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Research Article

Thrombocytopenia and Community-acquired pneumonia: A comparative analysis at a teaching Hospital

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ABSTRACT

Background & Objectives Community Acquired Pneumonia (CAP) continues to be a significant cause of morbidity and mortality worldwide, especially in at-risk populations. There have been only some recent publications focusing on hematological parameters and how they correlate with clinical outcome, such as thrombocytopenia. This study aimed to investigate the association between thrombocytopenia and CAP severity, as well as the predictive value of other clinical markers such as leukocyte count, duration of hospital stays, and CURB-65 score.

Materials and Methods: An analytical observational study with a prospective cross-sectional design was conducted on patients diagnosed with CAP at JMCTH from October 2023 to Sep 2024. Patient's data were extracted from medical records. The correlation between the platelet counts and CAP severity was analyzed.

Results: A total of 102 cases were collected. Number of patients diagnosed with CAP was found to be 100%. Males 59 (57.8%) were more affected compared to females 43 (42.1%). Patient ages ranged from 16 to 75 years old. Mild thrombocytopenia was 9(8.8%), moderate thrombocytopenia 49(48%), severe thrombocytopenia 44(43%) was observed. Patients with >65 years had highest prevalence of thrombocytopenia 25(24.5%)). Similarly in terms of leukocytosis, it was found to be mild 43(42%), moderate 50(49%), severe 9(8.8%) respectively. Regarding severe thrombocytopenia 2(66.67%)

participants were expired and in severe leukocytosis 2(66.67%) were expired which was statistically significant p value is <0.001. Also, CURB-65 score having >3, indicates the higher mortality rate which is statistically significant, p value < 0.001. Hospital stay was more than 14 days were 9(8.8%), where 2(66.67%) expired which was also statistically significant and p value < 0.001.

Conclusion: The significance of thrombocytopenia and other clinical indicators as they relate to the prognosis of CAP, and paves the way for novel interventions and individualized therapies.

Keywords: Community acquired Pneumonia, CARB-65, Thrombocytopenia, Leucocytes

INTRODUCTION

Pneumonia is defined as an acute infection of pulmonary parenchyma. There are 3 notable entities of pneumonia: community-acquired pneumonia (CAP), hospital-acquired pneumonia (HAP), and pneumonia in the immune-compromised patient [1]. CAP remains a leading cause of morbidity and mortality globally, particularly among vulnerable populations such as the elderly and those with co-morbid conditions [2]. While numerous factors contribute to the severity of pneumonia, recent studies have begun to highlight the role of haematological parameters, including thrombocytopenia, in predicting clinical outcomes [3]. Thrombocytopenia is defined as a condition characterized by abnormally low platelet counts (count less than 150,000 per ml) [4]. Platelets are the chief effectors cells in homeostasis and have additional major functions in inflammation, vascular integrity, and tissue repair. Platelets and the lungs have interrelated activities. Previous studies provide evidence that platelets contribute to pulmonary vascular barrier function and are required for defense against pulmonary hemorrhage, and that the lungs can influence platelet number and distribution [3,5]. Platelet count in a patient with CAP at the time of hospital admission in predicting outcome may be one of the suitable parameters in a country like ours [6]. However, its specific impact on pneumonia severity has not been uniformly established, leading to some debate within the medical community.

Controversies surrounding the relationship between thrombocytopenia and pneumonia severity arise from varying definitions of pneumonia severity, the influence of underlying health conditions, and the timing of platelet count assessment in the course of the disease. Some studies suggest that thrombocytopenia is a marker of severity of systemic illness [4,5]. While others propose that it may have direct patho-physiological implications in respiratory infections [7]. A retrospective study done in Egypt concluded that abnormality in platelet count and levels of $PaCO_2$ were associated with an increase in ICU admission and higher 30-day mortality [8].

Similar study conducted in Pakistan revealed similar findings and also added that thrombocytopenia was associated with complications like respiratory failure, need for mechanical ventilation and complicated para-pneumonic effusion [9], but one of the studies conducted in North and Central Denmark revealed that platelet counts, even within the normal range, are associated with mortality in adult patients hospitalized for community acquired pneumonia [10]. Variations in clinical practice guidelines and treatment protocols further complicate the

integration of thrombocytopenia as a reliable prognostic factor. The lack of consensus on the role of thrombocytopenia in predicting pneumonia severity creates a gap in clinical practice, potentially leading to suboptimal patient management. A study done in Tribhuvan University Teaching Hospital, TUTH, Kathmandu on 2071/072 revealed that there is significant association between thrombocytopenia and severity of pneumonia [11,12]. Prognostication is an important part of the management of patients with CAP, and there are several prognostic scales currently in use. These scales include the pneumonia severity index (PSI), CURB-65 (Confusion, Urea, Respiratory rate, Blood pressure, Age ≥65), and CRB-65 (Confusion, Respiratory rate, Blood pressure, Age≥65). However, these scales have some limitations [13].

