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Demographic and Clinical Profiles of Acute Coronary Syndrome Patients: Analyzing Age, Sex, Blood Pressure and BMI

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ABSTRACT:

This prospective observational study on Acute Coronary Syndrome (ACS) was conducted at Bangalore Baptist Hospital, Bangalore, involving 200 patients admitted with ACS over six months. The study evaluated the demographic profile, risk factors, diagnosis, treatment, and in-hospital outcomes of ACS patients through patient records and structured interviews. Statistical analysis was performed to identify associations between clinical and demographic variables. The results showed that STEMI was the most common form of ACS (60.5%), followed by unstable angina (20%) and NSTEMI (19.5%). Males accounted for 67% of cases, consistent with higher ACS risk in men due to factors like smoking and hypertension. The mean patient age was 64 years, with most cases occurring in the 51–70 age group. Hypertension (39%), family history of coronary artery disease (42%), smoking (24%), and diabetes (19%) were the most common risk factors. A moderate positive correlation was found between age and troponin levels, indicating more severe myocardial injury in older patients. The findings highlight the need for improved cardiovascular prevention and larger, multi-center studies to validate the results.

Keywords: Acute Coronary Syndrome, Prospective Study, Age, Sex, Blood pressure

1. INTRODUCTION:

Acute Coronary Syndrome (ACS) is a term that encompasses a group of cardiovascular conditions, including unstable angina, non-ST elevation myocardial infarction (NSTEMI), and ST elevation myocardial infarction (STEMI) **[1]**. These conditions result from a sudden reduction in blood flow to the heart, often due to the rupture of atherosclerotic plaques and subsequent thrombus formation in the coronary arteries. ACS remains a leading cause of morbidity and mortality worldwide, contributing significantly to the global burden of cardiovascular diseases. Despite significant advancements in medical therapy, interventional procedures, and preventive strategies, ACS continues to pose challenges due to its complex pathophysiology, variable presentation, and diverse risk factors **[2, 3]**.

The development of ACS is influenced by multiple factors, including lifestyle choices, genetic predisposition, and underlying comorbidities. Smoking, dyslipidemia, hypertension, diabetes, and obesity are among the most significant contributors to the pathogenesis of ACS. The interplay between these risk factors and patient-specific characteristics, such as age, sex, blood pressure, and body mass index (BMI), plays a crucial role in determining disease progression and clinical outcomes. Understanding the demographic and clinical profiles of ACS patients is essential for optimizing risk assessment, early detection, and treatment strategies to reduce the burden of cardiovascular disease and improve patient survival **[4, 5]**.

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Demographic and clinical characteristics significantly influence the presentation, management, and prognosis of ACS. Age is one of the most important determinants of ACS outcomes, as older patients tend to have a higher burden of atherosclerosis, impaired endothelial function, and multiple comorbidities. As a result, they are more likely to experience severe complications, prolonged hospital stays, and higher mortality rates. Conversely, younger ACS patients, although at lower overall risk, may have unique risk factors such as smoking, poor dietary habits, and a sedentary lifestyle that contribute to early disease onset **[6]**.

Sex differences also play a critical role in ACS presentation and prognosis. Research has shown that men typically develop ACS at a younger age than women, and they are more likely to present with classic symptoms such as chest pain. Women, on the other hand, often experience atypical symptoms, including nausea, fatigue, and shortness of breath, leading to delays in diagnosis and treatment. Furthermore, hormonal variations, differences in vascular biology, and disparities in healthcare access contribute to the variations in ACS outcomes between men and women. Addressing these differences is essential for improving early recognition and tailoring gender-specific treatment approaches **[6, 7]**.

BMI also has a complex relationship with ACS prognosis. Obesity is commonly associated with metabolic disturbances, including insulin resistance, chronic inflammation, and dyslipidemia, all of which contribute to the development of atherosclerosis and cardiovascular disease. However, studies have suggested the existence of an "obesity paradox," where overweight and mildly obese individuals may have better short-term survival following ACS compared to those with normal or low BMI. This paradox highlights the need for a deeper understanding of the role of body composition in ACS outcomes and the importance of personalized management approaches **[8]**.

