

ORIGINAL ARTICLE

THE CROWD OF ACUTE CORONARY SYNDROME IN A RURAL EMERGENCY ROOM OF PAKISTAN: DISTRIBUTION OF DEMOGRAPHIC, CLINICAL, AND ANGIOGRAPHIC CHARACTERISTICS

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Objectives: Data are available regarding pattern of acute coronary syndrome (ACS) in urban areas of Southeast Asia. We conducted a study to assess the demographic, clinical, and angiographic characteristics and management strategies in patient presenting with ACS arriving in emergency room (ER) of satellite center located in rural area.

Methodology: It was a cross-sectional study done at tertiary cardiac care center located in rural area of Pakistan. In February to March 2021, 355 patients with ACS were included in this study. Patients were categorized into STEMI (ST-segment elevation myocardial infarction), NSTEMI (Non ST-segment elevation myocardial infarction), and USA (unstable angina).

Results: A total number of 4210 patients visited the ER out of which 355 patients were with ACS. Mean age was 56±10 years and 43% of patients were <60 years of age, 80.6% of patients were male and presentation with symptoms duration of ranging from 1 hour to 7 days range. Hypertension was prevalent in (52.7%) followed by diabetes in 33% and smoking (29%). STEMI and NSTEMI were the predominant types of ACS (50.4% and 33.5%). Primary PCI was done in 97% of eligible patient presenting within window period and percutaneous revascularization was performed in 69% of ACS patients. In-hospital mortality was noted in 1.1%.

Conclusion: STEMI and NSTEMI were the predominant type of ACS. Majority of patients were male and hypertension was the most prevalent risk factor followed by diabetes and smoking. Significant improvement has been achieved in the management of ACS with in-hospital mortality remain 1.1%.

Keywords: Acute coronary syndrome, Revascularization, Primary PCI, Rural areas

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INTRODUCTION

Ischemic heart disease is still the leading cause of mortality and morbidity in world.¹ Acute coronary syndrome a subset of ischemic heart disease consists of unstable angina, non-ST-elevation myocardial infarction, and ST-segment elevation myocardial infarction are life threatening disorders that are major causes of emergency medical care and hospitalizations.² Although the incidence of acute coronary syndrome is declining over past few decades due to decreased number of patient presenting with unstable angina (UA), but there are increased number of patients with acute coronary syndrome (ACS) undergoing revascularization.³⁻⁶ Although because of

widespread use of revascularization mortality due to acute coronary syndrome is decreasing, it still remains high in middle and lower income countries.^{7,8} Management of acute coronary syndrome in emergency department includes antiplatelet medications and anticoagulation therapy and strategy of revascularization. Timing of revascularization depends on subtype of the ACS which can be primary percutaneous coronary intervention (PCI), immediate, early or delayed and have shown to improve patient mortality.⁹⁻¹²

National Institute of Cardiovascular Diseases, (NICVD) after constitution of its 9 satellite centers is providing improved cardiac care for cardiovascular

health since 2017. There is enormous increase in number of revascularization due to free of cost availability and increase in number of available primary operators and technical staff. It received all the patient of cardiac issue from all over the country.

Although few studies have been carried out in subcontinent mostly from urban region there is not sufficient data regarding rural population which comparatively has less sedentary life style. The purpose of study is to study the pattern of acute coronary syndrome and characteristics of population presenting with acute coronary syndrome at our satellite center which is responsible for covering rural population of Sindh province of Pakistan. This study will help in introspection of quality of care and also will help in devise a plan for adequate minimize this lethal disease. The rationale of this study was to assess the demographic, clinical, and angiographic characteristics and management strategies in patient presenting with ACS arriving in emergency room (ER) of satellite center located in rural area.

METHODOLOGY

It was a cross-sectional study done at satellite center responsible for covering rural areas of Sindh province of Pakistan including areas of district Badin, Tando Mohammad Khan, Thatta, Hyderabad and few rural areas of District Sangahr and Umerkot. Study was conducted for duration of two months. Data was collected after approval of ethical committee (ERC-64/2020). All patients who were diagnosed as acute coronary syndrome regardless of Killip Class were included in the study after informed consent. Patients presenting with ACS along with concomitant valvular heart disease, patients diagnosed with ACS along with end stage renal disease and patients presenting with acute exacerbation of heart failure in which causative factor was other than ischemia were excluded from study. In February to March 2021 despite ongoing COVID Pandemic 4210 patients visited ER of NICVD satellite center of which 565 Patients were admitted. After informed consent 355 patients with ACS were included in this study. Patients were divided into STEMI, NSTEMI and USA.

