

A COMPARATIVE STUDY ON USE OF CURB 65 IN PREDICTING MORTALITY IN COMMUNITY ACQUIRED PNEUMONIA PATIENTS WITH AND WITHOUT MEAN PLATELET VOLUME

Anita Kumari¹, P.S. Pipliwal², Ashwani Kumar Vyas³, Girdhari Lal Dhayal⁴, Sudhir Mehta⁵

¹Resident, ²⁻⁵Senior Professor, ^{3,4}Assistant Professor, Department of Medicine, SMS Medical College and Attached Group of Hospitals, Jaipur, Rajasthan, India.

Received : 15/02/2023
Received in revised form : 07/03/2023
Accepted : 30/03/2023

Keywords:

Community acquired pneumonia (CAP), Mean platelet volume (MPV), CURB-65 score, Mortality, Comparative study.

Corresponding Author:
Dr. Girdhari Lal Dhayal,
Email: dr.dhayal@gmail.com

DOI: 10.47009/jamp.2023.5.3.154

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5(3); 749-752



Abstract

Introduction: Community acquire pneumonia (CAP) is an infection of the lung parenchyma, primarily caused by bacterial or viral respiratory pathogens. CURB-65 is an objective scoring system for evaluation of severity in community acquired pneumonia patients. Platelets are inflammatory cells with an important role to play in antimicrobial host defences. Mean platelet volume (MPV) measures average size of platelets and an indicator of platelet volume and activity. This study aims to investigate whether MPV is correlated with the CURB-65 score, and whether a combination of the CURB-65 score with MPV could better predict the mortality in patients with community-acquired pneumonia. **Methodology:** Hospital-based prospective observational analytic study on 94 patients of CAP. Patients fulfilling the inclusion and exclusion criteria were taken for study and work up was done. All the data were collected from each subject, Hemodynamic parameters were assessed upon admission. CURB-65 scores were calculated and MPV was measured for all the subjects. Survival status was be obtained from patients or their relatives by telephone interview at 28 days. The correlation between CURB-65 score with mean platelet volume was analysed using standard test. **Results:** Among patients with CAP critical cut off value of MPV for predicting 28-day mortality was 11.45, which had sensitivity of 94.4% and specificity of 98.3%. area under ROC curve was 0.958 (95% CI, 0.922-0.99, P<0.001) when the score was used alone, whereas it increased to 0.985 (95% CI, 0.97-1.000, P<0.001) with addition of MPV to the score. The correlation between CURB-65 score with MPV were analysed by Spearman's rank correlation test, and the results showed that CURB-65 score was significantly and directly correlated with MPV (R=0.7857). **Conclusion:** Our results showed that the CURB-65 score could independently predict mortality in CAP patients. Furthermore, a combination of the CURB-65 scores and MPV performed better in predicting 28 days mortality in CAP.

INTRODUCTION

Community-acquired pneumonia (CAP) is a leading cause of morbidity and mortality worldwide. The clinical presentation of CAP varies, ranging from mild pneumonia characterised by fever and productive cough to severe pneumonia characterised by respiratory distress and sepsis.

CURB-65 score is a clinical prediction rule that has been validated for predicting mortality in community acquired pneumonia. This score consists of five predictors, including confusion, urea >7 mmol/L, respiratory rate 30 breaths per minute, systolic pressure <90 mm Hg or diastolic pressure 60 mm Hg,

and age 65 years.^[1] Platelets play an important role in the inflammatory response. Multiple inflammatory

factors such as chemokines, cytokines and coagulation factors are secreted by platelets, which increase in size when they are activated. Mean platelet volume (MPV) is a reflection of platelet size, which has been shown to correlate with platelet function and activation. A higher MPV value is indicative of increased platelet activity and thus more intense inflammation.^[2]

Mean platelet volume (MPV) is an indicator of platelet size and activity. An increased platelet volume and size reflect a thrombotic and inflammatory milieu; thus, MPV has been proposed

as a possible marker of platelet function and activation.^[3,4] Inflammatory and thrombotic conditions may alter platelet size, which can be detected on routine blood cell analysis by evaluation of mean platelet volume. Therefore, in this study we aim to assess MPV levels in CAP patients and whether MPV is correlated with CURB-65 score.