By analyzing these demographic and clinical factors, healthcare professionals can improve risk stratification, enhance patient-centered treatment strategies, and develop targeted preventive measures. Identifying high-risk subgroups based on these characteristics can facilitate early intervention and contribute to reducing the overall burden of ACS-related complications **[6]**.

Despite the well-recognized impact of demographic and clinical factors on ACS outcomes, there remains a need for a more comprehensive analysis of how these variables interact to influence disease presentation and prognosis. Many studies have focused on individual risk factors, but fewer have provided a holistic view that integrates age, sex, blood pressure, and BMI to develop a clearer understanding of ACS patient profiles. This study aims to bridge this gap by examining the demographic and clinical characteristics of ACS patients and their association with disease outcomes **[9]**.

Variations in ACS outcomes based on demographic and clinical profiles highlight the importance of conducting targeted research to refine risk assessment models and enhance treatment guidelines. For instance, while older patients generally experience worse outcomes, understanding how their comorbidities interact with other risk factors can help tailor interventions to improve survival. Similarly, investigating sex-related differences can lead to improved diagnostic accuracy and treatment equity, addressing disparities in care. The role of blood pressure and BMI in influencing ACS prognosis is also an area that warrants further exploration, particularly in the context of personalized medicine **[6]**.

By systematically evaluating these key factors, this study aims to provide valuable insights into ACS risk stratification and disease management. The findings can inform healthcare policies, guide clinical decision-making, and support the development of targeted prevention strategies to reduce cardiovascular morbidity and mortality **[9]**.

This study aims to analyze the demographic and clinical profiles of ACS patients, focusing on age, sex, blood pressure, and BMI. It seeks to examine the impact of age on ACS presentation and outcomes by identifying trends in disease severity, treatment response, and prognosis across different age groups. Additionally, it will evaluate sex-based differences in symptom presentation, risk factors, and clinical outcomes to inform gender-specific management strategies. The study also investigates the role of hypertension in ACS severity, treatment success, and long-term risks while assessing the influence of BMI on disease presentation and survival, contributing to the understanding of the obesity paradox. Ultimately, the findings will provide evidence-based recommendations to improve ACS risk stratification, treatment strategies, and clinical guidelines, aiming to reduce complications and mortality **[8-10]**.

Acute Coronary Syndrome is a complex condition influenced by multiple demographic and clinical factors. Understanding how age, sex, blood pressure, and BMI impact disease progression and outcomes is essential for improving risk assessment, early diagnosis, and treatment approaches. The purpose of this study is to provide a comprehensive analysis of key variables influencing ACS, with the goal of contributing to more effective and personalized management approaches. By identifying high-risk groups and refining prevention strategies, the study intends to enhance the quality of patient care, reduce the incidence of cardiovascular complications, and ultimately improve overall survival rates **[11]**.

2. Material and Methods:

2.1 Material

The data for this study were collected from patient case sheets, which included various medical records such as the patient profile form, medication chart, laboratory data, physician and nurses' notes, discharge summary, observation chart, initial assessment record, outpatient (OP) chart, and intra-hospital referral form. Additionally, information was obtained from the medical records department to assess the patient's status at the time of discharge.

2.2 Methods

2.2.1 Study design, population and setting

This prospective observational study was conducted at a Bangalore Baptist Hospital Bellary road, Hebbal , Bangalore -560064 and included 200 patients admitted with Acute Coronary Syndrome (ACS) between December and May (6 months). Data were obtained from patient records, covering demographic details, risk factors, diagnosis, treatment, and in-hospital outcomes. Statistical analysis was performed to assess associations between various clinical and demographic variables.

