researcher with semi-structured questionnaire did data collection. And following completion of data collection, it was analyzed by the SPSS 21.

Result: Out of total 100 ACS patients male-female ratio was 2.6:1 (72% vs 28%) with mean age 57.86±13.69 SD (years). Age range was 29-83 years. Highest frequency of ACS (34%) was found between 55 to 64 years of age. About 43% of the patients belongs to 3000-4500 taka monthly followed by 35% with income >4500 taka and 22% with <3000 taka per month. Risk factors among male were hypertension (81.94%), dyslipidaemia (73.61%), smoking (72.22%) and family history of ACS (37.5%). On contrary, among women, dyslipidaemia (78.57%), hypertension (46.43%), over-weight of obesity (39.29%) constituted the principle risk factors. Of all, high blood pressure and tobacco ingestion are significant in men than women (p-value < 0.05 in each). The most prevalent symptom was chest pain among both male (84.72%) and female (75%). Next common symptoms were shortness of breath (48.61% vs 50%) and diaphoresis (33.33% vs 28.57%). Total 11 patients (11%) were died and there was no significant relationship between outcome and income.

Conclusion: Among the low socio-economic group,elevated blood pressure and active smoking are the most important risk factors in ACS patients, which frequently presents with typical chest pain along with radiation of pain in left as well as difficulty in breathing.

Keywords:- *Acute coronary Syndrome,Smoking,Lowincome,Diabetes,Hypertension,Chestpain,Shortness of breath, Bangladesh, Dhaka Medical college Hospital.*

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CHAPTER 1

INTRODUCTION

Majority of deaths in industrialized as well as developing countries occur due to cardiovascular problems[2]. It not only leads to loss of human lives but also contributes significantly to economic losses, accounting for 1/3rd of a projected 50 trillion US dollar loss due to chronic diseases over the next 20 years[3]. Mortality because myocardial ischemia, angina and myocardial infarction showed a falling trend in the 1970's and 1980's[4], but this success was only limited to those countries who are developed both socially and economically[2]. The scenario is reverse[5] in LMICs and also remarkably noticed in the lower socioeconomic groups in developed countries.

In high-income countries, decades of investigation went through to find out the presentation and risk factors for ACS[6]. But very few initiatives are noticed in LMICs[7]. However, it was also noted economic and cultural status of patients of developed countries (data obtained from salary, Profession and Learning level) are closely linked to cardiac disease morbidity and mortality[8-11]. This is based on the differences in the known cardiovascular risk factors amongst social classes[12]. Different epidemiological studies have suggested that the individuals from upper socioeconomic classes were more commonly afflicted by the coronary heart disease, which is why it was previously called "the disease of affluent"[13]. But the middle of the 20th century showed a gradual change in the western populations, thus now reversing the trend of cardiovascular diseases [10, 11]. In most privileged societies, risk factors for chronic diseases and diabetes are more prevalent than lower socioeconomic status individuals[14]. But the socio- economic development as well as the current statistical shift pattern change seen in developed countries, the risk factors are more commonly noted in non- affluent socioeconomic groups, which are now supported by various studies[14-15]. Due to improving awareness and availability of better treatment options, especially in the higher socioeconomic classes, reduction of these risk factors is seen[16, 17]. On the contrary, the risk factors showed minimal change, decline of the cardiac modifiable and non-modifiable trait was absent or slowing in the lower socioeconomic groups [16]. In addition, individuals from lower socioeconomic groups have less option for effective indoor as well as outdoor exercises, consume unhealthy food options, more exposed to nicotine vendors and nicotine-basedmass media advertisements[18-19]. These issues together contribute to the impaired functional heart capacity and autonomic dysfunctions leading to deaths at younger age[20]. Alarmingly, cardiovascular related deaths occur in younger age groups in developing nations than in high-income countries, often the sole bread winner age groups, [21] thus producing a vicious cycle for this region.

Bangladesh is changing rapidly[22]. World Bank classified the nation as middle GDP suggesting increasing income and betterdevelopment indices[22]. Subsequently, the disease pattern has changed from a disease profile consisting of under-nutrition, infectious diseases and children mortality largely dominated by non-communicable diseases (NCDs) [23-24]. According to the data of World Health Organization's (WHO) South-East Asia Region, NCDs – including cardiovascular and chronic respiratory diseases, Cerebrovascular disease, malignancy and diabetes – constitute around 50 percent of yearly mortality (54%) and prevalence of diseases (47%) [25.]Minimal evidence also denotes that NCDs accounts around 50 percent of yearly mortality (51%) [26] and halfof total disease proportion (41%) [27.] Among them IHD and ACS alone shares a major portion of mortality and morbidity with 19.6[28] %prevalence in urban population.

Effect of socioeconomic status on risk factors of non-communicable diseases, particularly vascular factors is not adequately studied in Bangladesh. In addition, there are less published paper evaluated the effect of various markers of human development status such as literacy, social status and certain professions on the disease burden of cardiovascular risk factors. Hence, this cross-sectional study aimed for analyse contributing factors and presentations on ACS in the lower socioeconomic group in Bangladesh.

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A. Rationale Of The Study

Developing countries like Bangladesh are likely to face an enormous burden of chronic diseases like angina , ACS. Several studies showed evidence of association of cardiovascular related mortality with low socioeconomic conditions. In spite of having a major portion of population living below the poverty line, there is no such kind of study done till date. This research was planned aiming to find various risk factors and admission presentations of coronary artery disease patients presented in a multi-facility hospital from low socioeconomic groups and which will help in conduction of future studies in our region, in order of finding the extent of the problem and develop measures to address issues that are uncovered by the Government of the people of Bangladesh.

B. Research Question : Risk Factors And Clinical Presentation of Cardiac Chest Pain pattern in admitted patient of a Tertiary Care Hospital from Low Socioeconomic Condition

a) General Objectives

Varied presentation and multiple risk factor pattern of ACS patient admitted in a multi-disciplinary hospital among low Socioeconomic Conditions**.**

b) Specific Objectives

- To find out the socio-demographic characteristics of the participants.
- To find out various clinical presentations of patients suffering from acute coronary syndrome.
- To assess the risk factors of patient suffering from acute coronary syndrome.
- To establish association of low socioeconomic status with Variable presentation and end result of hospitalised patient suffering from myocardial ischemia.

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CHAPTER 2

LITERATURE REVIEW

Greatest single cause of mortality isIschemic heart disease (IHD(accounting for roughly seven million deaths annually) and wasting of disability-adjusted life years (DALYs) (loss of 129 million DALYs annually) across the globe[30, 31], major part of this burden falls on developing nations[5]. The number of deaths from IHD and acute coronary syndrome (ACS) occur, on average, at younger ages developing nations than in high-income countries, often at economically productive ages, and likewise mostly prevalent in the poor within LMICs[5].

