"SERUM BRAIN NATRIURETIC PEPTIDE AS AN EARLY MARKER FOR PREDICTING PROGNOSIS IN COMMUNITY ACQUIRED PNEUMONIA AS COMPARED WITH A - DROP SCORE"

DR. BILAL AHMAD KHAN

DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE

IN

GENERAL MEDICINE

GUIDE:

DR. RAVEESHA.A **M.B.B.S, MD (MEDICINE)**
HOU & PROFESSOR
DEPARTMENT OF GENERAL MEDICINE
SDUMC, KOLAR

DEPARTMENT OF GENERAL MEDICINE
SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA,
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HOU & PROFESSOR
DEPARTMENT OF GENERAL MEDICINE
SDUMC, KOLAR

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SDUMC, KOLAR

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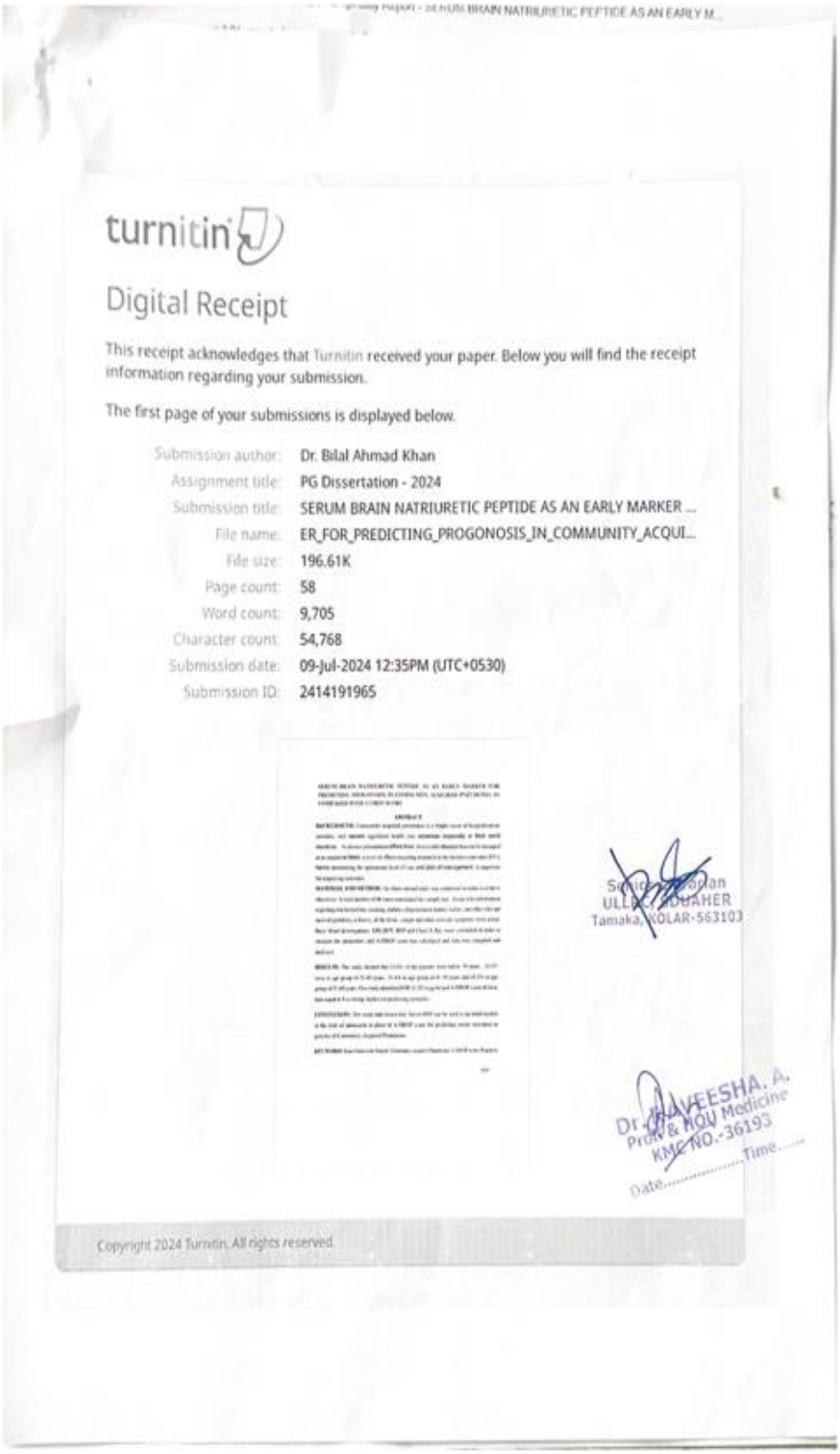

