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Research Article

Serum N-Terminal Pro-Brain Natriuretic Peptide, D-Dimer Levels In Community-Acquired Pneumonia and Its Correlation with CURB-65 as a Prognostic Marker

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Abstract

Background: Community-acquired pneumonia (CAP) is a common medical condition, especially in older adults, and is usually associated to systemic inflammatory response syndrome (SIRS). The study aimed to study serum N-terminal pro-brain natriuretic peptide (NT -probnp) and D-dimer levels in community acquired pneumonia and its correlation with CURB-65 as a prognostic marker.

Methods: A prospective study was conducted for 18 Months among 96 patients admitted with community-acquired pneumonia. All eligible patients underwent relevant investigations like renal function tests, liver functions tests, complete blood count, blood –culture and sensitivity, sputum or tracheal aspirate – gram stain, culture and sensitivity, ECG, Chest X ray, USG abdomen. The scoring will be done in these patients to assess the severity and the need for admission in these patients including CURB 65 and PSI.

Results: Among 96 patients, Comorbidities are present in 67% of the study population. The mean and SD NT pro-BNP levels are 336.58±109.78pg/ml. Survivors' mean NT-proBNP levels were 321.37 pg/ml. 425.71 pg/ml with an SD of 108.74 pg/ml are found in non-survivors. Survivors have mean D-dimer levels of 1410.39 ng/ml, while non-survivors have mean D-dimer levels of 2334.29 ng/ml with SD of 1173.00 ng/ml.

Conclusions: The values of NT proBNP and D-dimer in the survivors of patients with higher CURB-65 are lower in this study and in non survivors even with a lower CURB-65 the values of D-dimer and NT pro BNP are higher indicating that NT pro BNP and D-dimer levels are slightly better in predicting the mortality and prognosis which is statistically significant.

Keywords: Community Acquired Pneumonia, CURV 65, N-Terminal Pro-Brain Natriuretic Peptide, D-Dimer

INTRODUCTION

CAP, or community-acquired pneumonia is defined as pneumonia acquired outside the hospital and has led to life-years lost globally.[1] Approximately 6.6% to 16.7% of patients admitted in hospital with CAP would enter the severe stage. Unfortunately, mortality rate is supposed to reach up to 28.8% in patients of severe CAP. [2] A considerable proportion of severe CAP patients in the emergency department can be treated as outpatients. However, unpredictable disease course and uncertain outcomes are challenges for clinicians, hindering the early identification of patients at high risk. The severity of pneumonia and the prognosis can be evaluated by using various risk scores, including the pneumonia severity index (PSI) and CURB-65 (confusion, urea nitrogen, respiratory rate, blood pressure, and age >65 years).[3-5] For CAP, low risk was defined as PSI score classes I to III and CURB-65 score class 1. High risk was defined by PSI score classes IV-V and CURB-65 score classes 2–5. But their performance seems uncertain, and they were more appropriate for research than clinical decisions.[6]

Community-acquired pneumonia (CAP) has significant morbidity, mortality, and disease burden among adults ≥ 18 years of age.[7] Early assessment of severity of CAP is very important in its management.[8] The Pneumonia Severity Index (PSI) and the CURB-65 score (mental Confusion, Urea, Respiratory rate, Blood pressure, and age ≥ 65) were used to predict

CAP-related mortality in adults. Inadequate evidence of the effectiveness or safety of CURB-65, this score was conditionally recommended to determine whether hospitalization is required or not. Although PSI is an effective and safe assessment tool, its rules are complicated and its application is time consuming. Therefore, clinicians desire a simple test that could be helpful to predict CAP-related mortality. Additionally, few studies suggested that pro-adrenomedullin, pro hormone forms of atrial natriuretic peptide, cortisol, procalcitonin, copeptin, C-reactive protein, and IL-6 could also predict CAP-related mortality better.[10,11]