Cardiovascular disease has a significant burden on the economy, responsible for 1/3rd of estimated fifty trillion monetary loss as compared to chronic diseases in the next 20 years[3]. However, developed nations continue to deal with significant ACS mortality, nearly two-thirds of all ACS related Daily adjusted life years and over half of deaths takes place in developing nations. Many of these countries have undergone transformational growth in economy and lifestyle changes over the past few years that have increased the prevalence of ACS risk factors and higher mortality rates 32-36. Evaluating this change and comparing it with previous experience in High income nations, and available actions to stem the global tide of IHD mortality make up the research and action frontier regarding acute coronary syndrome (ACS) and IHD in LMICs. The epidemiologic transition gives an important framework for understanding the rise of IHD in LMICs[14, 24].

Urban aggression, modern commute, and increasing sitting jobs in developing nations made a pattern of acceleration and overlap among various stages of the transition in epidemiology[36-39]. While infections, under-nutrition, and maternal/child mortality are still major causes, they are no longer major causes of death in many poor nations: ACS has now become one of the top five causes of death in all regions of the world except sub-Saharan Africa. Even in sub-Saharan Africa, cardiovascular disease is the top cause of mortality and morbidity inthe individuals above thirty years of age[41]. Overall, numbers of deaths and DALYs attributable to IHD have increased since 1990[42, 43]. This significant rise of chronic diseases without a similar fall in the number of infectious disease burden, has resulted in a challenging “double burden of disease” in many countries[37, 44, 45]. In addition, the age-standardized mortality rates due to ACS are higher in number in many developing nations than in rich countries, thus correspondingly more people are dying at a *younger* age from IHD in developing nations[43]. While most of the IHD burden in LMICs occurs as those regions and individuals enter higher economic zones, there remains a significant health and economic burden on the lower segments of poor societies resulting from IHD and related NCDs[46-48]. In addition, given the population rise in developing countries, the absolute numbers of people with premature IHD is substantial even though global, age-standardized cardiac mortality rates have declined[42, 43].

There is a steep rise in multiple cardiac risk factors. The prevalence of obese and overweight individuals in many LMICs has increased significantlyraised between 1975 and 1997 especially in paediatric group in Brazil from 5.2% to 14.7%[49]. The age-standardized prevalence of obesity and overweight has jumped from 31.2% in 1981 to 45.3% in 2009, with 50 % of the rise happened after 2000[51]. Across the globe, average BMI has been raisedthroughout the world. Other biological risk factors include geographic and temporal variability. Comprehensive analyses of systolic blood pressure have revealed increases in sub-Saharan Africa and South/Southeast Asia, comparatively less change in Latin America, and significantly less in developed countries[52]. In opposite, mean serum cholesterol levels are in downward trend in several regions of the world, although at different rates[33]:However,rich countries and Russia Federation have experienced significant fall, South Asia has experienced slight declines, in contrast Latin America and the Middle East in unchanged and peaking in eastern part of Asia

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Statistical material collected from 40 years meta-analysis of original Framingham Study cohort which also included offspring of the patient with established cardiovascular disease (25 years of surveillance of their offspring) has allowed to rectify of the statistics of different cardiac episode for eg ACS (with classical symptoms or silent), stable, unstable, decubitus, crescendo angina, sudden, chronic cardiac deaths[53-55], stated the following observations. Firstly, patient ages more than forty years, overall risk of developing Coronary heart disease was forty-nine percent in men population and thirty-three percent in the women population, as compared to those reaching around second decade years, the overall risk was thirty-three percent in men and twenty two percent in women. At opposite end, for summative cardiac episodes, the prevalenceincreased in upward gradient in women which is way forward than men by ten years whilst for the serious complicated presentations of cardiac events, such as heart attack and overall mortality, women were behind men in incidence by twenty years, but the gender ratio for prevalence narrowed steadily once people ages[56]. The incidence at ages sixty-five to ninety-four years as opposed to ages thirty- four to ninety -three years were more than two times in men and three times in women, respectively. In addition, life threatening heart disease (i.e., acute coronary syndrome, cardiac arrest) is less common reproductive age women and the load of cardiovascular incidents were significantly high among postmenopausal women as opposed to reproductive age-matched referents[53]. Fourth, age group below sixty-five, the annual incidence of overall cardiovascular events of male population(twelve/one thousand)was more than equalled the ratio of all other atherosclerotic cardiac events summation (seven per one-thousand); On the other hand, in case of female sex, it equalled the ratio of the separate events (five/one-thousand)., CHD accounted for most of the incidents in those over sixty-five years of age. Coronary events hold thirty-three percent to sixty-five percent of atherosclerotic cardiovascular events in men and twenty-eight percent to fifty-eight percent in women. Finally, the fact that angina pectoris was more consistent in men population as compared with women was less striking. In women below seventy years, angina pectoris was more common than MI as the first manifestation of CHD[54]. Furthermore, angina in the female population was more likely to be benign with less hospital stay (eighty-one percent), as compared to angina in men, which often occurred after a MI (sixty-five percent). The most serious complication is acute myocardial infarction in all age groups of men in whom only twenty-five percent of cases there was previous history of angina chest pain. In addition, those with silent myocardial infarction, preceding history of angina is less[, 55].

Apart from gender there are few other factors that can predict on first presentation of coronary events would be angina or infarction. In a randomised control study it is seen that those received lipid lowering therapy and rate limiting beta-blocker therapy for some other reasons presents later than those who are naïve to above mentioned medications[57].

Over Decades, given the progression of atherosclerosis, patients are without symptoms for years in spite of the evidence of Coronary events. In absence of symptoms, the presence and extent of non-obstructive Coronary events the prognosis is worse as compared with patients with no evidence of CHD[58, 59]. In a retrospective cohort study of 37,000 American geriatric populations(Ninety-five percent of male) with no previous coronary incidents who underwent percutaneous vascular procedures from October 2008 till September 2013 and subsequently followed-up for 1 year revealed that the risk of MI increased significantly and progressively in parallel with the extent of non-obstructive (at least one stenosis ≥twenty-percent but <seventy-five percent) and obstructive Coronary events (at least one stenosis ≥seventy-five percent) both [58].When compared with patients with no previous heart disease, the risk of acute myocardial events trended higher as compared with patients with 1 vessel non-obstructive CHD [hazard ratio (HR) of 1.9; Ninety-five percent of Confidence Interval: 0.6–4.3] and was significantly higher for patients having non-obstructive cardiac events involving two (HR 3.4; Ninety-five percent confidence interval: 1.9–9.6) or three cardiac vessels (HR 3.4; Ninety-five percent of Confidence Interval, 2.6–11.4). Ultimately, patients who presented with nil blocked coronary vessels also required secondary prevention therapy to reduce mortality and morbidity.

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Surprisingly, apart from fixed non-modifiable factors multiple modifiable and environmental factors implicating in coronary events are also noted.It has been mentioned in several meta-analysis that overall prevalence of smoking reduced since decade of 1990; however, it is a matter of concern that the total number is increases exponentially in under-developed and developing countries since industrial revolution.[63-65]. The smoking rates differ geographically, for instance countries like china, eastern European countries and south-east Asian countries are more related with smoking in both young and aged. Intake of other unhealthy food habits, which includes sugary beverages, canned and processed food substitutes, and consumption of spirit have increased[66]. Despite variations in several countries ,overall regular aerobic and non-aerobic exercise time reduced overall due to obesogenic environment. It is matter of debate that certain developing countries populations physical exertion levels are more than the developed ones, however they are dying early due to other confounding factors for coronary events like smoking.[67]. From the most recent Global Burden of Disease estimates, the top ten risk factors contributing to mortality and DALYs in Developing and developed nations were all stress related or biological risks for NCDs[68].