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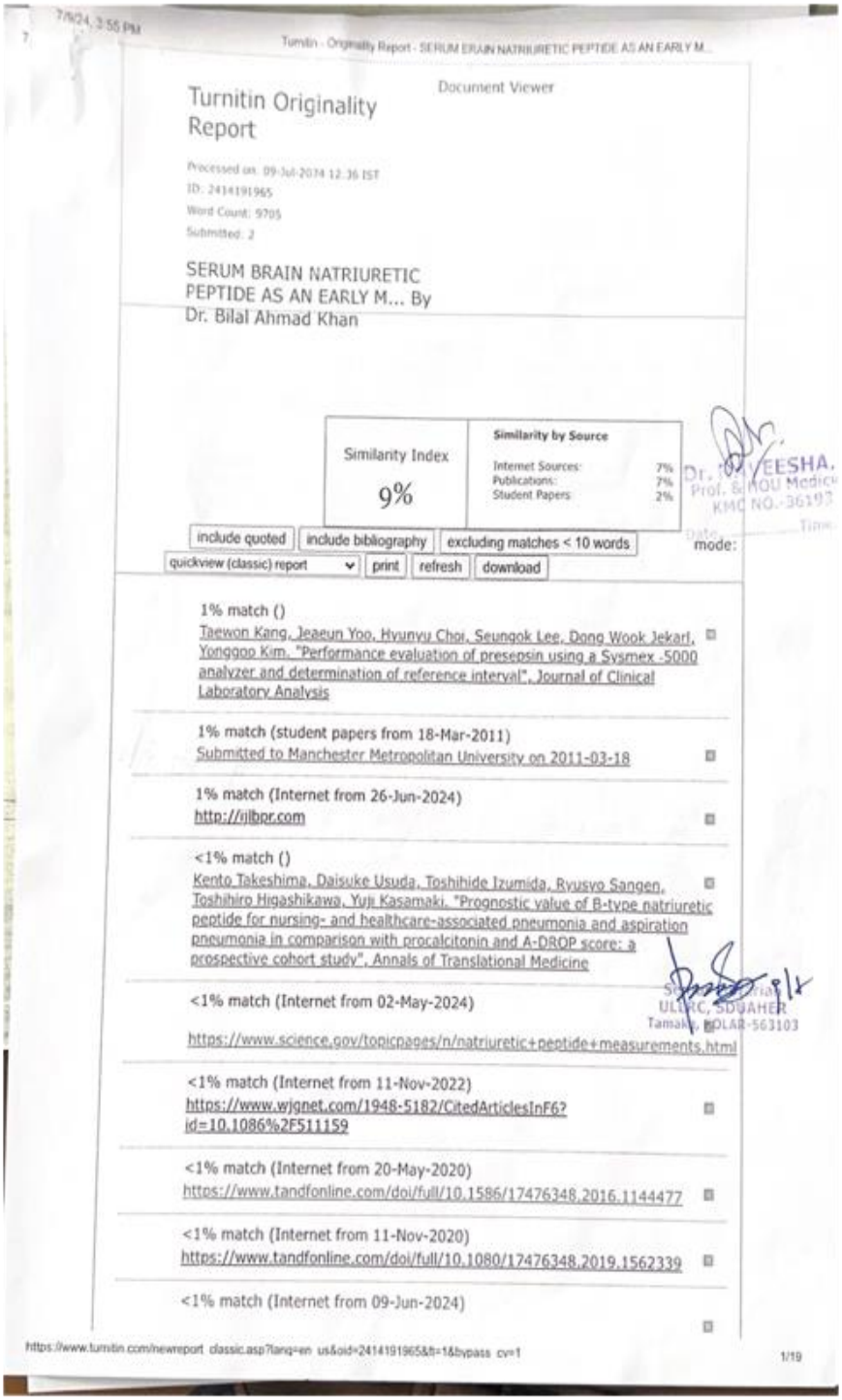

