

## Evaluation of the Role of Hs-Troponin among Patients with Acute Coronary Syndrome in Tertiary Hospital

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### Abstract

### Original Research Article

**Introduction:** Acute Coronary Syndrome (ACS) is a life-threatening medical emergency that requires prompt diagnosis and management. Traditional cardiac Troponin I has been the gold standard for the diagnosis of ACS, but the development of high-sensitivity cardiac Troponin assays, such as Hs-Troponin, has shown promise in improving the accuracy of diagnosis. This study aims to evaluate the role of Hs-Troponin among patients with ACS in a tertiary hospital in Bangladesh. Additionally, the study seeks to identify the prevalence of risk factors for ACS, such as hypertension and hypercholesterolemia, in this population. The findings of this study may inform clinical decision-making and guide the development of effective prevention and management strategies for ACS in Bangladesh.

**Methods:** This retrospective cross-sectional observational study was conducted at the Department of Cardiology, 250 Bedded District Hospital, Jashore, Bangladesh. The study duration was 1 year, from December 2021 to December 2022. Initial sample size was 400 patients, but patients under 18 years of age and those with incomplete data were excluded, resulting in a final sample of 175 non-ACS and 160 ACS patients. Data was collected after obtaining ethical approval. Mean values and standard deviations were calculated for continuous variables such as cardiac troponin and Hs-troponin levels, and compared using independent t-tests. Categorical variables were compared using Chi-square tests. Cardiac troponin levels of  $\leq 0.04$  ng/mL and Hs-Troponin range of  $\leq 14$  pg/mL were considered normal.

**Result:** Mean age was  $50.2 (\pm 14.3)$  in the Non-ACS group and  $58.7 (\pm 12.6)$  in the ACS group ( $p < 0.001$ ). The gender distribution differed significantly, with 53.14% males in Non-ACS and 66.25% in ACS ( $p < 0.05$ ). Mean onset of chest pain was  $3.1 (\pm 0.21)$  in Non-ACS and  $2.9 (\pm 0.42)$  in ACS ( $p > 0.05$ ). Mean systolic blood pressure was higher in ACS ( $138.19 \pm 4.18$ ) than Non-ACS ( $127.21 \pm 5.29$ ) ( $p < 0.001$ ). Mean BMI was similar in Non-ACS ( $26.4 \pm 6.1$ ) and ACS ( $26.0 \pm 0.5$ ) groups ( $p > 0.05$ ). Hypertension (58.75%) and hypercholesterolemia (41.88%) were significantly more prevalent in ACS than Non-ACS ( $p < 0.05$ ). Family history of CVD was similar in both groups (39.43% and 42.50%), but history of CVD was significantly more prevalent in ACS (58.75%) than Non-ACS (42.86%) ( $p < 0.05$ ). The mean cardiac troponin I level was higher in ACS ( $0.07 \pm 0.11$  mg/L) than Non-ACS ( $0.02 \pm 0.01$  mg/L) ( $p < 0.001$ ), and the range of troponin I levels was 0.01-0.03 mg/L in Non-ACS and 0.04-0.21 mg/L in ACS. Mean cardiac Hs Troponin T level was higher in ACS ( $23.7 \pm 5.82$  pg/ml) than Non-ACS ( $3.31 \pm 1.29$  pg/ml) ( $p < 0.001$ ), and the range of Hs Troponin T levels was 1.1-8.5 pg/ml in Non-ACS and 10.6-80.8 pg/ml in ACS.

**Conclusion:** In conclusion, our study highlights the superiority of Hs-Troponin T in diagnosing ACS and the high prevalence of hypertension and hypercholesterolemia among ACS patients in Bangladesh. It underscores the importance of early identification and management of risk factors to prevent ACS. Further studies with larger sample sizes and longer follow-up periods could explore the potential of Hs-Troponin in predicting adverse outcomes in ACS patients.