Different study over the time showed that NSTEMI is now more prevalent than STEMI[-71]. For example, a report from the National Registry of MI one to five reviewed over 1.9 million MI cases between 1991 and 2006[70] and found that the proportion of MI due to NSTEMI increased from twenty-percent in 1993 to fifty-nine in 2007. This change in proportion was associated with an absolute decrease in the incidence of STEMI and either a rise (using MI defined with CK-MB or cardiac troponin criteria) or no change in the rate of NSTEMI (using MI defined with CM-MB criteria only)[71]. Within a large community-based population, the incidence of MI decreased significantly after 2001, and the incidence of STEMI decreased markedly after 1998[72]. Reductions in short-term case fatality rates for MI are due, at least partly, to a decrease in the incidence of STEMI, a lower rate of death after NSTEMI[72], but also to the enhanced diagnostic effectiveness of modern cardiac troponin immunoassays for detecting even non-significant distance sub-endocardial ischaemia.

Although many cases of MI appear to occur without warning, there is a large reservoir of detectable advanced silent coronary events from which these apparently sudden events evolve. Such patients frequently have an ominous coronary risk profile and signs of pre-symptomatic CHD. Approximately three to five percent of the general population has silent coronary ischemia which is most of the time an asymptomatic condition can be actually detected with a tread mill tolerance test or with Holter electrocardiographic monitoring. This condition is more prevalent in male sex who already have more than 2 cardiac risk factors (Ten percent), and especially in patients with established cardiac events, e.g., 26-51 percent in those with reproducible angina detected through treadmill tolerance test or holtermonitoring[73].

Pathological Q-wave in electrocardiography is the most sensitive findings consistent with previous silent myocardial infarction in a susceptible individual with multiple cardiac risk factors. In a series of reports from the Framingham Heart Study, the following observations were made about silent MI. First, among patients who had suffered a new MI during routine biennial ECG, the infarct was silent in twenty-five percent in male and thirty-five percent of female, respectively[75]. In men, the frequency of unrecognized MI was higher in diabetic than in non-diabetic individuals (forty percent*vs*. twenty percent) [76]. Other large epidemiologic studies reported an overall comparable proportion of silent MI in both genders (thirty-five percent of MI in men *vs*. thirty-two to forty-three percent in women) [77-79]. On the other hand, the short-term (<4 week) mortality after Q-wave MI has decreased over the decades, but this remains to be presented as a long-term complications. Multiple meta-analysis showed that the death rate is significantly reduced over the last decades post ACs and those with poor LV function which is related with improvement in health facilities with strategy towards both primary and secondary preventions.[80]

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Silent MI, like clinically apparent MI, is strongly associated with age, as reflected by data of 9,000 men[81] and 13,500 women followed for 5–25 years in the Iceland Study[77]: for instance, the incidence went from ~zero (for those aged ~thirty=five years) to two per one-thousand man-year at age sixty. The incidence of unrecognized cardiac events might have been underestimated in the aforementioned twice in a year population-based estimates for at least 2 reasons: about eleven percent of anterior and 22% of inferior ECG MI revert to a non-diagnostic pattern within 2 years after the event, and some unrecognized MI precipitate sudden death –that can be found in post-mortem (e.g., type 3 MI)[82,83].

The respondents were 496, 196 (44.8%) were man and only fifteen of them had ACS, while 342 (41.3%) were women and twelve had ACS. Hence, the prevalence of ACS was 4.55% (95 percent confidence interval (CI): 1.75-4.33%). The unadjusted risk factors for ACS were age (P = 0.0008863), duration of DM (P = 0.01104) and presence of high blood pressure (P = 0.0006020). The presence of albuminuria, gender, and obesity was not associated with ACS. In addition, certain indicators e.g. HbA1c, high-density lipoprotein (HDL), triglyceride and low-density cholesterol (LDL) were also not associated with ACS. Logistic regression analysis showed that period of diabetes (odds ratio (OR) for below five years' history of DM = 0.174 (95% CI for OR: 0.181 - 0.834), P = 0.04052) and high blood pressure (OR = 2.461 (95% CI for OR: 1.003 - 6.501), P = 0.038) were absolute risk factors for ACS[84].

Of the 20,811 patients in this study, 1,363 (7.4%) are found without chest pain, 21.7% of whom were not initially recognized as having an coronary evants. They were unlikely to get best cardiac medications, and experienced higher in- hospital morbidity and mortality (14% vs 2.4%, respectively; $p < 0.0005$) than did patient presented with classical symptoms. With adjustment of confounding variables, highest hospital death rates were found in those admitted with pre-syncope/fainting(odds ratio [OR], 2.1; 95% confidence interval [CI], 1.2 to 2.8), nausea and vomiting (OR, 0.6; 95% CI, 2.1 to 3.4), and shortness of breath (OR, 2.5; 95% CI, 2.1 to 2.8), and in those of silent presentations of unstable angina (OR, 2.4; 95% CI, 1.3 to 2.7) and STEMI (OR, 1.4; 95% CI, 1.7 to 2.3)[85].

The study revealed elderly patients with myocardial ischaemia report chest pain more commonly when arriving to the emergency department. Geriatric group have higher in-hospital death rates than those who are around sixty-four years of age. However, certain group of elderly populations mentioned about no chest pain on admission are in two-time more risk ofdeath compared to those presented without chest pain. When it come s to gender, this study found that that women usually present with more autonomic symptoms than men. In addition, females have higher in-hospital death rates both with and without chest pain presentation. Delayed arrival as well as admission to needle time delay to primary percutaneous intervention, is reported in geriatric populations irrespective of presence or absence of chest pain[86].

Regardless of clinical diagnostic category, women reported significantly more indigestion ($\beta = 0.24$; confidence interval [CI] = 0.02–0.48), palpitations ($\beta = 0.30$; CI = 0.07–0.51), nausea ($\beta = 0.33$; CI = 0.11–0.62), numbness in the hands ($\beta = 0.27$; CI = 0.03–0.53), and unusual tiredness ($\beta = 0.59$; CI = 0.25–0.87) than men reported. Differences between men and women in dizziness, weakness, and new-onset cough did differ by diagnosis. Reports of chest pain did not differ between men and women. Women with acute coronary syndromes reported a higher intensity of four symptoms (but not chest pain) than men reported. Whether differences between the gender is less typical, however particular symptoms are clinically significant remains unclear[87].

Acute coronary syndrome was diagnosed in 79 (6.9%) of the 970 patients included. The following parameters were non-dependent indicators of Acute Coronary syndrome (odds ratio, p): age (1.08, $p<0.005$), male sex (7.6, $p<0.003$), dyspepsia (2.0, $p<0.035$), radiation of pain to left (2.4, $p<0.0131$) or right (5.71, $p<0.0011$) arm, vomiting (3.51, $p<0.0071$), and ex(5.11, $p<0.0011$) or active (3.71, $p<0.0011$) smoking[88].