2.2.2 Inclusion and exclusion criteria

This study includes adult patients diagnosed with Acute Coronary Syndrome (ACS), including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI), with or without specific ECG changes. Patients admitted to a tertiary care hospital are selected to reflect the hospital's typical patient population. A diverse group is included, representing different genders, ethnicities, and socioeconomic backgrounds to ensure a comprehensive understanding of ACS across various demographics. The identification and selection of participants will involve screening patients admitted to the hospital with a confirmed diagnosis of ACS. Informed consent will be obtained from eligible individuals, and demographic details, medical history, and clinical information will be recorded.

Patients with a history of prior heart surgery or recent major cardiac interventions, such as stent placement, are excluded to focus on new-onset ACS cases. Those with pre-existing heart conditions or non-cardiac surgeries in the recent past are also excluded to minimize confounding factors. Individuals with severe illnesses or limited life expectancy are not included, as their condition may impact study outcomes. Additionally, pregnant women are excluded due to physiological changes during pregnancy that could influence cardiovascular parameters.

2.2.3 Data collection methods (age, sex, blood pressure, BMI, etc.)

The study on ACS risk factors in a tertiary care hospital employs a systematic data collection approach, ensuring ethical compliance through institutional review board approval. Data collection integrates retrospective and prospective methods. Retrospective data from electronic health records provide insights into patient demographics, medical history, diagnostics, treatment, and outcomes, enabling pattern identification and association analysis. Prospective data is obtained through structured patient interviews using standardized questionnaires to assess lifestyle factors, psychosocial influences, and family history related to ACS. This comprehensive approach enhances the study's reliability in understanding ACS risk factors.

Structured interviews gather additional information on lifestyle factors (e.g., smoking, diet, physical activity), family history, and psychosocial influences. Standardized questionnaires may be used to ensure consistency and facilitate quantitative analysis. Clinical examinations, including physical assessments and laboratory tests, provide supplementary data, measuring key biomarkers like blood pressure and cholesterol levels.

Follow-up assessments may be conducted to monitor long-term outcomes and recurrence of ACS, offering insights into the persistence of risk factors over time. This comprehensive approach enhances understanding of ACS risk factors, aiding in prevention and management strategies.

2.2.4 Study procedure

This study employs a structured and rigorous methodological approach to investigate risk factors associated with acute coronary syndrome (ACS) in patients at a tertiary care hospital, ensuring the reliability and validity of the findings. It will begin with the development of a comprehensive research protocol outlining the objectives, study design, and criteria for inclusion and exclusion.

2.2.5 Clinical Assessments

Participants will undergo detailed clinical evaluations, including blood pressure monitoring, anthropometric measurements, and laboratory tests to assess lipid profiles, glucose levels, and other key biomarkers. These assessments will provide a comprehensive understanding of their cardiovascular health.

2.2.6 Data Analysis

Statistical techniques will be utilized to analyze the data, incorporating descriptive statistics to summarize participant characteristics and inferential statistics to examine associations between risk factors and ACS occurrence. Multivariate analysis may be applied to account for confounding variables and evaluate the independent effects of identified risk factors.

2.2.7 Ethical Considerations

The study will strictly adhere to ethical guidelines, ensuring participant privacy and confidentiality. The research protocol will undergo institutional review board approval to maintain compliance with ethical standards. By employing rigorous methodological procedures, this study aims to generate valuable insights into ACS risk factors in a tertiary care hospital, contributing to improved preventive and treatment strategies for this significant cardiovascular condition.

3. Result and Discussion

The study on ACS at Bangalore Baptist Hospital identified several important findings consistent with global and national research on cardiovascular diseases. The results offer a detailed overview of the demographics, risk factors, and outcomes among ACS patients, providing valuable insights for better understanding and managing the condition. Data were collected from 200 patients admitted to the hospital with ACS over the past six months.

3.1 Acute Coronary Syndrome: Age Distribution

The age distribution graph **(Figure 1)** shows that the majority of ACS patients are between the ages of 51 and 70 years, with the highest number of patients (61) in the 51–60 age range. The prevalence decreases in the younger (31-40 years) and older (81-90 years) age groups, suggesting that middle-aged to elderly individuals are at higher risk of ACS. The majority of ACS patients in this study were between the ages of 51 and 70 years. This is consistent with previous studies indicating that ACS is most prevalent in middle-aged and elderly populations. The mean age of ACS patients in this study was 64 years, which aligns with similar findings by Dilip et al., where the mean age was 62.57 years in a study conducted at a tertiary care hospital in Kerala **[12]**.