**Keywords:** Coronary, Cardiac, Troponin, Heart.

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## INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality worldwide, with ischemic heart disease (IHD) being the most

common form of CVD [1–3]. In Bangladesh, CVDs are a significant public health problem, and the prevalence of CVDs is increasing rapidly [1]. The Bangladesh National Heart Foundation estimates that CVDs are responsible for almost 33% of all deaths in the country,

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and the burden of CVDs is projected to increase in the coming years [4, 5]. Acute coronary syndrome (ACS) is a manifestation of IHD and represents a severe and potentially life-threatening condition [6, 7]. The incidence of ACS in Bangladesh is significant, and it is associated with a high morbidity and mortality rate. The Bangladesh National Heart Foundation reports that ACS is responsible for approximately 14% of all CVD-related deaths in the country [4]. ACS is typically caused by the rupture of an atherosclerotic plaque in a coronary artery, which leads to the formation of a thrombus and a reduction in blood flow to the heart [8, 9]. ACS is associated with various risk factors, including smoking, hypertension, dyslipidemia, diabetes mellitus, and a family history of premature coronary artery disease [10, 11]. Early identification of patients at risk of ACS is essential for effective management and prevention of complications. The diagnosis of ACS is based on clinical presentation, electrocardiogram (ECG) findings, and biomarkers of myocardial injury, including cardiac troponins [6, 12, 13]. Cardiac troponins are highly sensitive and specific biomarkers of myocardial injury, and they are widely used in the diagnosis of ACS [14, 15]. The introduction of high-sensitivity cardiac troponin (Hs-cTn) assays has improved the sensitivity and accuracy of troponin testing for the diagnosis of ACS [16, 17]. Hs-cTn assays can detect lower levels of troponin than previous assays and can detect myocardial injury earlier in the course of the disease. The use of Hs-troponin in the diagnosis and management of ACS in Bangladesh is not well studied. Bangladesh is a lower-middle-income country with a high burden of CVDs. Tertiary level hospitals in Bangladesh provides care to patients with complex medical conditions, including ACS. However, the use of Hs-troponin assays in these hospitals is limited, and there is little information about the clinical utility of Hs-troponin in this setting. The implications of ACS are significant, including increased morbidity, mortality, and healthcare costs. ACS can result in acute myocardial infarction, heart failure, and sudden cardiac death. Early and accurate diagnosis of ACS is critical to improving patient outcomes and reducing the burden of disease. The use of Hs-troponin in the diagnosis and management of ACS has the potential to improve patient outcomes and reduce healthcare costs [18, 19]. Hs-troponin assays can detect myocardial injury earlier than previous assays, allowing for earlier intervention and treatment. The use of Hs-troponin can also help to

reduce the number of unnecessary hospital admissions and improve the efficiency of healthcare services [19]. Therefore, there is a need to evaluate the role of Hs-troponin in patients with ACS in a tertiary level hospital in Bangladesh. The findings of such a study could have important implications for the management of ACS in Bangladesh, and it could inform the development of local guidelines for the diagnosis and management of ACS. Furthermore, the study may have broader implications for the use of Hs-troponin in other low- and middle-income countries where the burden of CVDs is high. Therefore, the present study aimed to observe and evaluate the role of Hs-troponin among patients with acute coronary syndrome (ACS).

## METHODS

This retrospective cross-sectional observational study was conducted at the Department of Cardiology, 250 Bedded District Hospital, Jashore, Bangladesh. The study duration was 1 year, from December 2021 to December 2022. During this period, data from the hospital records of a total of 400 patients visiting the emergency department or the cardiology department of the study hospital due to cardiac problems. Patients had undergone clinical assessment including prior medical history, physical examination, standard blood test and further test assigned by the attending physician. The patients were then divided into two equal groups based on diagnosis of Acute Coronary Syndrome (ACS). Any patients less than 18 years of age and patients with incomplete data records were excluded from the study, resulting in 175 patients with cardiac problems without ACS, and 160 patients diagnosed with ACS. Data collection was conducted after ethical approval for the study was obtained from the hospital. Cardiac troponin levels of  $\leq 0.04$  ng/mL were considered normal, and cardiac Hs-Troponin range of  $\leq 14$  pg/mL was considered normal. Data was entered into an SPSS database, and analyzed using SPSS v.25. Mean values and standard deviations were calculated for continuous variables such as troponin and Hs-troponin levels. Independent t-tests were used to compare mean values between the ACS and control groups. Chi-square tests were used to compare categorical variables between the two groups.