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Approximately one-half of patients in the large cohort studies and one-quarter of patients in the smaller reports and direct patient interviews presented without chest pain or discomfort. The absence of chest pain or discomfort with Acute Coronary Syndrome was found commonly in women than in men in both the cumulative summation from multi-centric cohort studies(33% vs 37%) and the single-study and small reports or interviews (32% vs 27%)[89].

The average age for both sexes was forty-nine years. Females were likely to have NSTEMI (37.5 vs 30.7; P = .03) and presentation is silent acute coronary syndrome compared with men (29.0%vs 33.7%; P = .03). Patients with silent ACS reported fewer symptoms overall and no particular pattern of non–chest pain symptoms was found. In the multivariate model, being a female (odds ratio [OR], 2.95 [95%CI, 1.232-3.113]; P = .005) and high heart rate (OR, 2.071 [95%CI, 1.201-3.562]; P = .0091) were independently associated with acute coronary syndrome presentation without chest pain. Patients without chest pain did not differ significantly from those with chest pain in terms of ACS type, elevation of blood markers like Troponin, or stenosis of coronary vessels[90].

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CHAPTER 3

MATERIALS AND METHODS

A. Study Design:
Cross sectional study(descriptive)

B. Place of Research:
Department of Cardiology in Dhaka Medical College Hospital (DMCH).

C. Study Period:
Six month

D. Study population:
People who are diagnosed as a new case or old case of Acute coronary syndrome with or without complication of either sex and with ongoing medication.

E. Sampling Method:
Purposive convenient sampling.

F. Sample size:
No such relevant study is available in Bangladesh regarding the required prevalence value and data on the incidence of ACS in low socioeconomic class.However, for this research, we used a sample size with an expected prevalence 50% (unknown Prevalence in Bangladesh), confidence interval of 95% and 5% statistical error. For 50% prevalence P=0.5, 95% confidence level Z = 1.96 and for 5% error = .05

⇨ $n = P(1-P)Z^2/(error)^2$

⇨ $n = .5(1-.5)1.96^2/(.05)^2$

$n = 384$

Due to resource and duration constraints 100 subjects entered in research design.

G. Selection criteria:

a) Inclusion criteria:
- Age: 18-65
- Sex : Both sex
- Patient of ACS evidenced by both clinically and by investigations.
- Monthly Income < 5,5000 BDT per family
- Willing to participate

b) Exclusion criteria:
- Age : < 18 years
- Not willing to participate.
- Monthly Income > 5,500 BDT

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H. Operational definitions:

- **Acute coronary syndrome:** consists of Acute Myocardial Infraction (AMI) ,unstable angina (UA).
- **Acute Myocardial Infarction**: Described as classical symptoms and/or electrocardiogram (ECG) changes and serial troponins.
- **Unstable angina (UA):** Clinical Presentation or Electrocardiographic changes consistent with ACS without raised levels of troponins.
- **Categorization of patients:** Patients is also categorized as having -
  - *ST Elevated-Acute Coronary Syndrome:* Evidence of ACS as described above and ST-segment elevation.
  - *Non-STE-ACS* (NSTE-ACS) based on initial ECG findings. NSTE-ACS involved patients having ischaemic symptoms, also T-wave abnormalities or ST-segment depression in the absence of ST-elevation on the initial ECG.
- **Low socioeconomic condition**[91]: The household salary, expenditure survey 2010 of BBS put forward a conclusion of an individual earning Taka 1250 per month is considered as poor who lives in low socioeconomic areas throughout nation which again translates to an average income of TK. 5500 per family per month. For people living in industrial areas, BSS states that low Income people are those who have per capita earning of Taka 1250 or less.

I. Study procedure

An informed written consent form was obtained from the patients. Face to face interview was conducted by using a semi-structured questionnaire containing socio-demographic parameters and relevant information about clinical presentation and risk factors of ACS patients comes from low socioeconomic group. Researcher himself did physical examination and fill up the questionnaire with maintaining proper ethical measures. Data interpretation was done by researcher and encoded into statistical software.

J. Informed consent:

Consent obtained from each patients in written format.

K. Ethical issues

Before the commencement of the study, the protocol for the following study was approved by Ethical review committee (ERC) of DMCH. In all cases, informed written consent of the patients were taken following describing the aim, objectives and purpose of the study. They were also given freedom to withdraw themselves from the study whenever they want and were ensured that the information obtained from them will be kept confidential. Researcher himself did all physical Examination and taken history and review of investigation profile. The interview was in less than 30 minutes in duration. Patient were not willing to participate the study were excluded from the study and new patients were included up to fill-up of the total sample population.

L. Data Processing and Analysis:

All the data were checked and edited after collection. Then data were entered in SPSS 21 for Windows 10 program version. An analysis plan was developed keeping the objectives of the study in mind. Frequency distribution and normal distribution of all continuous variables were calculated and expressed as Mean ± SD. Significant mean difference and association were established by testing chi-square. In all cases, p value less than .05 was considered as significant.

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CHAPTER 4

RESULTS

Result

100 patients who had acute coronary syndrome met the inclusion criteria within study period. Average age calculated in study participants were 57.86±13.69 years with minimum and maximum ages of 29 and 83 years respectively. Highest frequency of ACS was found between 55 to 64 years of age (34%).Figure 1 shows the details.