It is known that D-dimer is a specific product of fibrinolysis and can be tested quickly. Besides, D-dimer testing is commonly used. Some studies revealed mean levels of D-dimer in non survivors of CAP were far more significant than were those in survivors of CAP and that D-dimer levels could be used to predict mortality in patients with CAP.[12-14] However, some researchers[15] claimed that there was no statistically significant difference in the mean D-dimer levels between CAP survivors and non-survivors. The impact of D-dimer levels on CAP patients' prognosis has not yet been thoroughly investigated and addressed. A neurohormone known as brain natriuretic peptide (BNP) is released by the heart in reaction to myocardial exertion caused on by volume overload. It is a neurohumoral marker for left ventricular dysfunction and an accurate predictor of outcome for patients suffering with congestive heart failure.[16] Community-acquired pneumonia (CAP) is a common medical condition, especially in older adults, and is usually associated to systemic inflammatory response syndrome (SIRS). It has high morbidity and mortality rate and frequently leads to septic shock. Patients with sepsis and septic shock have been reported to have markedly higher levels of brain natriuretic peptide (BNP).[17,18] The current study aimed to study serum N-terminal pro-brain natriuretic peptide (NT -probnp) and D-dimer levels in community acquired pneumonia and its correlation with CURB-65 as a prognostic marker.

MATERIAL AND METHODS

A prospective study was conducted for 18 Months at PES Hospital, Kuppam. Study Population include all patients admitted with community-acquired pneumonia in the PESIMSR hospital Purposive Sampling Method was used to select the sample.

With the expected prevalence of CAP of 50%, with 5% absolute precision and 95% CI using the formula $4pq/l^{2,}$ the Sample size was calculated as 96.

All patients of age greater than 18 years and diagnosed as community acquired pneumonia by clinical feature-like cough, fever, dyspnea and radiological features suggestive of community acquired pneumonia were included in the study. Patients with k/c/o heart failure, pulmonary thromboembolism, COVID-19, Patients with clinical, biochemical and radiological evidence of acute kidneyinjury or chronic kidney disease, with or without failure, Patients with history or radiological evidence of Pulmonary tuberculosis / sputum positive for Pulmonary TB and Patients in which symptoms develop after 48 hours of admission were excluded from the study.

Methods: Patients and their families will be asked to provide a detailed medical history that includes diabetes mellitus, systemic hypertension, ischemic heart disease, seizures, cerebrovascular accident, tuberculosis, bronchial asthma, COPD, retroviral disease, malignancies, previous surgeries, blood transfusions, and their elaboration of the presenting complaints. We will ask about personal history, including use of alcohol, smoking, and other adverse exposures, such as antibiotics. All the patients will be undergoing a thorough clinical examination from head to foot, including vital signs, SpO2, and detailed systemic examination to confirm the diagnosis and to pick up other relevant clinical findings.

The study participants are patient's community-acquired pneumonia who were admitted to the general medicine department of PES Medical College Hospital. This study is conducted over period of 18 months. All eligible patients underwent relevant investigations like renal function tests, liver functions tests, complete blood count, blood –culture and sensitivity, sputum or tracheal aspirate – gram stain, culture and sensitivity, ECG, Chest X ray, USG abdomen, ECHO - cardiogram when there was a doubtful cardiac disease , CT- chest whenever the diagnosis is in doubt. The BNP levels on admission were measured by using immune-fluorescence method. The choice of antibiotic usage and other treatments are according to the standard hospital protocols. Profroma includes age, gender, presenting complaints, past history, history of medications, clinical examination, and laboratory investigations. The scoring will be done in these patients to assess

the severity and the need for admission in these patients including CURB 65 and PSI. The patients will be examined daily with closely monitoring vitals spo2 in all the cases, the duration of hospital stay will be noted, and the cases followed up till death/discharge. The study was approved by IEC of PESIMER.

Statistical Analysis: The data will be entered into MS Excel 2007 version and further analyzed using SPSS (version 23.0; SPSS Inc., Chicago, USA) for descriptive analysis, the categorical variables was analyzed by using frequency and percentages and the continuous variables was analyzed by calculating mean + Standard Deviation. For inferential analysis, "t test" was used to analyze the numerical data. The categorical data was analyzed using Chi square testand "p" <0.05 will be considered statistically significant.

