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PREVALENCE AND PROGNOSTIC SIGNIFICANCE OF BUNDLE BRANCH BLOCKS IN ACUTE CORONARY SYNDROME IN A TERTIARY CARE HOSPITAL-A PROSPECTIVE STUDY

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ABSTRACT

Background: Bundle branch blocks (BBBs) in acute coronary syndrome (ACS) represent a significant clinical challenge in cardiovascular medicine. These conduction disturbances can complicate diagnosis, affect treatment decisions, and potentially influence patient outcomes. Despite their clinical importance, the exact prevalence and prognostic implications of BBBs in ACS remain subjects of ongoing research.

Methods: This prospective study was conducted at Basaveshwara Medical College Hospital, Chitradurga, over 18 months (March 2021 to August 2022). Thirty patients with ACS and new-onset BBB were enrolled. Patients underwent comprehensive clinical examination, ECG analysis, cardiac biomarker testing, and 2D echocardiography. All patients were followed through their hospital stay and for 30 days post-acute myocardial infarction, monitoring for complications and outcomes.

Results: Among 30 patients, 19 (63.3%) presented with LBBB and 11 (36.7%) with RBBB. LBBB patients were older (mean age 64.47 years) and showed higher rates of anterior wall

MI (68.4%). Diabetes mellitus was the predominant risk factor (70%). Congestive heart failure was the most common complication (63.3%), occurring more frequently in LBBB patients (73.7%). LBBB was associated with higher mortality rates both in-hospital (15.8% vs 9.1%) and at 30 days (26.3% vs 9.1%) compared to RBBB. The overall 30-day mortality was 20%.

Conclusion: The presence of BBB in ACS patients, particularly LBBB, is associated with higher morbidity and mortality rates. These findings emphasize the importance of early recognition and aggressive management of ACS patients presenting with BBB, especially LBBB, to improve clinical outcomes.

Keywords: Acute Coronary Syndrome, Bundle Branch Block, Left Bundle Branch Block, Right Bundle Branch Block, Myocardial Infarction, Cardiac Complications, Mortality, Prognostic Factors, Coronary Intervention, Cardiac Conduction

INTRODUCTION

Acute Coronary Syndrome (ACS) represents a spectrum of cardiovascular emergencies, including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI) [1]. These conditions are characterized by a sudden reduction in blood flow to the heart, often resulting from atherosclerotic plaque rupture or erosion [2]. ACS remains a significant global health concern, contributing substantially to morbidity and mortality worldwide [3].

In the context of ACS, electrocardiographic (ECG) abnormalities play a crucial role in diagnosis, risk stratification, and management decisions [4]. Among these abnormalities, bundle branch blocks (BBBs) - including right bundle branch block (RBBB) and left bundle branch block (LBBB) - have garnered particular attention due to their potential prognostic implications [5].

BBBs are conduction disturbances that can occur as a result of ischemia, infarction, or pre-existing structural heart disease [6]. The presence of BBBs in ACS patients has been associated with more extensive coronary artery disease, larger infarct sizes, and potentially worse outcomes [7]. However, the exact prevalence and prognostic significance of BBBs in ACS remain subjects of ongoing research and debate.

Several studies have reported varying prevalence rates of BBBs in ACS patients, ranging from 5% to 30%, depending on the population studied and the specific type of BBB [8]. The prognostic impact of BBBs in ACS has also been a topic of considerable interest, with some studies suggesting increased mortality and complications in patients with BBBs, particularly

LBBB [9]. However, the results have been inconsistent, and the implications may differ based on the timing of BBB onset (new versus pre-existing) and the specific ACS subtype. Given the potential clinical significance of BBBs in ACS and the lack of consensus on their exact impact, there is a need for further research in this area. This is particularly true in the context of tertiary care hospitals, where complex cases are often managed and where the findings could have significant implications for patient care and resource allocation.

This prospective study aims to investigate the prevalence of BBBs in patients presenting with ACS at a tertiary care hospital and to evaluate their prognostic significance. By examining the relationship between BBBs and various clinical outcomes, including in-hospital mortality, complications, and long-term prognosis, this research seeks to contribute valuable insights to the existing body of knowledge on this topic [10].