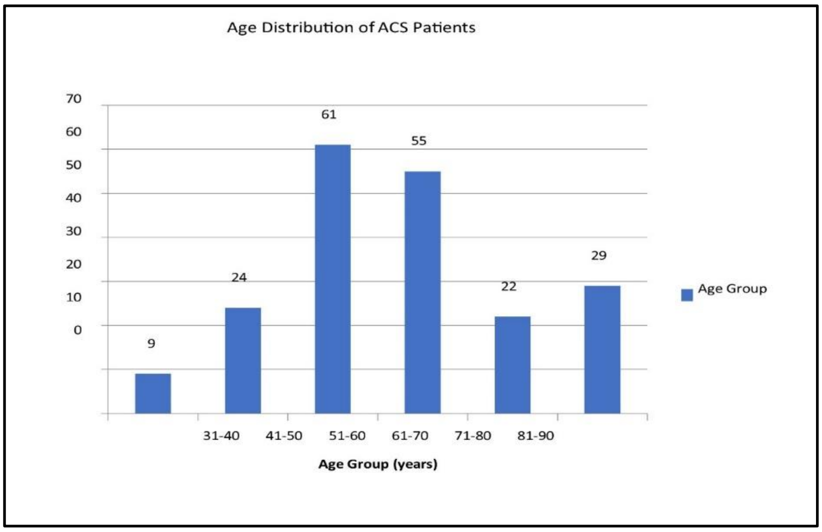


Figure 1: Age wise distribution of ACS patients.

3.2 Acute Coronary syndrome: Gender distribution

Males account for a significantly larger share (67%) of ACS cases compared to females (33%). This higher prevalence in men is consistent with established findings that men are more susceptible to coronary artery disease at younger ages, partly due to higher rates of traditional risk factors such as smoking, alcohol use, and hypertension. In contrast, premenopausal women benefit from the cardioprotective effects of estrogen, which likely contributes to the lower incidence of ACS in females. **Figure 2** shows ACS diagnostic distribution among test population. The gender distribution in the present study indicates a markedly higher incidence of Acute Coronary Syndrome (ACS) among males, accounting for 67% of the total cases, compared to 33% in females. This male predominance aligns with findings from previous research, including the study by Ralapanawa et al. conducted in Sri Lanka**,** which also reported a significantly greater occurrence of ACS in male patients. The observed trend may be attributed to a combination of biological, behavioral, and lifestyle factors, such as higher rates of smoking, alcohol consumption, and occupational stress among men, as well as gender differences in hormone profiles**,** particularly the protective cardiovascular effects of estrogen in premenopausal women. These findings underscore the need for targeted awareness, screening, and preventive strategies that consider gender-specific risk factors in the management of ACS. This higher prevalence in men is likely due to the greater prevalence of traditional risk factors, such as smoking and hypertension, among males compared to females **[13]**.