RESULTS

Table 1. Distribution According To Socio-Demographic Factors, Symptoms, Culture, Comorbidities, Habits, CURB Score, NT Pro-BNP Values and Outcome

Variable		Frequency	Percentage
Age (Years)	19-28	10	10
	29-38	8	8
	39-48	12	13
	49-58	22	23
	59-68	22	23
	>68	22	23
Gende	Male	62	65
	Female	34	35
Symptoms	Dyspnoea	94	98
	Cough	9	98
	Expectoration	90	94
	Fever	91	95
	Chest Pain	40	42
	Haemoptysis	2	2
	Oliguria	10	10
	Altered sensorium	2	2
Culture & Sensitivity	Pseudomonas aeruginosa	13	13.2
	Streptococcus pneumonia	12	12.2
	Klebsiella Pneumonia	9	9.3
	Staphylococcus aureus	9	8.3
	H. Influenza	4	4.1
	Enterbacter	3	3.1
	No organism isolated	47	49
Comorbidities	Present	64	67
	Absent	32	33
Family history of disease	Present	50	52
	Absent	46	48
Smoking	Yes	42	44
	No	54	56
Alcoholism	Yes	39	40
	No	57	60
NT pro-BNP Values	<200pg/ml	10	10
	200pg/ml-400pg/ml	54	56
	>400pg/ml	32	34
CURB 65 score	0	19	20
	1	40	42
	2	23	24
	3	10	10
	4	3	3
	5	1	1
Outcome	Survived	82	85
	Died	14	15

The age distribution in the study population are as follows 49-58 years 23%, 59-68 years 23%, >68 years 23% followed by 13% of them are 39-48 years, 10% of them are 19-28 years, 8% of them are 29-38 years. Majority 65% of them are males followed by 35% of them are females. Majority 98% of them with cough, dyspnea, 95% of them with fever, 94% of them with expectoration 42% of them with chest pain, 10% with oliguria and 2% with hemoptysis & altered sensorium were the presenting symptoms among the study participants. Organisms isolated from culture and sensitivity, Pseudomonas aeruginosa 13.2%>Streptococcus pneumoniae 12.2%> Klebsiella pneumoniae 9.3%>Staphylococcus aureus 8.3%> Hemophilus influenzae 4.10%> Enterobacter 3.10%. Organism isolated among 49% of the study population.

Comorbidities are present in 67% of the study population. Majority 52% of them had family history of diabetes and hypertension present and rest had no significant family history. Majority 56% of the study population have no smoking history and rest 44% of them have smoking history.All of the smokers being males. 40% of the patients had history of alcoholism. All of them are males. The mean and SD NT pro-BNP levels are 336.58±109.78pg/ml. Majority 56% of the study participants had >200pg/ml followed by 34% of them had ≥400pg/ml and 10% of them had ≤200pg/ml. The mean and SD of D-dimer levels among study population are 1545.12±844.08 ng/ml. Majority 42% of the study participants had CURB 65 score 1, 24% of them had 2, 20% of them had 0, 10% of them had 3, 3% of them had 4, 1% of them had 5. Outcome of the study population are 85% of them survived, 15% of them died.

Table 2. Distribution According To Socio-Demographic Factors, Symptoms, Comorbidities, Habits, CURB Score, NT Pro-BNP Values and Outcome

Variable		Outcome		P value
		Survived No. (%)	Died No. (%)	
Age	<48 years >49 years	28 (93) 54 (81)	2 (7) 12 (19)	0.116
Gender	Male Female	56 (90) 26 (77)	6 (10) 8 (24)	0.06
Smoking	Yes No	37 (88) 45 (83)	5 (12) 9 (17)	0.51
Alchoholism	Yes No	33 (85) 49 (86)	6 (15) 8 (14)	0.85
Comorbidities	Present Absent	52 (81) 30 (94)	12 (19) 2 (6)	0.102
CURB 65 score	0 1 2 3 4 5	19 (100) 40 (100) 23 (100) 0 (0) 0 (0) 0 (0)	0 (0) 0 (0) 0 (0) 10 (100) 3 (100) 1 (100)	<0.001
NT pro-BNP Values	<200pg/ml 200pg/ml-400pg/ml >400pg/ml	10 (100) 50 (93) 22 (69)	0 (0) 4 (7) 10 (31)	0.004
D-Dimer	Normal Elevated	2 (100) 80 (85)	0 (0) 14 (15)	0.34

The study participants in the age group >49 years, Survived 81% & 19% of them died. The study participants in the age group <48 years, 93% of them survived and 7% of them died it was statistically insignificant >0.05. 77% of the females and 90% of the males are survived and 24% of the females and 10% of the males are died. Comparison of gender and outcome is not statistically significant (p>0.05). 88% of the study participants with history of smoking survived, 83% of the study participants without smoking history are survived and 12% of the study participants with history of smoking are died, 17% of the study participants without smoking history died. Comparison between smoking and outcome is not statistically

significant. (p>0.05). 85% of the study participants with history of alcohol survived, 86% of the study participants without alcohol survived and 15% of the study participants with history of alcohol died, 14% of the study participants without alcoholism died. Comparison between alcohol and outcome is not statistically significant (p>0.05).