Patients population were assessed for age group, gender, chest pain time, risk factors and whether revascularization or primary PCI was done or not. Additional information like presence of cardiogenic shock, mechanical ventilation, intra-aortic balloon pump (IABP) usage, and in hospital mortality was also noted. Treatment strategies of ACS include Medical management only and medical management along

with revascularization. Percutaneous revascularization is defined as PCI of culprit artery done as primary PCI for STEMI or early invasive strategy for the NSTEMI-ACS. STEMI was defined as persistent ischemia along with new ST elevation at the J point in at least 2 contiguous leads of 2 mm (0.2 mV) in men or 1.5 mm (0.15 mV) in women in leads V2–V3 and/or of 1 mm (0.1mV) in other contiguous chest leads/limb leads Or new or presumed new LBBB along with persistent ischemia. Late arrival was defined as > 24 hours since onset of symptoms or >12 hours since onset of symptoms without ongoing pain. NSTEMI and unstable angina here were defined as episodes of chest pain at rest or with minimal exertion, which increase in frequency or severity, often with dynamic ECG changes along with raised troponin levels or without raised troponin levels respectively.

All the invasive procedures including diagnostic angiography and PCI were after written consent from patient and after discussing the risk vs. benefit ratio to patients and all invasive procedures were performed by trained interventionist. STEMI late arrival was considered for revascularization if they had Post MI angina and viable area of myocardium on noninvasive test. Multi-vessel disease that underwent percutaneous revascularization of culprit artery based on ECG and morphology of lesion were planned for staged PCI. Patients with NSTEMI and unstable angina who did not underwent percutaneous revascularization of any vessels were either referred for surgical revascularization or were kept on medical management depending on complexity of lesions.

Collected data were analyzed with the help of IBM SPSS version 19. Data were presented as mean \pm standard deviation (SD) and frequency (%), appropriately. Patients were further stratified based on age and appropriate ANOVA or Chi-square test were applied to compare demographic, clinical, and angiographic characteristics and management strategies with $p \leq 0.05$ level of significance.

RESULTS

In February 2021 despite ongoing pandemic 4210 patients visited the ER of NICVD Tando Mohammad Khan satellite center out of which 355 patients with acute coronary syndrome were included in Study. Baseline characteristics of patients are highlighted in table 1. Majority of our patients were male with a male to female ration of 4:1. Among risk factors of ischemic heart disease 52% of patients have hypertension as risk factor followed by diabetes, smoking in 33%, and 29% respectively (Table 1). Among these ACS patients 50% (n=179) patients present with STEMI, 33%

(n=118) patients present with NSTEMI and 16% (n=58) presented with Unstable Angina. Among Patients with STEMI 80.5% (n=144) presented within window period of primary PCI and 19.5% (n=35) Patients arrived with late presentation. Among Patients presenting with STEMI who were eligible for primary PCI 98% (n=142) patient underwent Primary PCI. Among STEMI who underwent primary PCI 87.3% (n=124) presented within 12 hours of onset of symptoms and about 12.6% (n=18) presented within 12-24 hours of symptoms.

Table 1: Demographic and clinical characteristics of ACS Patients in 2021

| Characteristic | Total |
|---|---------------|
| Total (N) | 355 |
| Gender | |
| Male | 80.6% (286) |
| Female | 19.4% (69) |
| Age (years) | 56.27 ± 10.93 |
| < 60 years | 43.3% (154) |
| ≥ 60 years | 56.6% (201) |
| Co-morbid conditions | |
| Diabetic Mellitus | 33% (117) |
| Hypertension | 52.7% (187) |
| Smoking | 28.7% (102) |
| Hyperlipidemia | 2.8% (10) |
| Family History | 3.4% (12) |
| Chronic Kidney Disease | 0.6% (2) |
| Time since onset of symptoms (hours) | 2 [1 - 3] |
| ≤ 2 hours | 13.8% (49) |
| 2 to 6 hours | 26.3% (95) |
| 6 to 12 hours | 33.8% (120) |
| >12 hours | 25.6% (91) |
| Type of ACS | |
| STEMI | 50.4% (179) |
| NSTEMI | 33.5% (119) |
| Unstable Angina | 16.1% (57) |
| STEMI late arrival | 9.9% (35) |
| ^Type of STEMI | |
| Anterior wall | 58.1% (104) |
| Inferior wall | 35.8% (64) |
| Lateral wall | 5% (9) |
| Posterior wall | 1.1% (2) |
| TIMI Score | 3.26 ± 1 |
| Cardiogenic shock | 2% (7) |
| Heart failure | 8.2% (29) |
| Mechanical ventilation | 2.8% (10) |
| IABP support | 1.7% (6) |
| Percutaneous revascularization | 70.1% (249) |
| Primary PCI performed | 40% (142) |
| LHC performed | 86.2% (306) |
| ¥Left Main significant disease (≥50%) | 10.8% (33) |
| Significant disease in other vessel (≥70%) | |
| ¥Single Vessel Disease | 34.3% (105) |
| ¥Double Vessel Disease | 34.6% (106) |

