Clinico-Epidemiological Profile of Patients Presenting with Acute Chest Discomfort at Tertiary Care Hospital in Southern Rajasthan, India: A Prospective Observational Study

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Abstract:

Background: Acute chest discomfort is a common presenting complaint in the patients in emergency clinic. The knowledge of clinical presentation, risk factors and point of care investigations for precise diagnosis helps in prioritizing emergent patients providing better care and optimal utilization of resources. There is a paucity of studies related to clinico-epidemiological profile of patients with acute chest discomfort in our population. We planned this study to address the knowledge gap in this field.

Methods: A prospective observational study of patients presenting with acute chest discomfort was conducted in the emergency unit of our tertiary care hospital. We included adults above the age of 18 years from December 2022 to December 2023 and excluded trauma patients. A standardized form was used to document patient demographic patterns, comorbidities, chest discomfort description, physical findings, investigations, consultations, emergency management, and disposition. Variables having p-value ≤ 0.05 were considered to be significant.

Results: A total of 385 patients were included. The most common cause of chest discomfort was cardiac, accounting for 40.5% of patients. Majority of patients presented within 6 to 24 hours making early diagnosis and treatment possible. Echocardiography proved useful in diagnosing cardiac and pulmonary diseases, most of which (60.5%) required hospitalisation. Patients with musculoskeletal, gastrointestinal and psychiatric factors were mostly discharged (38.2%) from emergency unit.

Conclusion: ACS followed by respiratory causes are the predominant etiologies of acute chest discomfort in the emergency unit. Knowledge of the differential diagnosis of acute chest discomfort can aid in prompt diagnosis and delivery of life saving treatment to these patients.

Keywords: Acute Chest Discomfort, Clinico-Epidemilogical Profile, Acute Coronary Syndrome.

Introduction

Acute chest discomfort is a frequent presenting symptom in emergency and cardiology clinics worldwide. This condition encompasses a spectrum of sensations, including pain, pressure, or tightness in the chest region, typically extending from the jaw to umbilical region and back.[1] The challenge for healthcare providers lies in differentiating between life-threatening and benign causes of this symptom.

In the realm of emergency medicine, rapid and accurate diagnosis is paramount. Clinicians must be vigilant for potentially fatal conditions such as Acute coronary syndrome (ACS), aortic dissection, pulmonary embolism (PE), ruptured aortic aneurysm, and tension pneumothorax.[2] Simultaneously, they must conduct thorough evaluations for less severe cases to establish precise diagnoses and appropriate treatment plans. The nature of chest discomfort can be broadly categorized into somatic and visceral origins. Somatic pain typically arises from musculoskeletal structures, organ coverings, and skin, while visceral pain emanates from organs such as the heart and liver.[3]

A methodical assessment of pain characteristics is crucial, as the patient's description often provides vital clues to the underlying cause. Anginal pain, a key concern in chest discomfort presentations, is frequently described as dull, heavy, or crushing. Patients often perceive it more as pressure than pain. In contrast, sharp, stabbing, or burning sensations are less commonly associated with angina. The location of the pain is typically substernal or across the anterior chest, with potential radiation to the left arm, and occasionally to the right arm, jaw or neck.[4]

Acute coronary syndrome (ACS), a group of conditions characterized by sudden reduction in coronary blood flow, remains a primary concern in chest pain evaluation.[5] For patients presenting with activity-induced chest pain, determining the level of exertion that triggers discomfort is crucial. A decrease in the threshold for pain onset may signal a need for immediate medical intervention.[6]

However, the differential diagnosis is broad, encompassing various cardiac, pulmonary, gastrointestinal, and musculoskeletal conditions. Associated symptoms can offer valuable diagnostic insights. Respiratory symptoms might point towards pulmonary pathologies, while gastrointestinal symptoms could suggest digestive system involvement. Interestingly, research has indicated that some patients with non-cardiac chest pain and normal coronary angiograms may have underlying psychiatric conditions such as panic disorder, anxiety, or depression.[7]

Despite the prevalence of acute chest discomfort in emergency settings, there is a paucity of research on its etiology, prevalence, and outcomes in tertiary care hospitals in southern Rajasthan. This knowledge gap underscores the need for region-specific studies to enhance our understanding of local patterns and inform clinical practice. Comprehensive research in this area can potentially guide emergency physicians in providing more targeted, efficient, and cost-effective care. Moreover, such studies can contribute to the development of refined diagnostic algorithms and standardized protocols tailored to regional healthcare needs.