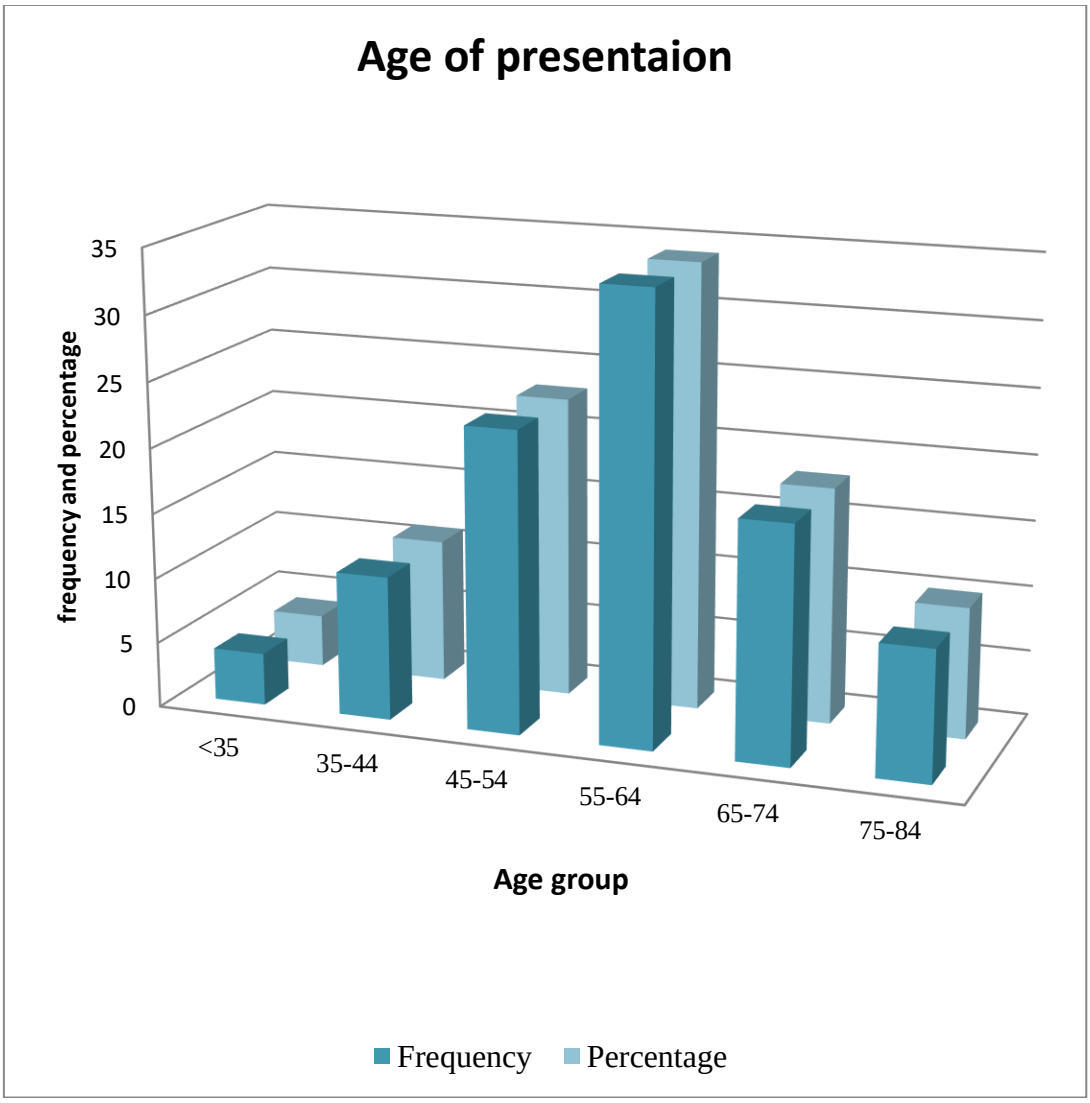

Fig. 1: Age distribution of acute coronary syndrome

Our study shows a male dominance with a male to female ratio of 2.6:1. Mean age of the two separate genders were 56.10±11.32 years and 62.80±8.24 years respectively which tells us that women are affected by ACS in later age of life than that of men. We also found that only 2% women belonged to the reproductive age group (less than 40 years). Figure 2 shows a pie chart of the distribution.

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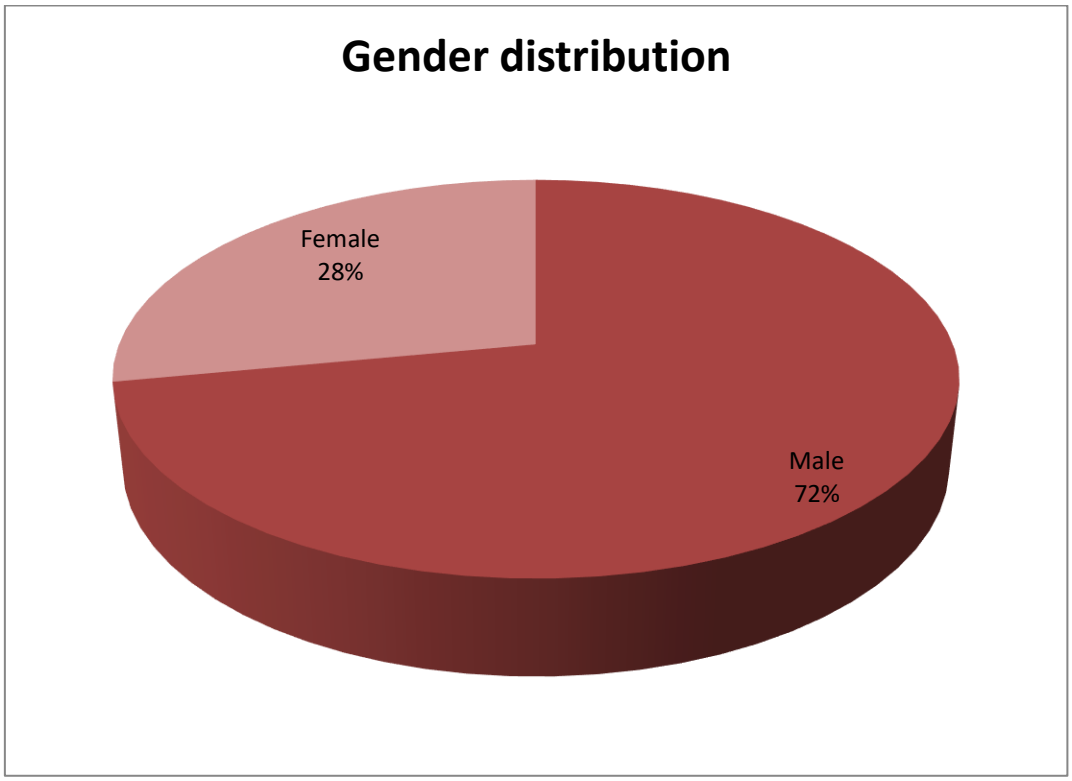

Fig. 2: Sex distribution of acute coronary syndrome

We further classified our low-income patients according to their actual income into three sub-categories. 43% of the patients belongs to 3000-4500 taka monthly income sub-group followed by 35% to >4500 taka and 22% to <3000 taka income. A doughnut chart represents the details.