| | |
|------------------------------|----------|
| ¥Three Vessel Disease | 31% (95) |
| In-hospital mortality | 1.1% (4) |

STEMI= ST elevation myocardial infarction, STEMI_LA = ST elevation myocardial infarction late arrival, NSTEMI= non ST elevation myocardial infarction, LHC= left heart catheterization, IABP= Intra-aortic balloon pump

^based on patients with STEMI, ¥ based on patients in whom LHC performed

Left heart catheterization was performed in 86 % (n=306) of ACS patients out of which 10.7% (n=33) had significant left main stem disease. Among patient who underwent left heart catheterization prevalence of single, double and triple vessel disease was 34.3%, 34.6% and 31% respectively. Percutaneous revascularization was done in 69% (n=249) of ACS patients. Among patients who underwent percutaneous revascularization 65% (n=162) were STEMI, 26% (n=64) were NSTEMI and 8% (n=19) patients were with Unstable angina (Table 2). Out of 355 patients 7(2%) of ACS patients presented with cardiogenic shock among which 4 were with STEMI and 3 were with NSTEMI. In ACS patients with cardiogenic shock only 4 patients out of 7 patients were able to survive. IABP was inserted in 2% (n=7) of ACS patients and about 2.8% (n=10) required mechanical ventilator support. In hospital mortality was 1.1% and myocardial pump failure and cardiogenic shock was the major cause of mortality. Patients with STEMI who had multi vessel disease were planned for Stage percutaneous or surgical revascularization after PCI of Culprit vessel. 85% (n=102) of patients with NSTEMI and Unstable Angina underwent diagnostic angiography and percutaneous revascularization was done in 77% (n=79) of patients.

Table 2: Age wise distribution of the disease and parameters

| | Age 40 or below | Age between 41-59 | Age 60 or above |
|-----------------------------|-----------------|-------------------|-----------------|
| Total (N) | 28 | 172 | 155 |
| Sex | | | |
| Male | 82.1% (23) | 81.4% (140) | 79.4% (123) |
| Female | 17.9% (5) | 18.6% (32) | 20.6% (32) |
| Co-morbid conditions | | | |
| Diabetes | 10.7% (3) | 37.2% (64) | 32.3% (50) |
| Hypertension | 35.7% (10) | 52.3% (90) | 56.1% (87) |
| Smoking | 32.1% (9) | 27.9% (48) | 29% (45) |
| Hyperlipidemia | 0% (0) | 3.5% (6) | 2.6% (4) |
| Family History | 7.1% (2) | 2.3% (4) | 3.9% (6) |
| Chronic Kidney Disease | 3.6% (1) | 0% (0) | 0.6% (1) |

| Diagnosis | | | |
|---|------------|-------------|-------------|
| STEMI | 60.7% (17) | 51.2% (88) | 47.7% (74) |
| NSTEMI | 25% (7) | 31.4% (54) | 37.4% (58) |
| Unstable Angina | 14.3% (4) | 17.4% (30) | 14.8% (23) |
| Percutaneous revascularization | 64.3% (18) | 73.8% (127) | 67.1% (104) |
| Primary PCI | 35.7% (10) | 41.9% (72) | 38.7% (60) |
| LHC performed | 82.1% (23) | 88.4% (152) | 84.5% (131) |
| ¥Left main disease (≥50%) | 4.3% (1) | 10.5% (16) | 12.2% (16) |
| Significant disease in other vessel (≥70%) | | | |
| ¥Single Vessel Disease | 52.2% (12) | 28.9% (44) | 37.4% (49) |
| ¥Double Vessel Disease | 26.1% (6) | 39.5% (60) | 30.5% (40) |
| ¥Three Vessel Disease | 21.7% (5) | 31.6% (48) | 32.1% (42) |
| In-hospital mortality | 0% (0) | 1.3% (2) | 1.5% (2) |

STEMI= ST elevation myocardial infarction, STEMI_{LA} = ST elevation myocardial infarction late arrival, NSTEMI= non ST elevation myocardial infarction,