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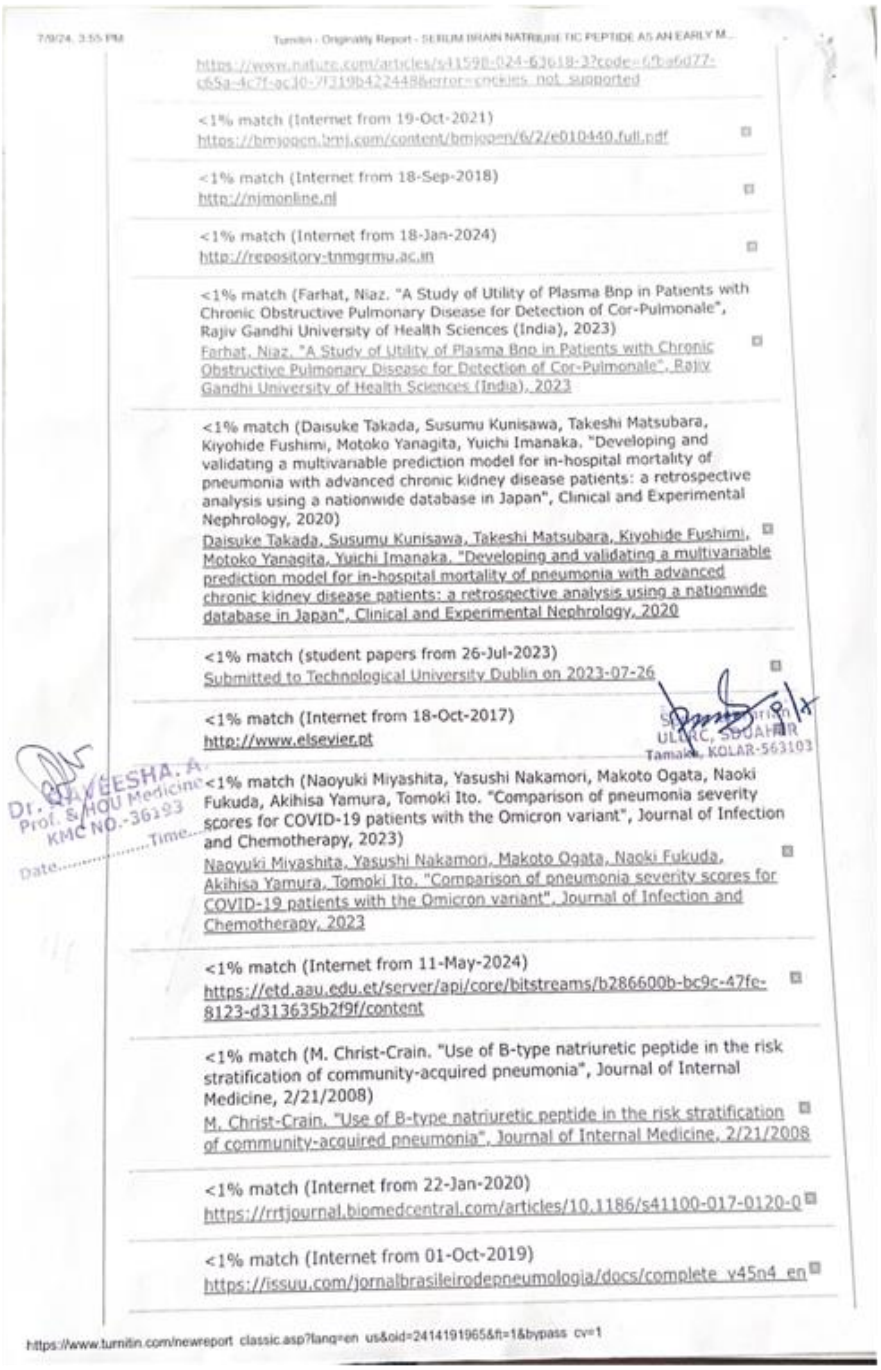