In light of these considerations, we conducted a study to investigate the clinical and epidemiological characteristics of patients presenting with acute chest discomfort to our emergency department. Our aim included analyzing clinico-epidemiological profile, role of investigations, emergency patients' distribution patterns and assessing 24-hour mortality rates in this patient population.

Materials and Methods

This one-year prospective, observational, hospital-based study was conducted in Department of Cardiology at our medical college hospital. Informed written consent from patients was obtained for data recording. The codes of the Helsinki Declaration were followed. Medical records of the patients maintained by the hospital were used for data collection. Patients of both genders with age $\geq$18 years, presenting with acute chest discomfort to outpatient department or emergency unit were included in this study.

Based on the hypothesis that we are estimating single proportion and assumptions that variables are categorical, sampling distribution of sample proportion is approximated as normal and observations are independent.

Sample size = [Z1-α/2]2 [100-P] P

d2

Z1 –α/2 = 1.96 (Two tailed and 5% α error)

P = Prevalence of cardiac cause for chest discomfort is 48.5% in previous study by Chanda et al. [7]

d = Absolute precision = 5%

After placing values in above formula, we require 385 patients (sample size) for our study.

Documentation of patient demographics, comorbidities, description of chest discomfort, investigations, emergency management, and dispersal was done by the attending resident doctor using a pre-structured proforma. Follow up of patients was done in the hospital till discharge or death for final diagnosis and outcome. Informed consent form was available both in English and Hindi. The collected data of patients involved in the study was kept confidential.

Microsoft Excel was used to enter the data, and SPSS version 20 (IBM Corp., Armonk, NY) was used for analysis. For the demographic characteristics, descriptive analysis was done. For categorical variables, percentages were used, and for continuous variables, mean ± Standard Deviation (SD) was used. Prior to running a statistical test, the data were examined for normality. A statistically significant P value was defined as less than 0.05.

Results

During the study period, 385 patients who visited the outpatient department or emergency unit with acute chest discomfort were included in the study. The average age of patients was 56.75 ± 18.69 years, with the majority (48%) in the 50–60-year age range. Males comprised 66.4% of the patients. Common predisposing factors for coronary artery disease (CAD) included obesity (57.4%), smoking (23.1%), and alcoholism (29%). (Table 1) The most frequent type of chest pain reported was pressure-like, radiating to both arms, more commonly to the left, occurring in 41.8% of patients. Most patients presented to the hospital between 6 to 24 hours after symptom onset. Hypertension (39.5%) and diabetes mellitus (33.5%) were the most common comorbidities observed. (Table 2)

Upon admission, 34.8% of patients had a normal sinus rhythm on ECG. ST-elevation myocardial infarction (STEMI) was observed in 27.0% of patients, and non-ST-elevation myocardial infarction (NSTEMI) in 13.5% patients. Echocardiography revealed wall motion abnormalities (LVEF<50%) in 37.9% of patients. Most chest X-rays were normal (71.7%). Diagnostic angiography was performed on 36.5% of patients who were suspected of having cardiac cause of chest discomfort. (Table 3) Ten patients received thrombolysis in the emergency and were subsequently admitted to the cardiology ICU for percutaneous coronary intervention (PCI). Stents

were placed in 24.9% of patients who underwent angiography. Intercostal chest drain (ICTD) insertion was performed for 44 patients in the emergency or ICU. A significant proportion of patients (34.3%) were admitted to the ICU. (Table 4) The 24-hour mortality rate was 3.9% (15 deaths). (Table 5)