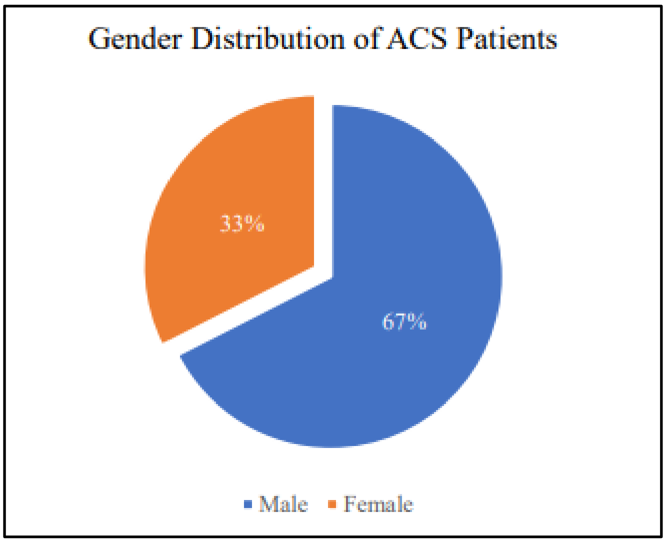
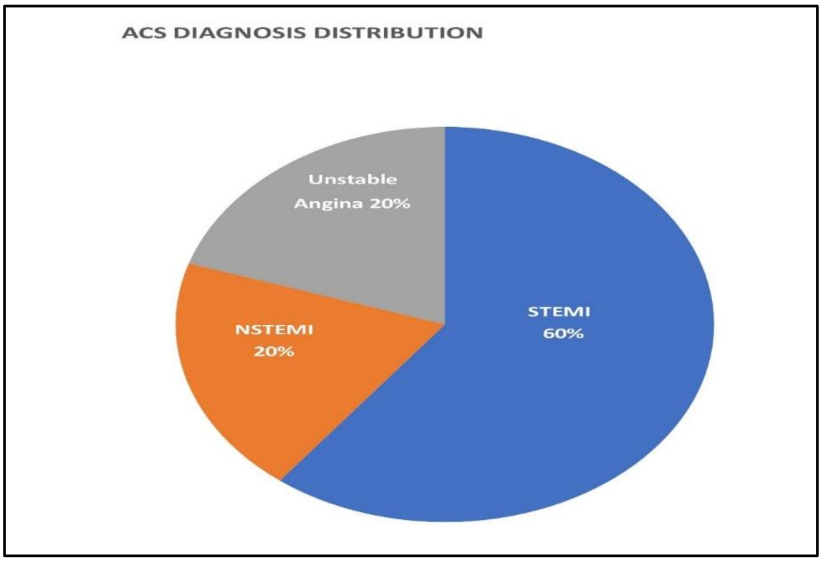


Figure 2: Gender wise distribution of ACS patients.

3.3 Acute coronary syndrome: Diagnosis distribution

The **Figure 3** shows that most ACS patients were diagnosed with STEMI (60.5%), followed by NSTEMI (19.5%) and unstable angina (20%). STEMI represents the most severe form of ACS, caused by a complete blockage of a coronary artery, resulting in substantial myocardial damage. This pattern suggests that a significant number of patients experienced life-threatening heart attacks, requiring prompt medical interventions such as percutaneous coronary intervention (PCI) to restore blood flow and minimize heart muscle damage. In the current study, ST-elevation STEMI emerged as the most prevalent form of ACS, accounting for 60.5% of cases, followed by unstable angina (20%) and NSTEMI (19.5%)**.** In contrast, the study conducted by Ralapanawa et al. reported a higher prevalence of NSTEMI**,** indicating a different distribution pattern of ACS subtypes. This discrepancy may reflect regional variations in patient demographics, risk factor profiles, lifestyle habits, and healthcare accessibility**,** which can influence both the presentation and timely diagnosis of ACS. While our findings suggest a predominance of more acute presentations such as STEMI, the earlier detection and management practices in other regions, like that of Ralapanawa's study, may contribute to a relatively higher detection rate of NSTEMI cases **[13].**



. **Figure 3: ACS diagnosis wise distribution of ACS patients.**

3.4 ACS Diagnosis Distribution by Sex

The diagnosis distribution graph in **Figure 4** shows notable differences in ACS types between males and females. STEMI is the most common diagnosis in both sexes but occurs more frequently in males (93 males vs. 28 females), possibly due to higher risk factors like smoking and hypertension in men. NSTEMI and Unstable Angina (UA) are less common overall, but the relative proportion of females is higher. For NSTEMI, 27 males and 12 females were diagnosed, and for UA, 31 males and 9 females. This may be due to women's ACS pathophysiology, with more plaque erosion leading to less severe coronary obstruction.