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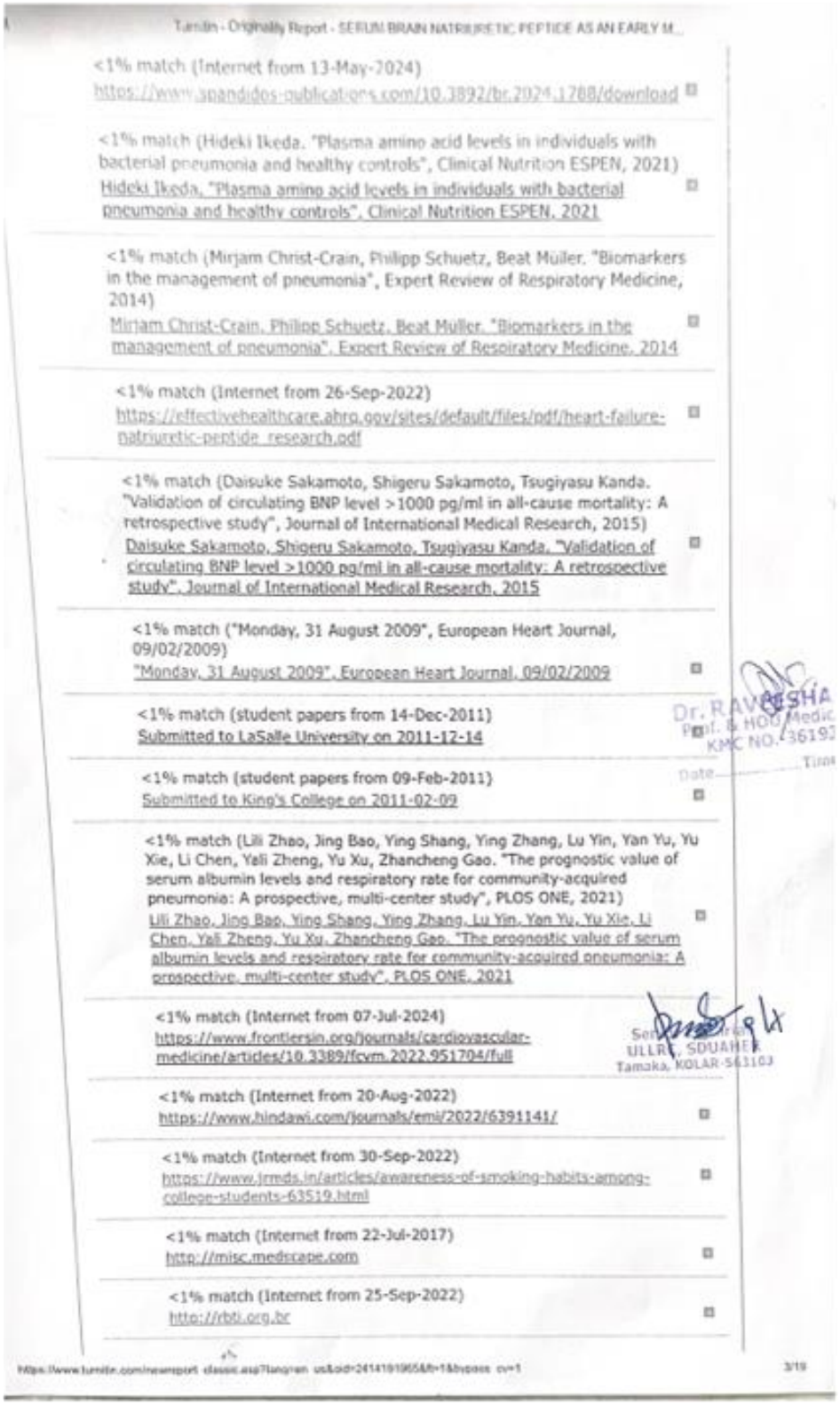