In our settings like Janaki Medical College Teaching Hospital, JMCTH, where a significant number of patients present with respiratory infections, it is crucial to elucidate the role of thrombocytopenia in predicting pneumonia outcomes. This research aims to systematically assess the association between thrombocytopenia and pneumonia severity, utilizing a well-defined cohort of patients to provide clarity on this relationship. The aim of this study was to investigate whether thrombocytopenia can serve as a reliable predictor of pneumonia severity in patients of JMCTH.

Materials and Methods

This study was prospective observational study conducted at Janaki Medical College Teaching Hospital (JMCTH) from October 2023 to September 2024. All cases of community-acquired pneumonia (CAP) patients presented at Janaki Medical College & Teaching Hospital (Medicine OPD, Emergency Department), Janakpur, Nepal. All patients presenting to JMCTH with CAP (as per case definition) from both the Emergency and Medical Outpatient Departments were enrolled for the study until the required sample size was achieved. The inclusion criteria were set for all patients presenting with a new pulmonary infiltrate and at least one of the following: New or increased cough**,** Fever or hypothermia (<35°C or >37.8°C)**,** Leukocytosis, left shift, or leucopenia defined by local laboratory values, No hospitalization within two weeks prior to admission and age >16 years. The patients with Pneumonia other than those included in the case definition, known cases of idiopathic thrombocytopenic purpura, TB, HIV, Aplastic anemia, leukemia, lymphoma, Patients on dialysis, Patients with chronic liver disease with portal hypertension, congestive cardiac failure were excluded. Thrombocytopenia was defined as a platelet count of ≤150,000/µL. It was further classified into the following categories [11].

Mild: 100,000/µL to 150,000/µL
Moderate: 50,000/µL to 100,000/µL
Severe: ≤50,000/µL
Leucocytosis Grading [11]**:**
Mild: WBC 10,000-15,000 per mm^3
Moderate: WBC 15,000-20,000 per mm^3
Severe: WBC ≥20,000 per mm^3

Table 1: CAP Grading according to CURB-65 Severity Score [11]:

Clinical Criteria	Points
Confusion	1
Blood Urea Nitrogen	1
Respiratory Rate	1
Blood Pressure (SBP <90 mm Hg or DBP ≤60 mm Hg)	1
Age ≥65 years	1

Table 2: Division of Score level

Total Score	Grading
0-1	Mild pneumonia
2	Moderate pneumonia
3-5	Severe pneumonia

A structured Proforma was used. All patients presenting to JMCTH Emergency and Medical Outpatient Departments with CAP and fulfilling the case definition criteria were considered as study participants. After obtaining informed consent, blood samples were sent for total count (TC/cu.mm) and platelet count (/cu. mm) in an EDTA vial and in a test tube for blood urea (mg/dl), serum creatinine (mg/dl), and other investigations required for the study. Automated analyzers were used to obtain hematological results in JMCTH. All relevant data were recorded in a Proforma by MDGP resident, which was part of routine check-up procedures.

After receiving approval from the JMCTH Institutional Review Committee (Ref. 008/IRC-JMC/2023), data collection was started. The collected data were manually checked and entered into SPSS version 22.0 for processing, analysis, and interpretation. Findings were presented in tables, bar diagrams, and pie charts as needed. Percentage or proportion was presented for categorical data, and summary statistics were obtained for continuous data.

RESULTS

Table 3 shows the age-group and gender-wise distribution of participants. The majority of participants fall within the age groups of 26-35 and over 65, making up 23.5% and 24.5% of the total, respectively. This data indicates a balanced but varied age distribution among males and females, with a higher number of older participants.

Table 4 shows the distribution of patient outcomes based on platelet count levels. Among patients with a platelet count of ≤50,000 per mm^3, 42 (42.42%) recovered, while 2 (66.67%) expired, totaling 44 cases (43.1% of the sample). For those with platelet counts between 50,000–1, 00,000 per mm^3, 48 (48.48%) recovered and 1 (33.33%) expired, comprising 49 cases (48.0% of the sample). In the 100,000–150,000 per mm^3 range, 9 patients (9.1%) recovered with no expired case, making up 8.8% of the sample. Overall, there were 102 cases, with a full distribution across recovery and mortality outcomes.