MATERIALS AND METHODS

A Hospital-based prospective observational study was done in Department of Medicine, SMS Medical College & Hospital, Jaipur, Rajasthan. In this study 94 patients of community acquired pneumonia were included.

Inclusion Criteria

- Patient who were 18 years or more
- Cases of pneumonia defined as per the criteria
- Individuals giving written informed consent to be a part of the study.

Exclusion Criteria

- Hospital acquired pneumonia (occurred 48 hours or more after hospitalization)
- Health care associated pneumonia
- Aspiration pneumonitis
- Immunocompromised patients.
- Patients with history of haematological disorders.
- Patients who had undergone a recent blood transfusion.

Detailed history with the examination was done. Investigations including CBC, PBF, MPV, RFT, LFT, were done. Results were assessed. Data were collected in prestructured proforma.

RESULTS

The mean age of the patients included in this study was 50.06±17.63 with majority of cases are in age

group 35-49 years (28.7%) and >65 years (26.6%) followed by 24.5% in age group 20-34 years, 20.2 % in age group 50-64 years. 51.1% were male and 48.9 patients were female. Most common presenting complaints was fever (93%), followed by shortness of breath (80%), cough (65%), drowsiness (10%), altered sensorium and chest pain in 6% cases. One or more concomitant Co morbid medical conditions were present in 63 patients (67.02%). The most common were diabetes mellitus (28.7%), HTN (25.5%), COPD (18%). In addition, CKD, Kyphoscoliosis, pregnancy was associated with high mortality. 36 out of 94 patients died during first 28 days. 58 patients were discharged and followed up with outpatient clinics. In our study Statistically there was significant difference in MPV between survivors (MPV = 9.62±0.77) and non survivors (MPV=12.69±0.76, P<0.001). Among patients with CAP critical cut off value of MPV for predicting 28-day mortality was 11.45, which had sensitivity of 94.4% and specificity of 98.3% (95%CI, AUC= 0.985, P<0.001). Patients with MPV levels above cut off value had significantly high mortality rates than those with MPV levels below the cutoff at 28 days. In our study there was significant difference in mean CURB-65 score between survivors (CURB-65= 1.31±0.84), and non survivors (3.67±0.96, P<0.001). Area under the ROC curve was 0.958 (95% CI, 0.922-0.99, P<0.001). Critical cut off value was 2 for predicting 28- day mortality, which had sensitivity of 86.1% and specificity of 93.1%. In our study we found out that area under ROC curve was 0.958 (95% CI, 0.922-0.99, P<0.001) when the score was used alone, whereas it increased to 0.985 (95% CI, 0.97-1.000, P<0.001) with addition of MPV to the score. The correlation between CURB-65 score with MPV were analysed by Spearman's rank correlation test, and the results showed that CURB-65 score was significantly and directly correlated with MPV (R=0.7857).

Table 1: Age distribution of study subjects

Age group (years)	N	Percentage
20-34 years	23	24.5
35-49 years	27	28.7
50-64 years	19	20.2
≥65 years	25	26.6
Total	94	100
Mean ± SD	50.06 ± 17.63	
Median (Range)	48 (20 – 86)	

Table 2: Frequency of presenting complaints among study subjects

Presenting complaints	N	Percentage
Fever	93	98.9
SOB	80	85.1
Cough	65	69.1
Drowsiness	10	10.6
Altered sensorium	6	6.4
Chest pain	6	6.4

Table 3: Past medical history among study subjects

Past medical history	N	Percentage
Smoking	18	19.1
Alcoholic	5	5.3

COPD	17	18.1
Old K chest	1	1.1
Diabetes	27	28.7
Hypertension	24	25.5
CKD	2	2.1

Table 4: Comparison of mean MPV (fl) among study groups

Group	N	MPV (Mean ± SD)	P value
Nonsurvivors	36	12.69 ± 0.76	<0.001 (S)
Survivors	58	9.62 ± 0.77	

Table 5: Comparison of mean CURB-65 score among study groups

Group	N	CURB-65 score (Mean ± SD)	P value
Nonsurvivors	36	3.67 ± 0.96	<0.001 (S)
Survivors	58	1.31 ± 0.84	

Table 6: ROC Curve for MPV for predicting mortality

AUC (95% CI)	0.985 (0.961 – 1.000)
P value	<0.001 (S)
Critical cutoff	11.45
Sensitivity	94.4%
Specificity	98.3%