¥ based on patients in whom LHC performed

DISCUSSION

The study was conducted in our satellite center covering rural areas of Sindh province of Pakistan. We observed that as in the previous studies from the region majority of our patients were male with male to female ratio almost 4:1. STEMI was predominant type of ACS in our population followed by NSTEMI and Unstable angina. A large study conducted by Jafary MH et al. in the region showed USA was the major types of ACS 43.0% of All ACS patients in their study while we found that USA was least frequent type of ACS in our population and found in only 16% of patients.¹³ The study was conducted 15 years back showing change in the temporal presentation of ACS which may be result improved medical management and increased number of revascularization being performed in the region. Another study conducted in underdeveloped areas of region showed STEMI as predominant type of ACS and Hypertension as most prevalent risk factor similar to our study, about 2/3 of their STEMI patients were thrombolized with in hospital mortality of >6%.¹⁴ Compared to that study Primary PCI was performed in our 97% of eligible patients in our center and with In-hospital mortality of 1.1% showing significant improvement in management and In-hospital mortality. This also endorses the importance of Primary PCI in reducing mortality which has been recognized since almost three decades. AHA and ESC guidelines have considered Primary PCI as first line therapy for

STEMI patients.^{9,15} Various clinical trials have also shown importance of Primary PCI in improving mortality and morbidity of patients presenting with STEMI.¹⁶⁻¹⁸ On the other hand revascularization has also been mainstay of treatment for patients presenting with NSTEMI and Unstable angina.^{10,19} In our study 54% (n=64) of NSTEMI and 50% (n=19) of USA angina patients also underwent percutaneous revascularization reminder were either referred for coronary artery bypass graft (CABG) surgery or kept on medical management (Table 2).

Hypertension was most prevalent risk factor found in our population however as compared to a study conducted in urban areas of Pakistan found to be hyperlipidemia to be most prevalent risk factor found in 91% as compared to 2.8% in our population.²⁰ This significant change might be because of change the socioeconomic profile of these two population under study. Cardiogenic shock was found traditionally found to be associated with high mortality reaching up to 70-90% in the absence of expertise and in our region it was noted around 45% in a study conducted in local state of art hospital located in urban areas.²¹ However in our study we received only 7 (2%) of patients cardiogenic shock with and out of which 4 patients were able to survive showing almost similar mortality trends in these high risk patients.

We also observed also observed that around 8% (n=28) of patients were younger than 40 years, age wise distribution of risk factors and disease pattern is given in table 2. Data regarding patients of ACS patients < 40 years of age from urban area of region showed that majority of patients in this age group are male and have either hypertension or smoking as most prevalent risk factor.^{22,23} We also found similar finding in this age group as majority of ACS patients less than 40 years of age are male and hypertension followed by smoking was most prevalent risk factor in this age group.

Finally diagnostic coronary angiography was performed in 86% of patients and shows that 9.3% of patients were having significant > 50% left main stem disease. A study conducted in urban areas of the region showed 23.1% of patients having three vessel disease in STEMI patients as compared to overall 31% in all ACS patients and 21.4% of STEMI patients in our study.²⁴ Another study conducted from urban areas of the region by showed less extensive coronary artery in ACS patients younger than 40 years of age and 2/3 pf

patients having single vessel disease.²² We also found that Single vessel disease was present in around 43% age <40 years of age as compared to 70% patients in that study and triple vessel disease was found in only 18% of patients as compared to 5.9% in that study.²²

Study was limited by patient was followed up to discharge from hospital and long term mortality were not known. Complete revascularization in NSTEMI and Multivessel disease has been found to be superior to culprit only.²⁵ We used lesion complexity and syntax score and patients preference for the decision regarding mode of revascularization. Optimal revascularization strategy for NSTEMI-ACS and multivessel regarding immediate complete revascularization or culprit-only plus staged complete revascularization remain unknown. Perhaps an ongoing BIOVASC study may answer the question.

CONCLUSION

Review of data collected from rural population was slightly different than the previous data collected from region. STEMI and NSTEMI were the predominant type of ACS. Majority of our patients were male and hypertension was the most prevalent risk factor followed by diabetes and smoking. Significant improvement has been achieved in the management of acute coronary syndrome with in-hospital mortality remain 1.1%. Patients presenting with unstable angina has markedly decreased possibly because of improved medical management and increasing number of patients undergoing revascularization.

AUTHORS' CONTRIBUTION

SA and GAS: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. TS, SA, and AM: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

Conflict of interest: Authors declared no conflict of interest.

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