81% of the study participants with history of comorbidities survived, 94% of the study participant's witho utcomorbidities survived and 19% of the study participants with history of comorbidities died, 14% of the study participants without comorbidities died. Comparison between history of comorbidities and outcome is not statistically significant (p>0.05). The study subjects with CURB 65 score<2, 100% survived and study subjects with CURB 65 score 3, 4, 5 100% are died. The comparison between CURB 65 and outcome is statistically significant (p<0.05). The study subjects with NT-proBNP values ≤200pg/ml 100% survived, the study subjects with NT-proBNP values >200pg/ml 93% survived,69% of the study subjects with NT-proBNP value ≥400pg/ml survived. The NT-proBNP values with >200pg/ml 7% died, and NT-proBNP values with ≥400pg/ml 31% died. The comparison between NT-proBNP values and outcome are statistically significant (p<0.05). The study subjects with normal D-dimer levels survived and the none of them died. The study subjects with elevated D-dimer levels, 85% of them survived and 15% of them died and the comparison between D-Dimer and outcome is not statistically significant.

Table 3. Comparison of Mean and SD of NT-Pro BNP & D-Dimer Levels According To CURB 65

CURB 65	Mean	Standard Deviation	F value	p value
PRO-BNP				
0	264.74	81.06		
1	320.00	90.82		
2	370.52	117.67		
3	390.00	100.99	6.305	<0.01*
4	493.33	76.37		
5	580	-		
D-DIMER				
0	988.47	218.78		
1	1326.4	645.43		
2	1904.17	775.5		
3	2033.3	818.28	12.276	<0.01*
4	2451.33	1392.96		
5	4987.00	-		

Mean NT-pro BNP levels under CURB 65 score '0' 264.74pg/ml with SD 81.06pg/ml, Mean NT-pro BNP levels under CURB 65 score '1'320.00pg/ml with SD 90.82pg/ml,Mean NT-pro BNP levels under CURB 65 score '2' 370.52 pg/ml with SD 117.67pg/ml,Mean NT-pro BNP levels under CURB 65 score '3' 390.00 pg/ml with SD 100.99 pg/ml,Mean NT-pro BNP levels under CURB 65 score '4' 493.33 pg/ml with SD 76.37 pg/ml,Mean NT-pro BNP levels under CURB 65 score '5' 580.00 pg/ml. Comparison of means and SD is statistically significant p<0.01.Mean D-dimer levels under CURB 65 score '0' 988.47 ng/ml with SD 218.78ng/ml, Mean D-dimer levels under CURB 65 score '1'1326.4 ng/ml with SD 645.43 ng/ml,Mean D-dimer levels under CURB 65 score '2' 1904.17 ng/ml with SD 775.5 ng/ml,Mean D-dimer levels under CURB 65 score '3' 2033.3 ng/ml with SD 818.28 ng/ml,Mean D-dimer levels under CURB 65 score '4' 2451.33 ng/ml with SD 1392.96 ng/ml,Mean D-dimer levels under CURB 65 score '5' 4987.00 ng/ml. Comparison of means and SD is statistically significant p<0.01.

Table 4. Comparison of Means and SD of NT-Probnp, D-Dimer, CURB65 Vs Outcome

Outcome	Mean	Standard Deviation	t value	p value
NT-proBNP				
Survived	321.37	103.11	-3.343	0.964
Death	425.71	108.74		
D-dimer				
Survived	1410.39	699.13 1173.00	-2.862	0.016*
Death	2334.29			

CURB 65 Survived Death	 1.05 3.36	 0.718 0.633	-11.28	0.0001

Survivors' mean NT-proBNP levels were 321.37 pg/ml with an SD of 103.11 pg/m.425.71 pg/ml with an SD of 108.74 pg/ml are found in non-survivors. The levels are statistically insignificant (p=0.964) and higher among non-survivors than survivors.Survivors have mean D-dimer levels of 1410.39 ng/ml with SD of 699.13 ng/ml, while non-survivors have mean D-dimer levels of 2334.29 ng/ml with SD of 1173.00 ng/ml. The levels were statistically significant (p=0.016) and higher among non-survivors than survivors. The survivors' CURB 65 score was 1.05 with an SD of 0.71, whereas the non-survivors' score was 3.36 with an SD of 0.63.The values were statistically significant (p<0.05) and higher among non-survivors than survivors.