Table 1: Demographic profile of patients

Demographic Variable	Mean ± SD, n (%)
Age (years)	56.75 ± 18.69
<40	24 (6.2)
40-50	59 (15.3)
50-60	185 (48)
60-70	82 (21.3)
>70	35 (9)
Gender	
Male	256 (66.4)
Female	129 (33.6)
BMI (kg/m2)	28.32 ± 6.98
<30	164 (42.6)
>30	221 (57.4)
Smoker	89 (23.1)
Alcoholic	112 (29)

Table 2: Patient characteristics on presentation in emergency

Variables	Mean ± SD, n (%)
Vitals at presentation	
HR (beats/min)	92.14±17.62
SBP (mm Hg)	115.78±22.85
DBP (mm Hg)	72.51±10.42
Time since symptom onset	12.23±4.57
< 6 hours	86 (22.3)
6-24 hours	142 (36.9)
24-48 hours	98 (25.4)
>48 hours	59 (15.3)
Character of chest pain	
Stabbing	52 (13.5)
Burning type	83 (21.55)
Pressure like, radiating	161 (41.8)
Sharp, non-radiating	74 (19.2)
Others	15 (3.9)
HEART Score	
0-3	278 (72.2)
≥4	107 (27.8)
Comorbidities	
None	88 (22.8)
Hypertension	152 (39.5)
Diabetes mellitus	129 (33.5)
Congestive Heart Failure	14 (3.6)
COPD	68 (17.6)
Chronic Kidney Disease	21 (5.4)

Table 3: Diagnostic tests done in emergency

Diagnostic tests	Number of patients (%)
ECG	
• Normal	134 (34.8)
• STEMI	104 (27)
• NSTEMI	52 (13.5)
• Tachycardia	46 (11.9)
• Bradycardia	22 (5.7)
• Others	27 (7)
Echocardiography	

• Normal	117 (30.4)
• Wall motion abnormalities (LVEF<50%)	146 (37.9)
• Aortic Dissection	15 (3.9)
• Pulmonary embolism	23 (5.9)
• Pleural effusion	46 (11.9)
• Pneumothorax	16 (4.1)
• Pericardial effusion	22 (5.7)
Positive Troponin I	94 (24.4)
Chest X ray	
• Normal	276 (71.7)
• Pneumonia	38 (9.8)
• Pulmonary edema	25 (6.5)
• Pleural effusion	46 (11.9)
Angiography	140 (36.5)

Table 4: Patient dispersal and treatment

Treatment	Number of patients (%)
Thrombolysis	10 (2.6)
PCI	96 (24.9)
ICTD	44 (11.4)
Patient dispersal	
• Admitted to ICU	132 (34.3)
• Admitted to ward	101 (26.2)
• Died in ED	5 (1.3)
• Discharged from ED	147 (38.2)
Place of admission	
• Cardiology ward	54 (14)
• Medicine ward	34 (8.8)
• Pulmonary ward	13 (3.4)
• ICU	132 (34.3)
• Discharged	147 (38.2)

Table 5: Twenty-four-hour mortality

Comorbidities	Number of patients (%)
Congestive Heart Failure	3 (20)
Coronary Artery Disease	6 (40)
Pneumonia	2 (13.3)
Aortic Dissection	1 (6.6)
Pulmonary embolism	3 (20)
Total	15 (100)

Discussion

Our cross-sectional, observational study aimed to evaluate the patterns of cardiac and non-cardiac causes of acute chest discomfort, associated risk factors, and diagnostic and management approaches in patients presenting to our tertiary care hospital. We collected comprehensive data on patient demographics, symptoms, comorbidities, diagnostic tests, management strategies, and 24-hour mortality rates. The age distribution of our patient population revealed a higher prevalence of acute chest discomfort in middle-aged to older individuals, with a mean age of 56.75 ± 18.69 years. This finding aligns with previous research, such as the study by Chanda et al., [7] which reported a similar mean age of 53.26 ± 16.23 years. The predominance of patients in the 50–60-year age range suggests a higher likelihood of cardiac causes, which are more common in this demographic area. Our study found that 40.5% of patients had cardiac disease (STEMI and NSTEMI), which is consistent with earlier studies by Knockaert et al. [8] and Buntinx et al. [9] This observation supports the established understanding that non-communicable diseases like ACS, hypertension, and respiratory conditions are more prevalent in older populations.