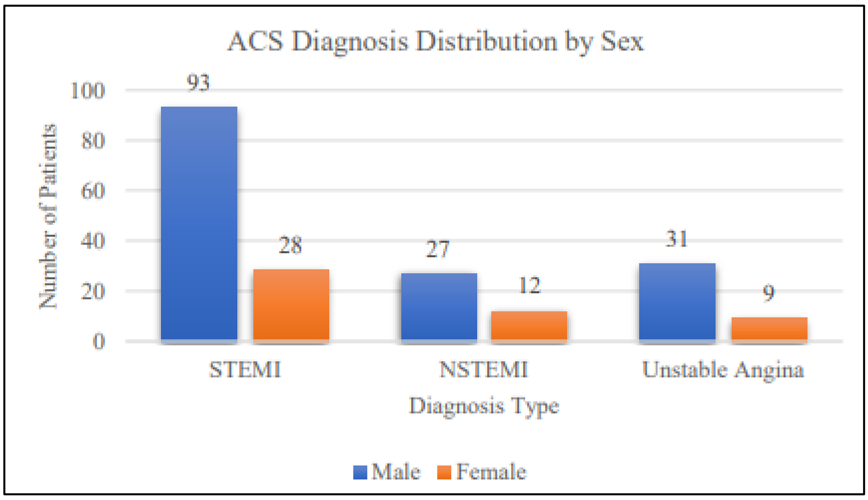


Figure 4: ACS diagnosis vs Gender wise distribution of ACS patients.

3.5 Acute coronary syndrome: Blood Pressure Distribution

Elevated systolic blood pressure (SBP) and diastolic blood pressure (DBP) are important risk factor associated with ACS. For systolic blood pressure, all 200 patients were divided into three groups: low SBP group (<120mmHg, n=95); medium SBP groups(120≥SBP≤140 mmHg, n=27); and high SBP group (>140mmHg, n=78) while for diastolic blood pressure, all 200 patients were divided into three groups: low DBP (<70 mmHg, n=68), medium DBP groups (70–80 mmHg, n=54) and high DBP (>80mmHg, n=78) **(Figure 5)**.

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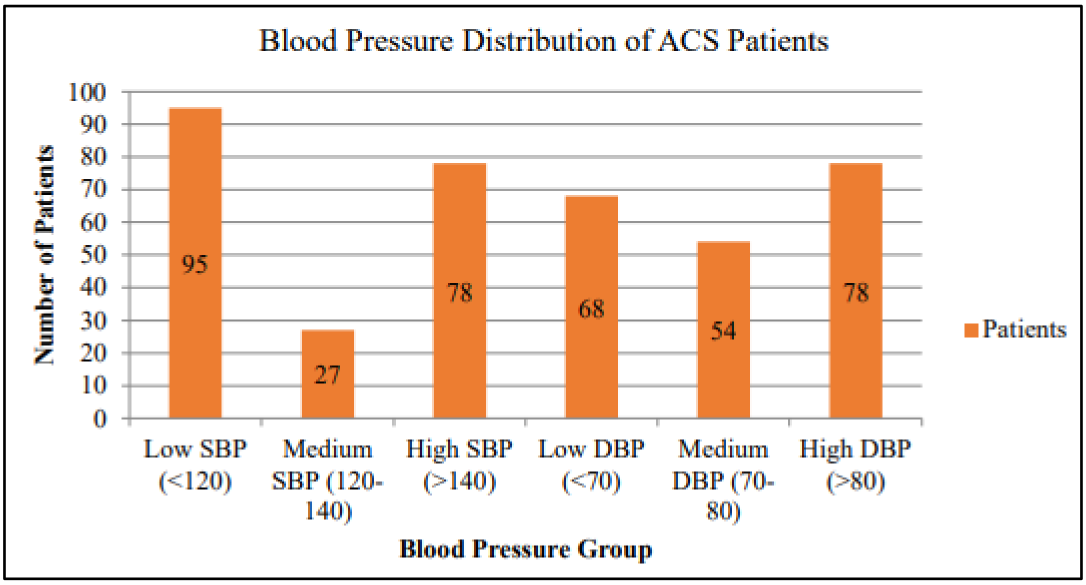

Figure 5: Blood pressure group wise distribution of ACS patients.