Table 7: ROC Curve for CURB-65 score combined with MPV for predicting mortality

AUC (95% CI)	0.985 (0.97 – 1.000)
P value	<0.001 (S)
Sensitivity	97.2%
Specificity	98.3%

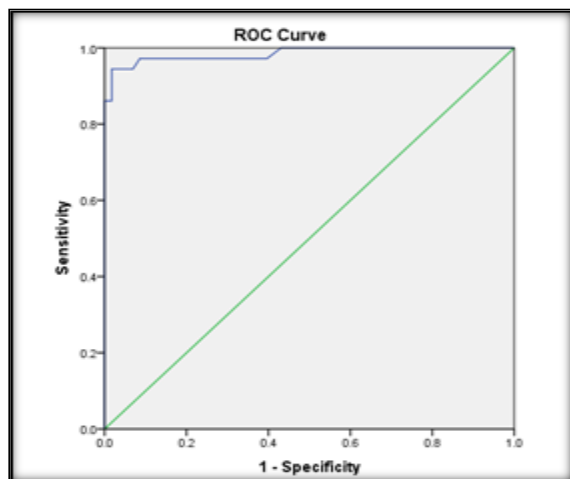


Figure 1: ROC Curve for MPV for predicting mortality

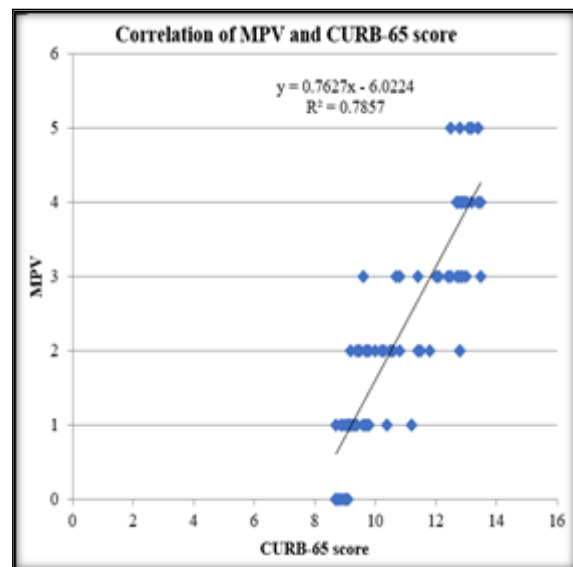


Figure 3: Correlation of MPV and CURB-65 score

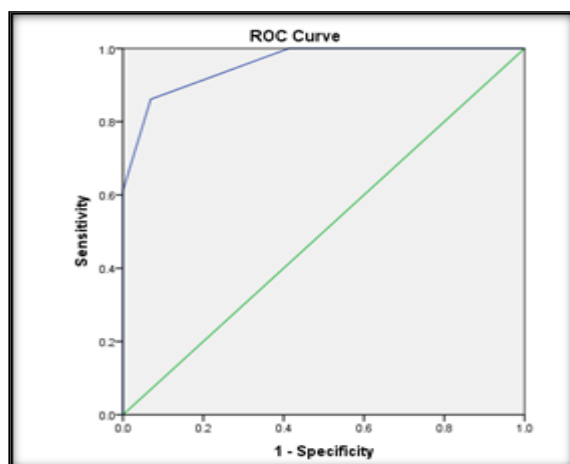


Figure 2: ROC Curve for CURB-65 score combined with MPV for predicting mortality

DISCUSSION

Relation between CURB-65 score and severity of community acquired pneumonia

CURB-65 Score is a widely used and simple and easy to remember method for stratifying patients according to severity and guiding initial treatment high risk patients, prognosis and site of care (outpatient, ward or ICU). In our study there was significant difference in mean CURB-65 score between survivors (CURB-65= 1.31±0.84), and non survivors (3.67±0.96, P<0.001). Critical cut off value was 2 for predicting 28- day mortality, which had sensitivity of 86.1% and specificity of 93.1%.

Mortality increases as the CURB-65 score increases in CAP patients. our results confirmed that this score is an independent predictor of mortality in patients with pneumonia.

Relation between MPV and severity of community acquired pneumonia

In our study Statistically there was significant difference in MPV between survivors and non survivors. Among patients with CAP critical cut off value of MPV for predicting 28-day mortality was 11.45, which had sensitivity of 94.4% and specificity of 98.3%. Patients with MPV levels above cut off value had significantly high mortality rates than those with MPV levels below the cutoff at 28 days.