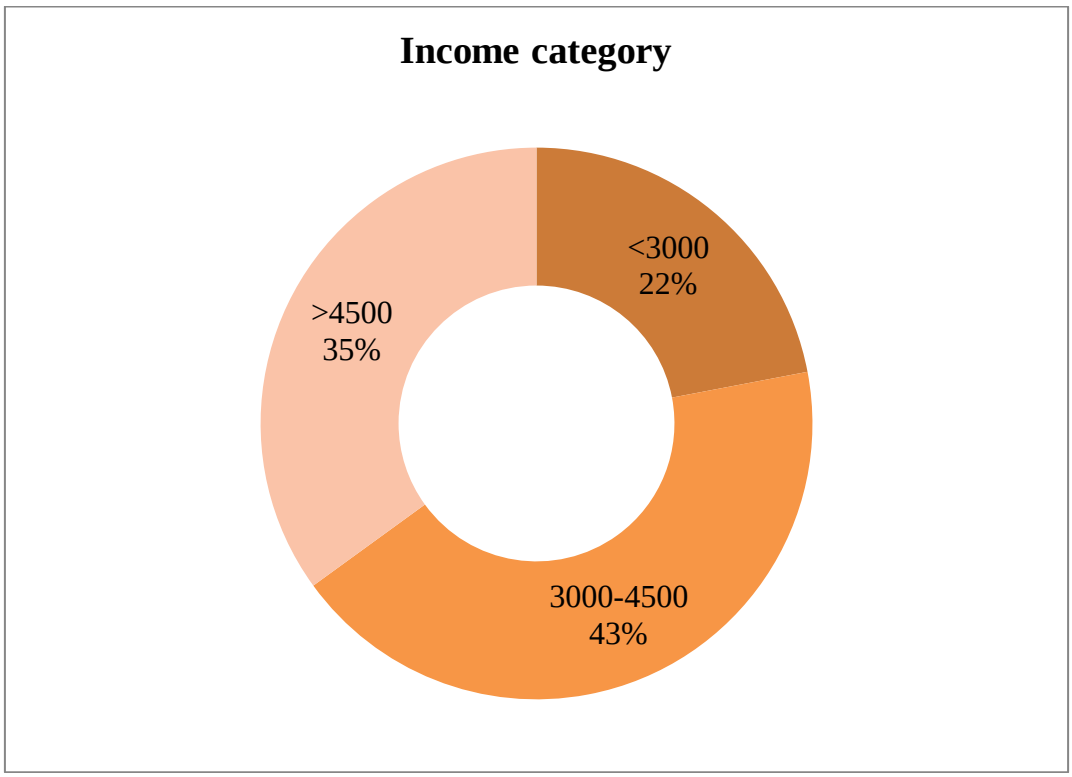

Fig. 3: Distribution of patients according to monthly income.

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Most of our patients passed secondary school certificate examination (29%). Those who passed higher secondary ranked second followed by above HSC (18%), below secondary (14%) and primary education (13%). Figure 4 shows a bar chart.

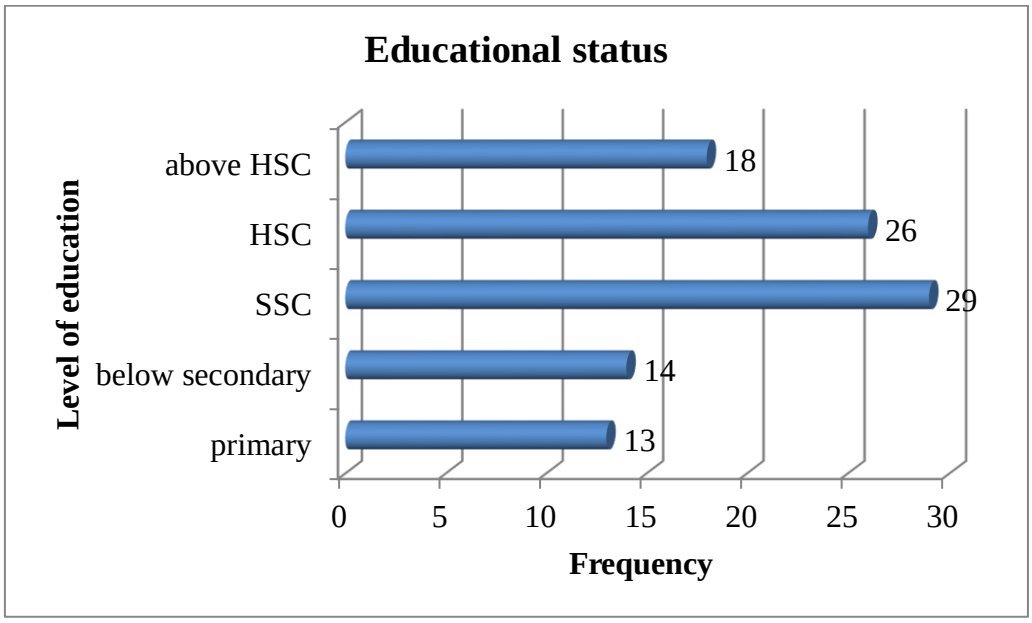

Fig. 4: Distribution of patients depending on their level of education

Among 100 patients of ACS with low socio-economic status, 29% were day laborer, 23% were rickshaw-puller. Among female, 28 patients 75% (n=21) were homemakers. See figure 5.

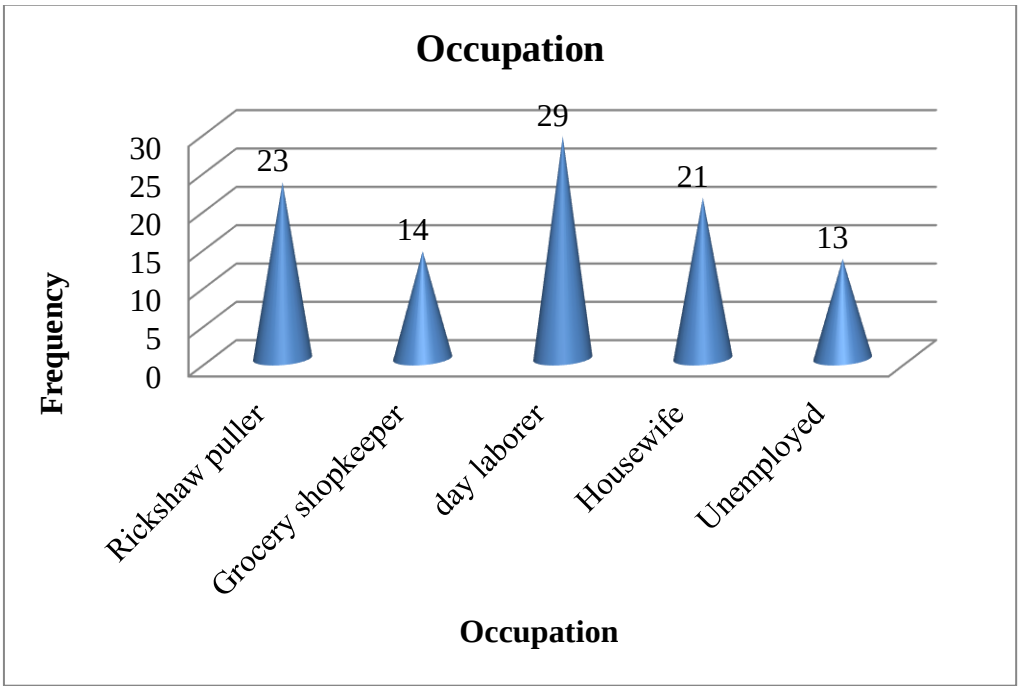

Fig. 5: Distribution of patients according to occupation.

Main risk factors among our male patients were hypertension (81.94%), dyslipidaemia (73.61%), smoking (72.22%) and family history of ACS (37.5%). Among women, dyslipidaemia (78.57%), hypertension (46.43%), over-weight of obesity (39.29%) constituted the main bulk of risk factors. HTN and smoking were found to be significant among men population compared to women (p-value < 0.05 for both risk factors). Table 1 shows more details.