3.6 Statistical significance of findings

The average age of the ACS patients was 64 years, with a standard deviation of 12 years. As shown in **Table 1** Most patients had a normal BMI, but a significant portion was overweight. Blood pressure and heart rate values are within ranges typical for ACS patients, indicating variability in hemodynamic status.

Table 1: Descriptive Statistics

Variable	**Mean ± SD**	**Range**
Age (years)	64 ± 12	31-90
BMI (kg/m²)	24 ± 4.2	16-30
Systolic Blood Pressure (mmHg)	129.6 ± 18.5	90-160
Diastolic Blood Pressure (mmHg)	77 ± 9.5	60-95
Heart Rate(beats/min)	77.3 ± 8.4	60-98

There is a moderate positive correlation between age and troponin levels, suggesting that older patients tend to have higher troponin levels, indicative of more severe myocardial injury as per **Table 2**.

Table 2: Correlation Between Age and Troponin Levels

Variables	**Pearson Correlation Coefficient**	**p-value**	**Significance**
Age vs. Troponin Level	0.45	0.02	Significant

The analysis reveals a moderate positive correlation ($r = 0.45$, $p = 0.02$) between age and troponin levels, as presented in Table 2. This statistically significant relationship indicates that as age increases, troponin levels also tend to rise, suggesting that older patients may experience more extensive myocardial injury during episodes of ACS. Elevated troponin levels are well-established biomarkers of cardiac muscle damage, and their association with advancing age could reflect age-related cardiovascular changes such as reduced myocardial resilience, increased comorbidity burden, or delayed presentation and diagnosis. These findings highlight the importance of age-specific risk stratification and management in patients presenting with ACS to improve clinical outcomes.

4. Conclusion:

A study on acute coronary syndrome (ACS) was conducted at Bangalore Baptist Hospital, Bellary Road, Hebbal, Bangalore - 560064, involving a cohort of 200 patients. Approximately 60% of the patients were diagnosed with STEMI, followed by unstable angina (~20%) and NSTEMI (~19%). The treatment included aspirin, clopidogrel, and beta-blockers. This research serves as a foundation for future studies aimed at improving ACS treatment protocols and patient outcomes, highlighting the need for larger, multi-center trials to confirm these findings. It also underscores the importance of enhancing cardiovascular primary prevention and health promotion in the population.

5. Study Limitations

The study on Acute Coronary Syndrome (ACS) at Bangalore Baptist Hospital involved 200 patients, but the small sample size may limit the generalizability of the findings to larger populations. Its retrospective cross-sectional design, based on data from medical records, introduces potential biases, missing data, and recall bias. Conducted at a single center, the study's findings may not reflect the broader diversity of ACS patients across different regions or healthcare settings. While the study reported on treatment practices, it lacked detailed insights into the rationale behind specific medical decisions. Additionally, it provided limited data on long-term outcomes, such as 30-day mortality, readmission rates, and post-discharge quality of life. The study also did not explore socioeconomic factors, such as income, education, or healthcare access, which could significantly influence ACS outcomes.

6. Future Directions

Future research on Acute Coronary Syndrome (ACS) at Bangalore Baptist Hospital should focus on several key areas to enhance patient outcomes. Incorporating machine learning can improve risk prediction and personalized treatment plans. Longitudinal studies are needed to track long-term outcomes such as readmission rates, mortality, and quality of life. Expanding socioeconomic research will help identify care disparities by analyzing the impact of income and education on ACS outcomes. Multi-center and international collaborations can provide a more comprehensive dataset and improve the generalizability of findings. Evaluating hospital-based quality improvement interventions, particularly in low- and middle-income settings, will enhance clinical outcomes and care processes. Research on the impact of public health crises, like the COVID-19 pandemic, will improve future preparedness. Patient-centered research can address patient preferences and barriers to care, while implementation science will help translate research into clinical practice by identifying obstacles to adopting evidence-based treatments.

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Conflict of Interest Statement: All authors have nothing else to disclose.