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SERUM BRAIN NATRIURETIC PEPTIDE AS AN EARLY MARKER FOR PREDICTING PROGONOSIS IN COMMUNITY ACQUIRED PNEUMONIA AS COMPARED WITH A-DROP SCORE ABSTRACT BACKGROUND: Community acquired pneumonia is a major cause of hospitalization, mortality, and causes significant health care expenses especially in third world countries. . As disease presentation differs from from a mild disease that can be managed as an outpatient basis to a severe illness requiring treatment in the intensive care unit (ICU), hence determining the appropriate level of care and plan of management is important for improving outcomes. MATERIAL AND METHOD: An observational study was conducted in order to achieve objectives. A total number of 66 cases constituted the sample size. Along with information regarding risk factors like smoking, diabetes, hypertension, kidney failure, and other relevant medical problems, a history of the fever , cough and other relevant symptoms were asked. Basic blood investigations, CBC,RFT, BNP and Chest X Ray were conducted in order to measure the parameters and A-DROP score was calculated and data was compiled and analyzed. RESULTS: The study showed that 13.6% of the patients were below 30 years , 33.3% were in age group of 31-40 years , 31.8% in age group of 41-50 years and 15.2% in age group of 51-60 years. Our study identified BNP of 251.6 pg/ml and A-DROP score of more than equal to 4 as strong marker for predicting mortality. CONCLUSION: This study had shown that, Serum BNP can be used as an inital marker at the time of admission in place of A-DROP score for predicting worse outcomes in patients of Community Acquired Pneumonia. KEY WORDS: Brain Natriuretic Peptide, Community acquired Pneumonia, A-DROP score, Prognosis xiii INTRODUCTION: Community acquired pneumonia (CAP) is a significant global health issue that leads to significant illness, death, and financial burden on healthcare systems of various countries of the world.(1) The severity of CAP varies from mild cases that may resolve on their own to severe pneumonia which might require hospitalization and intensive care. It is important to accurately assess the prognosis of CAP to determine and know the appropriate treatment approach, monitoring level, and timely interventions.(2) Many scoring systems and biomarkers have been proposed to help forsee the prognosis and stratify the risk of patients with CAP, with the A-DROP score and serum brain natriuretic peptide (BNP) level being viable options.(3) The A-DROP score, derived from the CURB-65 score, relies on age, dehydration, respiratory failure, confusion, and low blood pressure to

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PRIOR PERMISSION TO START OF STUDY

The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the synopsis entitled **"Serum brain natriuretic peptide as an early marker for predicting prognosis in community acquired pneumonia as compared with A-Drop Score"** being investigated by **Dr.Bilal Ahmad Khan** & Dr.Raveesha A in the Department of General Medicine at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

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SERUM BRAIN NATRIURETIC PEPTIDE AS AN EARLY MARKER FOR PREDICTING PROGONOSIS IN COMMUNITY ACQUIRED PNEUMONIA AS COMPARED WITH A-DROP SCORE

ABSTRACT

BACKGROUND: Community acquired pneumonia is a major cause of hospitalization, mortality, and causes significant health care expenses especially in third world countries. As disease presentation differs from a mild disease that can be managed as an outpatient basis to a severe illness requiring treatment in the intensive care unit (ICU), hence determining the appropriate level of care and plan of management is important for improving outcomes.

MATERIAL AND METHOD: An observational study was conducted in order to achieve objectives. A total number of 66 cases constituted the sample size. Along with information regarding risk factors like smoking, diabetes, hypertension, kidney failure, and other relevant medical problems, a history of the fever , cough and other relevant symptoms were asked. Basic blood investigations, CBC,RFT, BNP and Chest X Ray were conducted in order to measure the parameters and A-DROP score was calculated and data was compiled and analyzed.