## RESULTS

**Table 1: Baseline characteristics of the participants (N=335)**

Baseline Characteristics	Non-ACS [n=175]		ACS [n=160]		P-Value
	n	%	n	%	
<b>Age</b>					
Mean Age	50.2±14.3		58.7±12.6		<0.001
Age Range	20-72		36-80		
<b>Gender</b>					
Male	93	53.14%	106	66.25%	<0.05
Female	82	46.86%	54	33.75%	

Baseline Characteristics	Non-ACS [n=175]		ACS [n=160]		P-Value
	n	%	n	%	
<b>Number of onset of Chest pain</b>					
Mean Number of onset of Chest pain	3.1±0.21		2.9±0.42		>0.05
Range	1-9		1-8		
<b>Systolic BP</b>					
Mean Systolic BP	127.21±5.29		138.19±4.18		<0.001
Systolic BP Range	117-138		122-155		
<b>Diastolic BP</b>					
Mean	76.48±12.82		76.12±8.79		>0.05
Range	69-83		65-86		
<b>BMI</b>					
Mean	26.4 ± 6.1		26.0±0.5		>0.05
Range	18-32		22-30		

The mean age of the Non-ACS group was 50.2 years ( $\pm 14.3$ ), while the mean age of the ACS group was 58.7 years ( $\pm 12.6$ ). This difference was found to be statistically significant ( $p < 0.001$ ). The gender distribution of the two groups was significantly different, with 53.14% of the Non-ACS group being male compared to 66.25% of the ACS group ( $p < 0.05$ ). The mean number of onset of chest pain was not significantly different between the two groups, with the

Non-ACS group having a mean of 3.1 ( $\pm 0.21$ ) and the ACS group having a mean of 2.9 ( $\pm 0.42$ ) ( $p > 0.05$ ). The mean systolic blood pressure was significantly higher in the ACS group (138.19 $\pm$ 4.18) compared to the Non-ACS group (127.21 $\pm$ 5.29) ( $p < 0.001$ ). There was no significant difference in the mean diastolic blood pressure between the two groups. The mean BMI was also not significantly different between the Non-ACS (26.4 $\pm$ 6.1) and ACS (26.0 $\pm$ 0.5) groups ( $p > 0.05$ ).

**Table 2: Distribution of participants by observable risk factors (N=335)**

Risk Factors	Non-ACS [n=175]		ACS [n=160]		P-Value
	n	%	n	%	
Current smoker	48	27.43%	37	23.13%	>0.05
Former smoker	56	32.00%	49	30.63%	>0.05
Hypertension	70	40.00%	94	58.75%	<0.05
Hypercholesterolemia	51	29.14%	67	41.88%	<0.05
Diabetes mellitus	24	13.71%	32	20.00%	>0.05
Family history of CVD	69	39.43%	68	42.50%	>0.05
History of CVD	75	42.86%	94	58.75%	<0.01

The majority of participants in both groups were either current or former smokers, with 27.43% and 32.00%, respectively, in the non-ACS group and 23.13% and 30.63% in the ACS group. However, there was no statistically significant difference between the two groups in terms of smoking status. Hypertension and hypercholesterolemia were significantly more prevalent in the ACS group, with 58.75% and 41.88% of patients having these conditions, respectively, compared to 40.00% and 29.14% in the non-ACS group. The prevalence of diabetes mellitus was not

significantly different between the groups. Family history of CVD was similar in both groups, with 39.43% and 42.50% in the non-ACS and ACS groups, respectively. The history of CVD was significantly more prevalent in the ACS group, with 58.75% of patients having a history of CVD compared to 42.86% in the non-ACS group. These findings highlight the significance of hypertension, hypercholesterolemia, and history of CVD as important risk factors for ACS, and underscore the need for their identification and management to prevent and manage ACS.