Table 5 shows the relationship between platelet count and patient outcomes among 102 individuals. Patients are categorized by platelet count ranges: ≤50,000 per mm^3, 50,000-100,000 per mm^3, and 100,000-150,000 per mm^3. Among the total participants, 100 recovered, and only 2 expired. Most patients (48%) had platelet counts in the 50,000-100,000 per mm^3 range, and 48.48% recovered and 33.33% expired. In the ≤50,000 per mm^3 group, 42 patients recovered, while 2 expired, indicating that lower platelet counts may be associated with a higher risk of mortality. The smallest group, those with platelet counts between 100,000-150,000 per mm^3, comprised 9 patients, all of whom recovered. This data suggests that patients with higher platelet counts tend to have better outcomes. P value 0.001 shows our data is statistically significant.

Table 3: Age-group and Gender-wise distribution of participants

Age	Male		Female		Total	
	N	%	N	%	N	%
16-25	2	4.7	3	5.1	5	4.9
26-35	10	23.3	14	23.7	24	23.5
36-45	6	14.0	11	18.6	17	16.7
46-55	6	14.0	7	11.9	13	12.7
56-65	9	20.9	9	15.3	18	17.6
>65	10	23.3	15	25.4	25	24.5
Total	43	100.0	59	100.0	102	100.0

Table 4: Relation of Platelet count and outcome among participants

Platelets Counts	Recovered		Expired		Total		P-value
	N	%	N	%	N	%	
=< 50,000 per mm3	42	42.42	2	66.67	44	43.1	<0.001
50,000-1,00,000 per mm3	48	48.48	1	33.33	49	48.0	
1,00,000-1,50,000 per mm3	9	9.1	0	0.0	9	8.8	
Total	99	100.0	3	100.0	102	100.0	

Table 5: Relation of Leukocyte count with outcome of participants

Leukocyte count	Recovered		Expired		Total		P-value
	N	%	N	%	N	%	
10,000-15,000 per mm3	43	43.4	0	0.0	43	42.2	<0.001
15,000-20,000 per mm3	49	49.5	1	33.3	50	49.0	
>= 20,000 per mm3	7	7.1	2	66.7	9	8.8	
Total	99	100.0	3	100.0	102	100.0	

Table 6: Relation of hospital stay with outcome of patients

Length of hospital stay	Recovered		Expired		Total		p-value
	N	%	N	%	N	%	
0 - 7 days	45	45.5	0	0.0	45	44.1	<0.001
7-14 days	47	47.5	1	33.3	48	47.1	
>14 days	7	7.1	2	66.7	9	8.8	
Total	99	100.0	3	100.0	102	100.0	

Table 7: Relation of CURB-65 score with outcome of participants

CURB-65 score	Recovered		Expired		Total		P- Value
	N	%	N	%	N	%	
0-1	48	48.5	0	0.0	48	47.1	<0.001
2	46	46.5	1	33.3	47	46.1	
>=3	5	5.1	2	66.7	7	6.9	
Total	99	100.0	3	100.0	102	100.0	

Table 6 presents outcomes based on the length of hospital stay, indicating recovery and expired rates. In the group staying 0 to ≤7 days, 45.5% recovered with no expired case. The 7–14-day group had a slightly higher recovery rate.

Table 7 details patient outcomes based on CURB-65 scores, highlighting recovery and expired rates. For patients with scores of 0-1, 48.5% recovered with no expired case, indicating a strong positive outcome. The group with a score of 2 had a recovery rate of 46.5%, but one patient (33.3%) expired. In contrast, only 5.1% of patients with scores ≥3 recovered, while two patients (66.7%) expired. In contrast, only 5.1% of patients with scores ≥3 recovered, while two patients (66.7%) expired. The p-value of less than 0.001 shows a statistically significant correlation between CURB-65 scores and patient outcomes, suggesting that lower scores are associated with better recovery rates.

DISCUSSION

Our findings highlight an association between platelet count and patient outcomes in cases of community-acquired pneumonia (CAP). Patients with platelet counts ≤ 50,000 per mm^3 displayed a higher mortality rate, where out of 44 (43%) participants, 2 (66.67%) were expired. In contrast, patients with platelet counts between 50,000 and 100,000 per mm^3, representing the majority of cases, out of 49(48%) participants, 1 (33%) was expired. while those with platelet counts between 100,000 and 150,000 per mm^3 had no mortality. This data suggests that lower platelet counts are associated with higher mortality rates in CAP cases. This pattern aligns with prior research, such as the study by Moreau et al. [14] which found that a reduction in platelet count of 30% or more is a strong predictor of mortality in critically ill patients. These findings underscore the potential value of platelet count as an early prognostic marker in CAP, suggesting it could serve as a useful indicator of systemic complications like sepsis or disseminated intravascular coagulation (DIC) in severe cases [4,5,9]. By closely monitoring platelet trends, clinicians may gain insight into the patient's trajectory, allowing for timely intervention in at-risk individuals.