The findings of this study could have important implications for risk stratification, management strategies, and resource allocation in ACS patients with BBBs. Moreover, by focusing on a tertiary care setting, this research may provide particularly relevant data for high-acuity healthcare environments where complex cardiac cases are frequently encountered.

MATERIALS AND METHODS

This prospective study was conducted in the General Medicine Department at Basaveshwara Medical College Hospital, Chitradurga, over a period of 18 months from March 2021 to August 2022. The study included 30 patients diagnosed with acute coronary syndrome (ACS) and new-onset bundle branch block (BBB). Patients with pre-existing BBB, non-specific intraventricular conduction defects, or those unwilling to provide consent were excluded.

After obtaining institutional ethics clearance, eligible patients were enrolled in the study following informed consent. A thorough clinical examination was conducted for each patient, and information was collected using a pre-formed study proforma. Detailed history was taken, including the onset of symptoms, previous cardiac history, and risk factors such as smoking, diabetes mellitus, hypertension, and dyslipidemia. Vital signs were recorded on admission.

Electrocardiograms were performed to diagnose acute myocardial infarction and identify new-onset BBB. Investigations including high-sensitivity troponin T, CK-MB, and routine urine analysis were carried out. Two-dimensional echocardiography was performed for each patient. All patients with new-onset BBB were followed up until discharge and for

30 days after the onset of acute myocardial infarction. During this period, complications such as ventricular dysfunction, arrhythmias, recurrent angina, congestive heart failure, heart block, mechanical complications, cardiac arrest, and death were recorded.

The study also noted the history of thrombolysis and percutaneous transluminal coronary angioplasty (PTCA) treatment during the hospital stay. Data analysis was performed to assess the prevalence of BBB in ACS patients and evaluate its prognostic significance.

RESULTS

A total of 30 patients diagnosed with acute coronary syndrome (ACS) and new-onset bundle branch block (BBB) were studied. All patients underwent detailed clinical examination, ECG analysis, cardiac biomarker testing, and 2D echocardiography. Patients were followed up during their hospital stay and for 30 days post-acute myocardial infarction to monitor complications and outcomes.

Among the study population, 19 patients (63.3%) presented with left bundle branch block (LBBB) and 11 patients (36.7%) with right bundle branch block (RBBB). The findings are presented in the following tables:

Table 1 shows the demographic and clinical characteristics of the study population. LBBB patients were generally older (mean age 64.47 ± 11.52 years) compared to RBBB patients (55.00 ± 7.18 years). Males constituted the majority in both groups (56.6% overall). Diabetes mellitus was the most prevalent risk factor (70%), followed by smoking (40%) and hypertension (30%). Notably, a higher proportion of patients (60%) presented with Killip's class ≥2, indicating more severe clinical presentation.

Table 2 demonstrates the cardiac findings and interventions performed. Anterior wall MI was more common in LBBB patients (68.4%) while inferior wall MI was exclusively seen in RBBB patients (45.4%). The mean ejection fraction was lower in LBBB patients (44.2%) compared to RBBB patients (48.64%). While thrombolysis was performed in only 16.7% of cases, the majority of patients (93.3%) underwent PTCA, with 100% of RBBB and 89.5% of LBBB patients receiving this intervention.

Table 3 outlines the complications observed during the study period. Congestive heart failure was the most common complication (63.3%), with a higher prevalence in LBBB patients (73.7%) compared to RBBB patients (45.5%). Ventricular tachycardia occurred in 20% of cases, being more frequent in LBBB patients (26.3%). Complete heart block was exclusively observed in RBBB patients (27.3%). Mechanical complications were more common in RBBB patients (36.4%) compared to LBBB patients (21.1%).

Table 4 presents mortality data, showing both in-hospital and 30-day mortality rates. LBBB patients had higher mortality rates both in-hospital (15.8% vs 9.1%) and at 30 days (26.3% vs 9.1%) compared to RBBB patients. The overall in-hospital mortality was 13.3%, while the 30-day mortality reached 20%, indicating a poor short-term prognosis in ACS patients with bundle branch blocks.