RESULTS: The study showed that 13.6% of the patients were below 30 years , 33.3% were in age group of 31-40 years , 31.8% in age group of 41-50 years and 15.2% in age group of 51-60 years. Our study identified BNP of 251.6 pg/ml and A-DROP score of more than equal to 4 as strong marker for predicting mortality**.**

CONCLUSION: This study had shown that, Serum BNP can be used as an inital marker at the time of admission in place of A-DROP score for predicting worse outcomes in patients of Community Acquired Pneumonia.

KEY WORDS: Brain Natriuretic Peptide, Community acquired Pneumonia, A-DROP score, Prognosis

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LIST OF ABBREVIATIONS USED
(in alphabetical order)

ABG	ARTERIAL BLOOD GAS
ANP	ATRIAL NATRIURETIC PEPTIDE
ARDS	ACUTE RESPIRATORY DISTRESS SYNDROME
BNP	BRAIN NATRIURETIC PEPTIDE
CAP	COMMUNITY ACQUIRED PNEUMONIA
CBC	COMPLETE BLOOD COUNT
CRP	C-REACTIVE PROTEIN
ICU	INTENSIVE CARE UNIT
NPR	NATRIURETIC PEPTIDE
NT-proBNP	N-TYPE-PRO B NATRIURETIC PEPTIDE
PCT	PROCALCITONIN
PSI	PNEUMONIA SEVERITY INDEX
RAAS	RENIN ANGIOTENSIN ALDOSTERONE SYSTEM

RFT	RENAL FUNCTION TEST
RSV	RESPIRATORY SYNCYTIAL VIRUS
SBP	SYSTOLIC BLOOD PRESSURE
SNS	SYMPATHETIC NERVOUS SYSTEM
NHCAP	NURSING AND HEALTHCARE ASSOCIATED PNEUMONIA
HCAP	HEALTH CARE ASSOCIATED PNEUMONIA
AUC	AREA UNDER CURVE
PPV	POSITIVE PREDICTIVE VALUE
NPV	NEGATIVE PREDICTIVE VALUE
DM	DIABETES MELLITUS
HTN	HYPERTENSION
ROC	RECEIVER OPERATOR CHARACTERISTIC CURVE

INTRODUCTION

INTRODUCTION

Community acquired pneumonia (CAP) is a significant global health issue that leads to significant illness, death, and financial burden on healthcare systems of various countries of the world.[1] The severity of CAP varies from mild cases that may resolve on their own to severe pneumonia which might require hospitalization and intensive care. It is important to accurately assess the prognosis of CAP to determine and know the appropriate treatment approach, monitoring level, and timely interventions.[2] Many scoring systems and biomarkers have been proposed to help forsee the prognosis and stratify the risk of patients with CAP, with the A-DROP score and serum brain natriuretic peptide (BNP) level being viable options.[3] The A-DROP score, derived from the CURB-65 score, relies on age, dehydration, respiratory failure, confusion, and low blood pressure to categorize CAP patients into different risk groups for hospitalization and intensive care.[4] Though the A-DROP score is profoundly used, it has it's own limitations like being based on subjective assessments and not accounting in for factors like cardiac issues that can also impact CAP outcomes significantly.[5]

Serum BNP, a cardiac biomarker secreted by the ventricular myocardium due to increased volume and pressure, is becoming a important tool for predicting outcomes in different cardiac and non-cardiac related diseases, such as pneumonia.[6] High levels of serum BNP have been linked to more severe pneumonia and worse prognosis, indicating possible cardiac issues, lung congestion, and overall inflammation. Quickly and easily measured with commercially and locally available tests, serum BNP levels can help identify high-risk pneumonia patients early on and provide guide timely treatment decisions.

AIMS & OBJECTIVES

OBJECTIVES OF THE STUDY

- To estimate serum BNP levels in patients diagnosed with community acquired pneumonia at admission
- To assess patients according to A-DROP score diagnosed with community acquired pneumonia
- To compare serum BNP levels and A-DROP scores as a prognostic markers in patients diagnosed with community acquired pneumonia.