**Table 3: Comparison of Troponin and Hs-Troponin among participants (N=335)**

Troponin	Non-ACS [n=175]	ACS [n=160]	P-Value
Mean Cardiac Troponin I (mg/L)	0.02±0.01	0.07±0.11	<0.001
Cardiac Troponin I (mg/L) Range	0.01-0.03	0.04-0.21	
Mean Cardiac Hs Troponin T (pg/ml)	3.31±1.29	23.7 ±5.82	<0.001
Cardiac Hs Troponin T (pg/ml) Range	1.1-8.5	10.6-80.8	

The mean cardiac troponin I level in the ACS group (0.07 $\pm$ 0.11 mg/L) was significantly higher than that of the non-ACS group (0.02 $\pm$ 0.01 mg/L) with a p-

value of less than 0.001. The range of cardiac troponin I levels in the non- ACS group was between 0.01-0.03 mg/L, while in the ACS group, it was between 0.04-

0.21 mg/L. Similarly, the mean cardiac Hs Troponin T level in the ACS group (23.7 ±5.82 pg/ml) was significantly higher than that of the non-ACS group (3.31±1.29 pg/ml) with a p-value of less than 0.001. The range of cardiac Hs Troponin T levels in the non-ACS group was between 1.1-8.5 pg/ml, while in the ACS group, it was between 10.6-80.8 pg/ml.

## DISCUSSION

The present study aimed to evaluate the role of Hs-troponin among patients with Acute Coronary Syndrome (ACS) in a tertiary level hospital in Bangladesh. The results of this cross-sectional retrospective observational study demonstrated significant differences in various baseline characteristics, risk factors, and troponin levels between the ACS and non-ACS groups. The results of the present study showed some significant differences in various baseline characteristics between the two groups. The mean age of the ACS group was significantly higher than the non-ACS group (58.7 years versus 50.2 years) [20, 21]. The higher age of the ACS groups was similar to the findings of other studies, with older patients being more likely to suffer from ACS. Additionally, the percentage of males was significantly higher in the ACS group (66.25%) compared to the non-ACS group (53.14%). The percentage of patients with hypertension and hypercholesterolemia was also significantly higher in the ACS group compared to the non-ACS group. These findings were consistent with previous research that suggests age, male gender, hypertension, and hypercholesterolemia are significant risk factors for the development of ACS [22–24]. It is worth noting that the present study did not find a significant difference in the percentage of current and former smokers between the two groups. This finding is not consistent with previous research that suggests smoking is a significant risk factor for the development of ACS [25, 26]. However, the small sample size of the present study may have contributed to this finding, and larger studies are needed to investigate the role of smoking in the development of ACS. One of the most striking findings was the significant difference in mean Hs-troponin T levels between the ACS and non-ACS groups. The mean Hs-troponin T levels were significantly higher in the ACS group (23.7 pg/ml) compared to the non-ACS group (3.31 pg/ml). This finding was consistent with previous research that suggests Hs-troponin T is a sensitive and specific biomarker for the diagnosis of ACS [17, 20, 27, 28]. Additionally, the mean cardiac troponin I level was significantly higher in the ACS group (0.07 mg/L) compared to the non-ACS group (0.02 mg/L). This finding is consistent with previous research that suggests cardiac troponin I is a reliable biomarker for the diagnosis of ACS [14, 29–31]. The results of the present study have important implications for the early identification and diagnosis of ACS in Bangladesh. The high prevalence of risk factors such as hypertension and

hypercholesterolemia, as well as the high levels of Hs-troponin T and cardiac troponin I in the ACS group, highlight the importance of early identification and management of these risk factors [32]. Additionally, the use of Hs-troponin T and cardiac troponin I as diagnostic biomarkers for ACS may aid in the early identification and diagnosis of ACS in Bangladesh [33, 34].

### Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

## CONCLUSION

Our study found that Hs-Troponin T is a better indicator for the diagnosis of ACS compared to the traditional cardiac Troponin I. The results of this study also suggest that hypertension and hypercholesterolemia are more prevalent among ACS patients in Bangladesh. Our findings emphasize the importance of early detection and management of risk factors for the prevention of ACS. Future research can focus on larger sample sizes and longer follow-up periods to further investigate the role of Hs-Troponin in predicting adverse outcomes in ACS patients.

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**Conflict of Interest:** None declared.

### Ethical Approval

The study was approved by the Institutional Ethics Committee.

## RECOMMENDATION

Based on the findings of this study, it is recommended that Hs-Troponin be used as a biomarker for the diagnosis of ACS in Bangladeshi patients. Furthermore, it is important to identify and control the risk factors associated with ACS in order to prevent and manage the disease. Finally, additional research is needed to confirm these findings and explore the potential benefits of early Hs-Troponin testing in ACS patients.

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