We noted a higher frequency of ACS predisposing factors in our patient cohort, including male gender, obesity, smoking, and alcoholism. These findings point towards a probable cardiac etiology for many cases. Smoking, in particular, is a well-known risk factor for cardiac-related chest discomfort due to its pro-thrombotic effects and reduction in coronary reserve flow. [10] Hypertension (39.5%) and diabetes

mellitus (33.5%) were the most common comorbidities among our patients, mirroring the results of Geyser et al.[3] The high prevalence of hypertension in ACS patients (reported between 31% and 59% in various studies) can be attributed to its role in promoting arterial plaque formation and instability. Similarly, diabetes mellitus, present in approximately 30% of ACS patients, contributes to endothelial dysfunction, plaque alteration, and increased platelet activation and coagulation. [11]

Our study reinforced the importance of ECG and cardiac biomarker screening for all patients presenting with acute chest discomfort. We performed ECG and point-of-care troponin I tests on every patient, adhering to quality care indicators for chest discomfort management in the emergency unit. Focused cardiac ultrasound has emerged as a crucial tool for rapid bedside evaluation in emergency settings. Our findings align with those of Mancuso FJ et al, who demonstrated the value of point-of-care echocardiography in confirming or altering initial diagnosis. [12] Among pulmonary causes of chest pain, we found pleural effusion (11.9%), acute exacerbation of COPD (10.3%), pneumonia (9.8%), and PE (5.9%) to be the most common. The high prevalence of COPD exacerbations in our study population can be attributed to the significant number of smokers and previously diagnosed COPD patients. Pulmonary causes generally resulted in higher admission rates, possibly due to the need for oxygen support, ventilation, or intravenous antibiotics. [13]

Gastrointestinal causes accounted for 10.3% of acute chest discomfort cases in our study. This finding underscores the importance of considering noncardiac causes, as gastro-esophageal reflux disease is often observed in recurring non-cardiac chest pain.[14] Musculoskeletal causes were identified in 6.2% of patients, which may accurately reflect the true frequency of such pathologies in emergency unit presentations of acute chest discomfort. Interestingly, only 1.5% of cases were attributed to somatization or psychiatric disorders, possibly due to limited psychiatric evaluations in the emergency setting. [15]

Our study observed that patients with gastrointestinal, musculoskeletal, and psychiatric causes of acute chest discomfort were more likely to be discharged from the emergency unit, similar to findings by Geyser et al. [3] These patients are typically referred to outpatient departments for further evaluation. Within 24 hours of ED arrival, 15 patients died, with a gender distribution of nine males and six females. Majority of these deaths were associated with cardiac causes of acute chest discomfort.

Our study has few limitations. Some patients presented with multi-organ involvement, making it challenging to attribute chest discomfort to a single system. Additionally, the inclusion of both geriatric and younger populations may have affected the distribution of etiologies, mortality parameters, and risk factors. While ACS was systematically ruled out, other causes like gastrointestinal issues were diagnosed empirically based on history and clinical examination. Lastly, we lacked follow-up data for patients discharged from the emergency after ACS was ruled out.

Conclusion

ACS followed by respiratory diseases is the predominant cause of acute chest discomfort in the emergency unit. The clinical and epidemiological profile of patients highlights the predominance of male gender, presence of smoking, alcoholism, obesity, hypertension and diabetes mellitus. Investigations in emergency including ECG, echocardiography, troponin I, chest X-ray etc. usually aid in definitive diagnosis and early initiation of treatment. The noncardiac causes of acute chest discomfort include respiratory, gastrointestinal, musculoskeletal, psychiatric, and miscellaneous (soft tissues, vascular, etc.). Hence, knowledge of the differential diagnosis of acute chest discomfort in the emergency can aid in prompt diagnosis and delivery of necessary treatment for these patients.

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