Table 5. CURB 65 and NT-Probnp, D-Dimer Values among Survivors

CURB 65 and NT-pro BNP values among survivors				
CURB-65	**N**	**Mean**	**Std.Deviation**	**Mann-Whitney U test**
0&1	59	302.2	90.9	0.0063*
2,3&4	23	370.5	117.6	
CURB 65 and D-dimer values among survivors				
CURB-65	**N**	**Mean**	**Std.Deviation**	**Mann-Whitney U test**
0&1	59	370.5	117.6	P<0.0001*
2,3&4	23	1217.8	565.7	

Mean NT-pro BNP levels in the survivors of CURB 65 score 0&1 is 302.2 and in survivors of CURB 65 2, 3 &4 is 370.5 which was statistically significant p<0.0063. Mean D-dimer levels in the survivors of CURB 65 score <2 is 1217.8 and in survivors of CURB 65 2 and above is 370.5 which was statistically significant p<0.0001.

Table 6. CURB 65 and NT-Probnp, D-Dimer Values among Non-Survivors

CURB 65 and NT-pro BNP values among non survivors				
CURB-65	**N**	**Mean**	**Std.Deviation**	**Mann-Whitney U test**
0&1	4	282.5	81.8	0.002*
2,3&4	10	469	82.9	
CURB 65 and D-dimer values among non survivors				
CURB-65	**N**	**Mean**	**Std.Deviation**	**Mann-Whitney U test**
0&1	4	572	152.7	P< 0.0004*
2,3&4	10	2872.4	928.08	

Mean NT-pro BNP levels in the non-survivors of CURB 65 score 0&1 is 282.5 and in non survivors of CURB 65 2, 3 &4 is 469 which was statistically significant p<0.002. Mean D-dimer levels in the non-survivors of CURB 65 score <2 is 572 and in non survivors of CURB 65 2, 3 &4 is 2872.4 which was statistically significant p<0.0004.

DISCUSSION

The clinical profile, severity, and prognosis of patients admitted to the hospital with community-acquired pneumonia in the Department of General Medicine were assessed during the course of this 18-month prospective observational study at PES Hospital, Kuppam. A total of 96 patients above 18 years of age who were diagnosed with community acquired pneumonia were included.

In the present study majority 98% of them with cough, dyspnoea, 95% of them with fever, 94% of them with expectoration 42% of them with chest pain, 10% with oliguria and 2% with hemoptysis& altered sensorium are the presenting symptoms among them. The most common symptoms reported by patients in the Devi P et al. study were cough (95%) and dyspnoea (95%), followed by fever (91%) and expectoration (86.7%).[19]

In the present study, the organisms which were isolated from culture and sensitivity are Pseudomonas aeruginosa 13.2%>Streptococcus pneumoniae 12.2%>Klebsiellla Pneumoniae

9.3%>Staphylococcus aureus 8.3%> Haemophilus influenza. 4.10%>Enterobactoer 3.10%.No organisms were isolated among the49%. The four most prevalent etiological agents in the study by Zhu et al. were Escherichia coli (E. coli) [survival (n=4) and mortality (n=2) groups], Pseudomonas aeruginosa [survival (n=5) and mortality (n=8) groups], Acinetobacter baumannii (A. baumannii) [survival (n=4) and mortality (n=6) groups], and Klebsiella pneumoniae (K. pneumoniae) [survival (n=6) and mortality (n=12) groups]. Blood cultures yielded three strains (K. pneumoniae, n = 2; A. baumannii, n = 1; E. coli, n = 1), whereas sputum samples yielded the remaining bacteria. [20] Study conducted by Devi P, et al. S. pneumoniae was isolated in 15% of study population, S.aureus and Klebsiella pneumonia isolated in 10% of study population influenzae and pseudomonas were isolated in 7% of study population. No organisms isolated in 40% of study population. [19]