Table 1: Demographics and Clinical Characteristics

Characteristic	**RBBB (n=11)**	**LBBB (n=19)**	**Total (n=30)**
Mean Age (years)	55.00 ± 7.18	64.47 ± 11.52	-
Male	6 (54.54%)	11 (57.89%)	17 (56.6%)
Diabetes Mellitus	7 (63.6%)	14 (73.7%)	21 (70%)
Hypertension	3 (27.3%)	6 (31.6%)	9 (30%)
Smoking	2 (18.2%)	10 (52.6%)	12 (40%)
Killip's class ≥2	6 (54.5%)	12 (63.2%)	18 (60%)

Table 2: Cardiac Findings and Interventions

Characteristic	**RBBB (n=11)**	**LBBB (n=19)**	**Total (n=30)**
Anterior Wall MI	4 (36.4%)	13 (68.4%)	17 (56.7%)
Inferior Wall MI	5 (45.4%)	0 (0%)	5 (16.7%)
Mean EF (%)	48.64	44.2	-
Thrombolysis	2 (18.2%)	3 (15.8%)	5 (16.7%)
PTCA	11 (100%)	17 (89.5%)	28 (93.3%)

Table 3: Complications

Characteristic	**RBBB (n=11)**	**LBBB (n=19)**	**Total (n=30)**
CHF	5 (45.5%)	14 (73.7%)	19 (63.3%)
Ventricular Tachycardia	1 (9.1%)	5 (26.3%)	6 (20%)
Complete Heart Block	3 (27.3%)	0 (0%)	3 (10%)
Mechanical Complications	4 (36.4%)	4 (21.1%)	8 (26.6%)

Table 4: Mortality

Mortality	**RBBB (n=11)**	**LBBB (n=19)**	**Total (n=30)**
In-hospital	1 (9.1%)	3 (15.8%)	4 (13.3%)

30-day	1 (9.1%)	5 (26.3%)	6 (20%)

DISCUSSION

The prevalence of bundle branch block (BBB) in acute coronary syndrome (ACS) was 9% in this study, with left bundle branch block (LBBB) being more common than right bundle branch block (RBBB). LBBB patients were older on average and more likely to present with worse Killip class. Diabetes was the most common risk factor in both groups, followed by smoking in LBBB and hypertension in RBBB. The left anterior descending artery was the most frequently involved vessel overall and in LBBB, while the right coronary artery was most common in RBBB. These findings are generally consistent with previous studies like Ana Teresa et al.[11], C K Wong et al.[12], and Melgarejo et al.[13]

Regarding complications, congestive heart failure was the most frequent, occurring in 63.3% of patients overall and more commonly in LBBB (73.68%) than RBBB (45.45%). Ventricular tachycardia was the most common arrhythmia, particularly in LBBB patients (26.39% vs 9.09% in RBBB). Complete heart block occurred in 10% of patients, all in the RBBB group. Mechanical complications like ventricular septal rupture, mitral regurgitation, and cardiogenic shock were more frequent in RBBB (36.36%) compared to LBBB (21.05%). These complication rates are comparable to those reported by Ana Teresa et al.[11] and Melgarejo et al.[13]

Mortality was higher in the LBBB group, with in-hospital mortality of 15.7% and 30-day mortality of 26.3%, compared to 9.09% for both in-hospital and 30-day mortality in RBBB. The overall in-hospital mortality was 13.3% and 30-day mortality was 20%. These rates are somewhat higher than those reported in some previous studies like Ana Teresa et al.[11], but similar to others like Melgarejo et al.[13] The higher mortality in LBBB is consistent with most prior research. In conclusion, the presence of BBB in ACS, particularly LBBB, is associated with higher morbidity and mortality, indicating a poorer prognosis.

CONCLUSION

This prospective study of 30 patients with acute coronary syndrome demonstrates that bundle branch blocks, particularly left bundle branch block, are associated with significant morbidity and poor clinical outcomes, as evidenced by higher rates of complications (63.3% congestive heart failure) and mortality (20% at 30 days). Left bundle branch block patients presented with more severe manifestations, including higher rates of anterior wall MI (68.4%), lower ejection fraction (44.2%), and greater mortality (26.3% at

30 days) compared to right bundle branch block patients, suggesting a worse prognostic significance. These findings emphasize the critical importance of early recognition and aggressive management of acute coronary syndrome patients presenting with bundle branch blocks, particularly those with left bundle branch block, to potentially improve clinical outcomes in this high-risk population.

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