Similar to platelet counts, leukocyte count was found to have a significant impact on patient outcomes. The group with the highest leukocyte count (≥20,000 per mm^3) showed markedly worse outcomes; where total participants were 9 (8.8%) out of which 2 expired (7.1%). This supports the hypothesis that leukocytosis in CAP may be a reflection of an overwhelming inflammatory response, which is typically associated with more severe disease and worse prognosis, Lee et al. [13,15] found that elevated red cell distribution width (RDW) levels correlate with higher severity scores and mortality in CAP patients, reinforcing the role of systemic inflammatory markers in predicting adverse outcomes. Our results underscore the importance of early recognition and management of severe inflammatory responses in CAP, which may help improve outcomes and guide treatment decisions.

The analysis of hospital stay duration revealed a strong association with patient outcomes, with shorter stays being linked to higher recovery rates. In contrast, patients requiring longer stays (≥14 days) experienced a higher mortality rate. In our study, 9 (8.8%) participants with a stay of >14 days have only 7 (7.1%) recovery rate. This finding is in line with Viasus et al. [16]

who highlighted that hypoalbuminemia, often observed in prolonged hospitalizations, is associated with higher mortality and complications. Although the duration of hospital stay is a consequence of disease severity, it also reflects the capacity of the healthcare system to manage critically ill patients. Our results suggest that prompt interventions and early recovery are key to improving patient outcomes in CAP, emphasizing the role of timely clinical decision-making and appropriate treatment strategies.

The CURB-65 score, a well-established severity of scoring system for CAP, was shown to be a significant predictor of patient outcomes in our study. Patients with a CURB-65 score of 0-1 exhibited excellent recovery rates (48.5%), while those with scores ≥3 had a dismal recovery rate, with 2(66.7%) mortality. This finding aligns with the existing literature that underscores the predictive value of CURB-65 in CAP [17]. Lee et al. [13] found that including inflammatory markers like RDW with clinical severity scores could improve mortality predictions, but our study suggests that CURB-65 alone remains a highly effective tool in stratifying risk and guiding treatment decisions. The fact that even low-risk patients based on CURB-65 still had favorable outcomes further strengthens the validity of this score as a reliable prognostic marker.

The findings of this study have important clinical implications for the management of CAP. Monitoring platelet count, leukocyte count, and CURB-65 scores can help clinicians identify high-risk patients early and tailor treatment strategies accordingly. In particular, the association between platelet counts decline and poor outcomes calls for closer monitoring of platelet levels in hospitalized CAP patients, especially those showing signs of severe disease. The integration of CURB-65 score into clinical practice has been widely recommended, and our results further confirm its utility in predicting mortality and ICU admission needs. Additionally, combining inflammatory biomarkers with these clinical scores could enhance risk stratification, as demonstrated in studies by Glynn et al. [12]. Further research is needed to explore the potential of biomarkers like cathepsin B, cystatin C, and kallistatin in enhancing our understanding of CAP pathogenesis and predicting disease severity [15,17].

These biomarkers could provide a deeper insight into the inflammatory processes at play in CAP and serve as adjuncts to clinical scores, allowing for more personalized and effective treatment approaches. Community-acquired pneumonia (CAP) is a major cause of illness and death among adults in the Asia-Pacific region. Research published from 1990 to May 2010 highlighted that CAP poses a significant health challenge and has a considerable economic impact in this area. Key risk factors for developing CAP include chronic obstructive pulmonary disease, heart disease, diabetes, and being older [18]. Although, this study provides valuable findings but still there are several limitations. The relatively small sample size may limit the generalizability of the results, and a single-center study design may not fully capture the diversity of CAP cases. Furthermore, the lack of detailed follow-up data on long-term outcomes and potential complications after discharge which leaves some questions unanswered regarding the long-term prognosis of patients. Future multi-center studies with larger cohorts and longer follow-up periods would help to validate these

findings and further refine prognostic markers for CAP.

CONCLUSION

The study concludes with the significant role of clinical markers such as platelet count, leukocyte count, duration of hospital stays, and CURB-65 score in predicting outcomes in patients with community-acquired pneumonia. Higher platelet counts and lower leukocyte counts, shorter hospital stays, and lower CURB-65 scores are associated with better recovery rates and improved survival of the participants. These findings reinforce the importance of early risk stratification and appropriate clinical management to improve patient outcomes in CAP. Further research incorporating additional biomarkers and long-term follow-up data will enhance our understanding of disease severity and help optimize treatment strategies for this common and potentially life-threatening infection.

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