The mean and SD of NT pro-BNP levels are 336.58±109.78pg/ml. Majority 56% of the study participants have >200pg/ml followed by 34% of them have ≥400pg/ml and 10% of them have ≤200pg/ml. As the NT-pro BNP value increases the prognosis worsens and associated with increased mortality. In the study by Soo Yeon Kang, et al mean NT-pro BNP values of the study population was 1,305 (299.3–3,933), and in control group its was 984 (213.3–3,120) and in case group it was 1,797 (767.5–5,882).[21] In the study by Eman O Arram et al, The mean serum level of initial B-type natriuretic peptide (BNP) was significantly higher (86.73 ± 25.91 pg/ml) in patients group than the control group 30.70 ± 6.77.[22] Mean BNP values were significantly raising transiently among CAP patients of this study, similar results were found by Yetkin et al.[23] While Christ et al concluded that, BNP cut-off level to predict improvement in 302 CAP patients with sepsis or shock was 95.5 pg mL while sensitivity and specificity were 47.8%, 85.8% respectively, this difference may be attributed to small number of this study.[24]

In this current study mean and SD of D-dimer levels among study population are 1545.12±844.08 ng/ml. Increased D-dimer levels are seen among patients with high CURB-65 and were associated with raised mortality. In the Bradley J et al patients with SARS-CoV-2 CAP who died or pursued hospice care also showed higher levels of D-dimer (1,309 mg/mL vs 691 mg/mL).[25] In the study by Soo Yeon Kang, et al mean D dimer values of the study population was 1.78 (0.82–3.28), and in control group its was 1.36 (0.68–2.48) and in case group it was 2.60 (1.33–4.80). [21] A few studies enquired into the comparable pattern of coagulation abnormalities in CAP.[26] Raised levels of D-dimer, a fibrin breakdown product linked to increased pneumonia severity and death, have been the most prominent hemostatic derangement reported thus far in CAP patients. D-dimer levels may improve the predictive power of severity ratings in CAP, according to prior research. [27]

CURB 65 score Majority 42% of the study participants have CURB 65 score 1, 24% of them have 2, 20% of them have 0, 10% of them have 3, 3% of them have 4, 1% of them have 5.Higher CURB 65 at presentation was associated with poorer prognosis and increased ICU stay & mortality.

In the study by B.A. Shah et al., the CURB-65 risk class ≥III had a PPV and NPV of 32% and 100%, respectively, and a sensitivity and specificity of 100% and 74.6% to predict death. The CURB-65 class ≥III has the best sensitivity and specificity. When CURB-65 class ≥IV was used as the cut-off, the specificity rose to 88.8%, but the sensitivity unfavourably decreased to 87.5%.[28] According to Soo Yeon Kang et al.'s study, 42.5% of participants had a CURB 65 score of 1, 34.8% had a score of 0, 16.3% had a score of 2, 5.4% had a score of 3, 1% had a score of 4, and 0.1% had a score of 5.V[21] In the study by Abdelaziz etal, Overall ICU mortality was 41%. Apart from APACHE III score, all other scores, including the CURB-65 score, had good ability to differentiate survivors and nonsurvivors (P<0.0001). [29] In the study by Masahiro Shirata et al, There was an almost positive correlation between each score and mortality in CURB-65. [30]

Outcome of the study population are 85% of them are survived, 15 % of them are died. In the study by B.A. Shah et al sixteen patients (10.7%) died. [12 (8%) patients who died in-hospital and four (2.7%) within 30 days after discharge]. [28] in the study by Abdelaziz etal, CURB-65 score improved the sensitivity of the CURB-65 score with an AUC (95% confidence interval) of 0.683 (0.573–0.792). [29]

The mean NT-proBNP levels among survivors were 321.37 ng/ml with SD of 103.11 ng/ml, while in non-survivors they were 425.71 ng/ml with SD of 108.74 pg/ml. The levels were higher in non-survivors than in survivors, and the difference was statistically insignificant

(p=0.964). The mean D-dimer levels in survivors were 1410.39 ng/ml with SD of 699.13 ng/ml, and in non-survivors were 2334.29 ng/ml with SD of 1173.00 ng/ml. The difference between non-survivors and survivors was statistically significant (p=0.016).