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Risk factors	Male (n=72)		Female (n=28)		Chi-square, p-value
	n	%	n	%	
HTN	59	81.94	13	46.43	12.6138, 0.00038*
DM	23	31.94	8	28.57	0.1072, 0.743
Family history	27	37.5	6	21.43	2.355, 0.1248
Smoking	52	72.22	1	3.57	38.14, <0.05*
Dyslipidaemia	53	73.61	22	78.57	0.26, 0.6
Overweight or obesity	16	22.22	11	39.29	2.98, 0.084
Three risk factors	19	26.39	12	42.86	2.56, 0.11
Four risk factors	14	19.44	9	32.14	1.84, 0.18

Table 1: Risk factors of ACS

*significant value

Chest pain was found to be the most repeated manifestation among both men (84.72%) and women (75%). Next common symptoms were shortness of breath (48.61% vs 50%) and diaphoresis (33.33% vs 28.57%). Left arm pain occurred more frequently (31.94% & 21.43%) than right arm pain (13.88% & 7.14%). Table 2 gives an overview.

Initial symptom	Male (n=72)		Female (n=28)	
	n	%	n	%
Chest pain	61	84.72	21	75
SOB	35	48.61	14	50
Sweating	24	33.33	8	28.57
Nausea	16	22.22	7	25
Back pain	11	15.27	4	14.29
Left arm pain	23	31.94	6	21.43
Right arm pain	10	13.88	2	7.14

Table 2: Clinical presentation of ACS

Due to short study period, our patients were followed up for only 28 days in total. Out of 100, 11 patients died on the follow up period (11%). Death due to ACS was generally reduced as income increases with the highest death rate of 13.6% among below 3000 taka monthly income family and lowest of 8.6% among the patients whose income were more than 4500 taka. However, no significant relation was found between outcome and income. Table 3 shows the details.

Monthly income of the patients	28 day outcome		Chi-square, p-value
	Alive (%)	Dead (%)	
<3000 (n=22)	19 (86.40)	3 (13.60)	0.384, 0.825
3000-4500 (n=43)	38 (88.40)	5 (11.60)	
4501-5500 (n=35)	32 (91.40)	3 (8.60)	
Total (n=100)	89 (89)	11 (11)	

Table 3: Association between monthly income of patients and outcome of ACS

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CHAPTER 5

DISCUSSION

Extensive trials in the recent years which includes female wellbeing Initiative[92] and Women's Ischemia Syndrome Evaluation[93], elucidates the characteristics, diagnosis and outcomes in female patients, but the studies to illuminate differences in symptoms between women and men in the same cohort of patients are only handful. Evaluation of such dissimilarities is a key to prioritize treatment and level of care provided as it mostly depends on the clinical presentation of patients. Although history taking, assessment of risk factors, physical examination findings, clinical manifestations stability, life-threatening complication risks and diagnostic tests are equally essential in the recognition and management of ACS, the symptoms patients experience determines whether a person seeks treatment in an expeditious manner or seeks no treatment at all. The description of symptoms also influence the care provided by emergency medical services personnel.[94-96]

Women who were older, had lower wages, were presumed to be unemployed, were presumed to be obese, had higher mean anxiety and depression scores than men, have previously been associated to have poorer outcomes with ACS in a study titled "Effect of gender on outcomes of acute coronary syndromes" by Hasdai*et al.* in Israel.[97] This findings were further supported by more than one study.[88,98-100] The age variation for this sample (29–83 years) added weight to this study. Choosing diverse samples which includes a wide age span and people from low economic groups improves the generalizability of the study findings as it ensures that the samples are representatives of the general population. The mean age of 67 years for women furnish evidence on symptoms of ACS in older women.[88]

In a retrospective study, Muda and colleagues[101] reviewed medical records of 165 patients from Hospital University Sains Malaysia in the period of 2002 to 2004 who had confirmed CAD by angiography. They established that 92 patients (55%) had premature CAD (men aged less than 55 years and women aged less than 65 years). They also had a positive history of heart disease in family and low HDL levels. Very recently, Zuhdi et al.[102] explored NCVD-PCI registry data between 2007 to 2009 and categorized 1595 patients into young CAD (less than 45 years for men, and less than 55 years for women) and old CAD (45 years and older for men, and 55 years and older for women). 16% were grouped as young CAD who had significant active smoking habit and obesity compared to the older group. The study also found predominance towards single vessel disease in young CAD group with better clinical outcomes. Lu and Nordin in their series "A Review of Coronary Artery Disease Research in Malaysia" in 2013 showed that Malaysians are having ACS at a younger age compared to the developed countries, with a mean age of between 55.9 to 59.1 years compared to mean ages of between 63.4 to 68 years in most developed countries.[103] Our study shows a male dominance with an overall mean age of 57.86±13.69 years. Mean age of the two separate genders were 56.10±11.32 years and 62.80±8.24 years respectively which tells us that women are affected by ACS in later age of life than that of men which is also in accord with previous works.[104,105]

In case of educational status, we found that ACS events gradually decreases in higher education group compared to low-education group though no significant relationship could be establish between these two factors. Notara*et al.*[106]observed that 10-year recurrent ACS events (fatal and non-fatal) were more common in the low-education group than in the intermediate-education and high-education groups (42% vs. 30% and 35%, $p<0.001$), and no interactions between sex and education on the investigated outcomes were observed. Moreover, patients in the high-education group were more physically active, had a better financial status, and were less likely to have hypertension, diabetes, or ACS than the participants with the least education ($p<0.001$); however, when those characteristics and lifestyle habits were accounted for, no moderating effects regarding the relationship of educational status with all-cause mortality and ACS events were

observed. They concluded as a U-shaped association may be proposed for the relationship between ACS prognosis and educational status which supports our study.

Most studies suggest that diabetes is a stronger risk factor of CHD for women than men[107], but few have adjusted their results for classic risk factors: age, hypertension, total cholesterol level, and smoking[108, 109]. However, by performing a meta-analysis including 16 studies, Kanaya*et al.* reported that the excess relative risk of coronary heart disease mortality in women vs men with diabetes was absent after adjusting for classic risk factors[108]. Similar to the above findings, ACS-related mortality was similar between men and women in Chinese patients with T2DM which also supports our observations[105]. Maas also reported that coronary vascular disease is the main cause of death among women and its occurrence narrows women's survival advantage over men[110]. Cabrerizo-Garcia, et al. interpreted that ACS-related worse prognosis in women than in men was due to their unfavorable baseline characteristics rather than due to sex difference[111]. Due to the complexity of different risk factors, many controversies still exist regarding sex difference in ACS among patients with T2DM. Age, smoking, and other baseline characteristics are required to be taken into account when interpreting the effects of diabetes on the prevalence of ACS or ACS-related mortality.

Smoking, diabetes, hyper cholesterolaemia and hypertension are well established risk factors for the development of coronary artery disease[112], which presents different features in men and women. Among the cohort of Chinese patients, age, male, diabetes duration at baseline, systolic blood pressure (SBP), peripheral artery disease (PAD), total cholesterol (TC), HDL and albuminuria were independent predictors of ACS; age, diabetes duration at baseline, LDL, low HDL and albuminuria were demonstrated to be predictors of ACS in men and age, smoking, SBP, PAD, HbA1c and albuminuria in women. Although most of the risk factors have been well established[113, 114], the different profiles of risk factors reflect the variations of clinical features and mechanisms of ACS between men and women. Another previous study[113] reported that albuminuria was associated with increased insulin resistance and adverse lipid profiles, which may explain the reason why albuminuria is consistently found to be a predictor among the whole diabetic population, men or women. The identification of different predictors between men and women may provide potential targets for treatment to slow the progression of disease and to reduce the risk of ACS in individual diabetic patients. As our patients were from low socioeconomic community and were day laborer and rickshaw-puller only less than one-third were found to be diabetic which did not match previous studies.