Platelets plays and important role in the pathogenesis of inflammatory and infectious diseases.^[5,6]

Larger platelet expresses more procoagulant surface proteins and intracellular thromboxane A2 (TXA2), presenting a greater prothrombotic potency. TXA2 can also activate the pulmonary vascular endothelium, known to be integral in the process of acute lung injury related to serious infection.^[7]

As large thrombocytes are enzymatically, metabolically and functionality more active than smaller ones. Consequent hyper aggregations platelets, extended vasoconstriction and endothelial dysfunction may contribute to an increased short-term risk of cardiovascular thrombosis's death in patients with rising MPV.

MPV elevations may reflect hypercoagulation and an increased inflammatory response in pneumonia patients. Since an increased MPV is known to reflect reduced platelet counts and platelet activity^[8,9], the association between increased MPV and poor outcomes in severe pneumonia may suggest that decreasing platelet counts and increasing platelet activity correlate with a distorted host response.

Correlation between MPV and CURB-65 score

Our results demonstrate that the CURB-65 score and MPV are significantly and directly correlated; their combination results in a stronger predictive power. This could be helpful in the clinical identification of 28- day mortality rates in patients with CAP.

The area under ROC curve was 0.958 (95% CI, 0.922-0.99, P<0.001) when the score was used alone, whereas it increased to 0.985 (95% CI, 0.97-1.000, P<0.001) with addition of MPV to the score. The correlation between CURB-65 score with MPV were analysed by Spearman's rank correlation test, and the

results showed that CURB-65 score was significantly and directly correlated with MPV (R=0.7857).

CONCLUSION

Our results showed that the CURB-65 score could independently predict mortality in CAP patients. Furthermore, a combination of the CURB-65 scores and MPV performed better in predicting 28 days mortality in CAP patients in this study.

In our study we found that both CURB-65 score and MPV were independent predictors of 28-day mortality, and MPV in conjunction with CURB65 score significantly elevated the predictive accuracy. Higher than of 2 scores for CURB65 may increase the possibility of death. Our results demonstrate that the CURB-65 score and MPV are significantly and directly correlated, their combination results in a stronger predictive power. This could be helpful in the clinical identification of 28- day mortality rates in patients with CAP.

The results of this study provide additional acumen into the role of MPV levels in the risk stratification and subsequent management of patients with CAP.

REFERENCES

1. Lim WS, van der Eerden MM, Laing R, et al. Defining community-acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax* 2003;58:377e82.
2. Bath PM, Butterworth RJ: Platelet size: measurement, physiology and vascular disease. *Blood Coagul Fibrinolysis* 1996, 7:157-161.
3. Shah B, Valdes V, Nardi MA, HuL, Schrem E, Berger JS. Mean platelet volume reproducibility and association with platelet activity and anti-platelet therapy. *Platelets*. 2014; 25: 188-192.
4. Thompson CB, Eaton KA, Princiotta SM, Rushin CA, Valeri CR. Size dependent platelet subpopulations: relationship of platelet volume to ultrastructure, enzymatic activity, and function. *Br J Haematol*. 1982; 50: 509-519. PMID:7066203.
5. Semple JW, Freedman J. Platelets and innate immune. *cell Mol Life SCI* 2010;67:499-511.
6. Semple JW, Italiano Jr JE, FreedmanJ. Platelets and the immune continuum. *Nat Rev Immunol* 2011;11:264-74.
7. E.W.J. Kerris, C. Hoptay, T.Calderon, R.J. Freishtat, — Platelets and platelet extracellular vesicles in hemostasis and sepsis. *Journal of Investigative Medicine*68(4): 813-20.
8. Becchi C, Al Malyan M, Fabbri LP, Marsili M, Boddi V, Boncinelli S: Mean platelet volume trend in sepsis: is it a useful parameter? *Minerva Anesthesiol* 2006, 72(9):749-56.
9. T. Kitazawa, Y. Yoshino, K. Tatsuno, Y. Ota, and H. Yotsuyanagi, —Changes in the mean platelet volume levels after bloodstream infection have prognostic value, *Internal Medicine*, vol. 52, no. 13, pp. 1487-1493, 2013.