In another 2014 study conducted by Albina nowak7 et al with 341 patients of Community Acquired Pneumonia, their PRO-BNP levels were raised. This study also measured simultaneously the PRO-BNP and atrial natriuretic peptide to determine the significance of all the three peptides. With a P value of 0.014, the mean BNP value in the study by Devi P et al. was significantly higher in non-survivors (570 pg/ml) than in survivors (335.5 pg/ml). More than 400 pg/ml was linked to a greater mortality rate, and more than 200 pg/ml was often linked to clinically severe disease. Survivors aged ≥65 years had mean BNP levels of 298.92 pg/ml, whereas patients aged ≥65 years who died had mean BNP levels of 381.0 pg/ml. Survivors aged ≥65 years had mean BNP levels of 429.57 pg/ml, while patients aged ≥65 years had mean BNP levels of 652.14 pg/ml. [31]

According to Evrim Eylem Akpınar et al. The univariate analysis revealed that the serum NT-proBNP level ($p < 0.001$ and $p = 0.023$, respectively), CURB-65 score ($p < 0.001$ and $p = 0.002$, respectively), and PSI ($p < 0.001$ for both) were the factors impacting ICU admission and 30-day mortality. Additionally, patients who were hospitalised to the intensive care unit had a substantially higher mean NT-proBNP level than those who were not (5,209.50 ± 7,807.21 pg/mL vs. 1,255.44 ± 1,562.32 pg/mL; $p < 0.001$).[32] Nowak et al suggested that the levels of natriuretic peptides, especially NT-proBNP, could predict mortality in CAP and that their predictive ability is comparable to that of the PSI.[31] CAP and hospital-acquired pneumonia accounted for 35% and 25% of the sample, respectively, while healthcare-associated pneumonia accounted for 40%. Lin et al. examined the plasma levels of NT-proBNP at ICU admission and 30-day mortality in patients with pneumonia. Additionally, those authors discovered that survivors had significantly lower mean NT-proBNP levels than nonsurvivors. Additionally, they noted that among patients admitted to the intensive care unit (ICU) with pneumonia, the NT-proBNP level demonstrated predictive accuracy equivalent to the APACHE II score. [33]

Mean D-Dimer levels in the survivors of CURB 65 score 0&1 is 1217.8 and in survivors of CURB 65 2,3 &4 is 370.5 which was statistically significant p<0.0001. Mean D-Dimer levels in the non-survivors of CURB 65 score 0&1 is 572 and in non survivors of CURB 65 2,3 &4 is 2872.4 which showed statistically significant association where p<0.0004.

About half of the sample population in Devi P et al.'s study had a CURB 65 score of 2, 35% had a score of 3, and 6.7% had scores of 1 and 4. The P value is less than 60.289, and the mean BNP levels in survivors of CURB65 scores 0 and 1 are 447.80 and 323, respectively. These values were statistically insignificant. [34] For the Soo Yeon Kang et al. study in order to predict the primary result, the CURB-65's AUROCs were 0.615 (95% CI: 0.614–0.616), 0.701 (95% CI: 0.700–0.702), and 0.844 (95% CI: 0.843–0.845). The 30-day mortality ROC curves are displayed, and the CURB-65 AUROC is 0.581 (95% CI, 0.579–0.582). [21] Using electronic health information, a Dutch study found that after hospitalisation for CAP, only 8% of adults consulted primary care within 30 days.85 Their study comprised patients a) who were younger (mean age range per year from 2002- 2009; 57 years (SD 27.9) to 61 years (SD 24.8), compared to a median age of 76 years (IQR 60-85) for our study cohort and b) with lower pneumonia severity, as reflected in their combined mortality (in-hospital and within 30 days of discharge) of 7%.[35] A small 3-centre UK study by Daniel et al. (n=108) of adults aged <65 years found primary care consultation occurred in 59%. [36] In the study by Evrim Eylem Akpınar et al, The AUCs for the NT-proBNP level, and CURB-65 score, respectively, were as follows 0.735 (95% CI: 0.642 0.828; $p < 0.001$); and 0.659 (95% CI: 0.556-0.763; $p = 0.006$). [32]

In the current study, majority were males, having cough, dyspnoea, fever, major organism was Pseudomonas aeruginosa. Positive past and family history was seen in majority of the study population. Majority had CURB score 1. 15 patients died. Statistically Significant association was observed among the NT proBNP with age, outcome, D-dimer with age, sex and outcome. Comparison of means and SD of NT proBNP& D-dimer and CURB 65 was statistically significant. The values of NT proBNP and D-dimer in the survivors of patients with higher CURB-65 are lower in this study and in non survivors even with a lower CURB-65 the values of D-dimer and NT pro BNP are higher indicating that NT pro BNP and D-dimer levels are slightly better in predicting the mortality and prognosis which is statistically significant.

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