Hypertension increased the odds of ACS only in women, and dyslipidaemia reached statistical significance only in men in Lithuania.[104] Previous literature suggests that low- density lipoprotein (LDL) cholesterol may be a less important risk factor in women, especially in premenopausal age, because oestrogen protects the arterial wall against LDL deposition.[115]

Uretskyet al.[116] investigated the effects of obesity on CV outcomes in 22 576 treated hypertensive patients with known CHD. During a 2-year follow-up, all- cause mortality was 30% lower in overweight and obese patients, despite less effective blood pressure control in these patients compared with the normal weight group. In another study of 800 elderly hypertensive patients, total mortality and CV and non-CV major events were highest in those with the leanest BMI quintile.[117] Recently, interesting results were published from a cohort study of 11 240 participants, followed up for 12 years, suggesting that prevention of smoking and physical inactivity, not a change in BMI would prevent 13% of deaths.[118] Some studies suggest that although obesity may be a powerful risk factor for hypertension and left ventricular hypertrophy, obese hypertensive patients may paradoxically have a better prognosis, possibly because of having lower systemic vascular resistance and plasma renin activity compared with leaner hypertensive patients.[119] The association of overweight or obesity with ACS was insignificant in our study. Conclusions of Ceponien*et al.* were also in concert with ours regarding overweight or obesity.[104] Smoking was highly prevalent in the ACS subgroup, especially in younger age subgroups, and significantly increased the risk of ACS. The association was particularly strong in women in Lithuania[14] but not in our study as smoking is not so prevalent in our country. As a result, it was found to be a significant risk factor only among males. The association of smoking with CVD was confirmed in numerous studies.[120] In our study younger patients were more likely to

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be males, smokers and to have dyslipidaemia which goes in tandem with previous one.[104] About one-third of ACS patients possessed four risk factors in our series where in Ceponies*et al.* more than a half of young ACS patients possessed four risk factors.[104] The prevalence of hypertension did not differ between age categories. Several other studies have investigated the impact of age on the prevalence of CV risk factors.[121] A recent prospective multicentre study by Ahmed *et al.*[122] found that younger patients with ACS were more often obese, smokers, and had a positive family history of coronary heart disease (CHD), whereas older patients were more likely to have diabetes mellitus, hypertension, and dyslipidaemia which matches with ours. As we followed up our patient only for 28 days, predictive value of these risk factors for ACS and ACS related mortality could not be explored.

Gillis *et al.*[87] reviewed 11 studies and found chest pain is the most frequent symptom of ACS.[123-133] The 3 common chief complaints are chest pain, SOB, and diaphoresis.[123,128-132] Of older adults, 50% to 80% report chest pain,[123-133] 40% to 60% report SOB, and 15% to 56% report diaphoresis.[123,124,129,131-133] Approximately 20% of older adults report nausea and back pain.[123,124,129,130-133] Left arm pain occurs more frequently (23%-35%) than right arm pain (6%-15%).[129,132] Whereas 6 studies report chest pain, 2 report that up to 24% of older adults do not report chest pain when presenting to the emergency department with ACS.[125,126] Older adults with ACS who present without chest pain are more likely to die in the hospital compared with patients aged younger than 65 years with chest pain.[124-128] In fact, older women with chest pain or discomfort are twice as likely to die in the hospital compared with younger women with the same complaint (13% vs 3.7%, P < .001).[125] Similarly, older men with chest pain are twice as likely to die in the hospital as men aged younger than 65 years with chest pain (6.6% vs 2.4%, P < .001).[125] Older women with ACS who present without chest pain have a 6-fold increase in hospital mortality rate compared to women less than age 65 years with chest pain (21.2% vs 3.7%, P < .001).[125] Furthermore, older men without chest pain are more likely to die in the hospital compared with men aged younger than 65 years with chest pain (22% vs 2.4%, P < .001).[125] Chest pain is more common in men, whereas nausea is more common in women.[129,130] Diaphoresis is the least common chief complaint of both genders. [129,130] Our findings slightly varied from previous works with chest pain being the most common initial symptom among both men and women. We also noticed that patients who presented without chest pain had higher incidence of mortality which is in line with previous observaions.[124-128]

The results of the current study showed a statistically significant association between socio-economic status (SES) and in-hospital mortality in that the low-SES patients were more likely to die from the ACS than their high-SES counterparts. Whereas in western countries socioeconomic deprivation has shown a correlation with disease-specific mortality, in developing countries this association is not well documented.[134, 135] Furthermore, even in different western settings, this association has not been consistent.[136] However, the association between SES and in-hospital mortality has been found elsewhere. For instance, Welch et al.,[137] who assessed 84,423 patients of a critical care unit in England, found an association between increased socioeconomic deprivation and increased risk of hospital mortality (OR: 1.19, 95% CI: 1.10–1.28). Furthermore, Hutchings et al.[138] studied 51,572 patients admitted to intensive care units and found that, compared to the most socioeconomically deprived patients, the OR for hospital mortality in the least deprived patients was 0.70 (95% CI: 0.58–0.84). Lower-SES groups may also suffer from receiving lower quality treatment. A study by Shen et al.[139] on 95,971 patients with acute MI in the United States found that disadvantaged patients might even receive fewer specialized procedures probably due to higher levels of severity and financial barriers. However, other studies have found contrary results reporting an absence of association between SES and hospital mortality. Ciccone et al.[140] studied 49,949 patients admitted to a general hospital in Turin, Italy. After adjustment for possible confounders, the authors found that social class had no association with in-hospital mortality. Furthermore, a study in Canada by Pilote *et al.*, [141] who investigated 145,882 patients admitted to acute care hospitals, found no significant association between SES and short-or long-term mortality. As we studied only 100 patients all of whom were of low-socioeconomic profile and followed up for a very short period, an association between socioeconomic status and ACS & ACS related mortality could not be established but when we further classified the monthly income, a trend of decreased mortality was noted as income increased though was not significant.

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Presentation of heart attack is multi-faceted and subtle in geriatric age groups while young males are more prone to be smoker and have dyslipidaemia though mortality is similar among low-income sub-groups.

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CHAPTER 6

CONCLUSION

Human Development indices can influence the final outcome of medical problems. Multiple research found that poor economy is persistently related with cardiac risk factors and heart conditionsparticularly ACS. However, the temporal link between SES and clinical presentations, risk factors and outcome afterIschaemic Heart disease-related hospitalization are no pertinent. In this study, the chest pain, dyspnea, sweating, radiation of pain and nausea are most common clinical presentation. Among the risk factors hypertension, dyslipidaemia, smoking, family history and DM are the most frequently identified.

A. Limitation of the study

- Study design cross-sectional in nature
- Limited sample size.
- Data was collected from a single center.

B. Recommendations

- Further case-control or cohort studies can be recommended to establish the relationship between the outcome of ACS patients with low socioeconomic status

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