REVIEW OF LITERATURE

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Definition and Epidemiology

Community-acquired pneumonia (CAP) is a prevalent infectious condition where the lung tissue becomes inflamed due to various pathogens acquired outside of healthcare settings i.e hospital, nursing health care and other medical health facilities. [8] CAP is a unsettling concern for people of all ages , sex and demography, but it mostly impacts the elderly, young children, and those with compromised immune systems.[9] The prevalence of CAP varies depending on factors like age, existing health conditions, socioeconomic status, and seasonal changes.

While Streptococcus pneumoniae is the most common organism, other pathogens like Haemophilus influenzae, Mycoplasma pneumoniae, and Chlamydophila pneumoniae, as well as respiratory viruses such as the RSV and others, also play a role in causing CAP.[10]

The winter season tends to see a higher occurrence of CAP due to increased respiratory viral infections and other environmental factors. CAP is a noteworthy global healthcare challenge, leading to considerable levels of illness, death, and economic burdens.[11]

Clinical Significance and Severity Grading

Community-acquired pneumonia (CAP) can present with spectrum of symptoms, from mild respiratory problems to severe respiratory distress, often requiring intensive care.

Classical clinical signs are cough, fever, difficulty breathing, chest pain, and sputum production, although atypical symptoms may also be seen in elderly or immunocompromised individuals.

It is of paramount importance to accurately assess the severity of CAP to determine the appropriate treatment and the need for hospital admission.

Various scoring systems like CURB-65 and the pneumonia severity index (PSI) are used to classify patients based on their risk of mortality and hospital admission by considering factors such as age, vital signs, comorbidities, and lab results but , clinical understanding and physician evaluation are also important in determining the severity of CAP and initiating the correct interventions.[12]

Prognostic Indicators in CAP

Different factors help in predicting the progression and results of community-acquired pneumonia (CAP), helping in determining the risk level and guiding treatment options.

These factors consist of demographic variables like age, sex, socioeconomic status , existing medical conditions, symptoms, and lab parameters.

Old age, existing chronic health issues like chronic obstructive pulmonary disease and heart failure, severity of breathlessness, low oxygen levels, and abnormal chest imaging all indicate a worse outcome for CAP.

Increased inflammatory markers like C-reactive protein and procalcitonin, increased white blood cell count, and kidney dysfunction in the form of acute kidney injury also shows disease severity and poor outcomes. However, knowing the microbial cause, presence of sepsis, and the need for mechanical ventilation play important role in predicting CAP outcomes.

Using these predictive factors help in medical decision making hence enhancing patient care by guiding choices on when to treat the patient, which antibiotics to use, and how long the therapy should be provided.[13]

Role of biomarkers in prognosis prediction

Biomarkers are important for predicting the outcome and guiding treatment choices in CAP. These biomarkers include a variety of markers that indicate different aspects of the immune response and disease mechanisms, such as inflammatory markers, acute-phase proteins, cellular elements, and microbial products. C-reactive protein (CRP) and procalcitonin (PCT) are widely investigated biomarkers for CAP.

CRP is produced by the liver when there is inflammation in body, and in CAP, high levels of CRP are linked to more severe lung parenchyma involvement and a stronger overall inflammatory response. Patient with high CRP levels when they initially present indicate a more severe illness, higher risk of complications, and higher chances of mortality. Similarly, Procalcitonin, a substance made in response to bacterial infections, can indicate the extent of inflammation and bacterial presence in CAP. Elevated PCT

levels suggest a bacterial cause and are tied to more aggressive illness and negative results.

Although CRP and PCT are useful for predicting the outcomes and guiding the antibiotic use, researchers are currently researching the potential prognostic value of other biomarkers like interleukin-6, tumour necrosis factor-alpha, leukocyte subsets, and host genetic markers in community-acquired pneumonia.

Besides predicting outcomes, biomarkers help in making decisions about antibiotic treatment, especially in distinguishing between bacterial and viral etiology and determining how long treatment should be given. Increased levels of PCT are now included in guidelines for when to start and stop antibiotics for CAP, leading to more justful use of antibiotic and less unnecessary exposure.

On the other spectrum of this , low PCT levels can help in deciding whether to give or to stop antibiotics in patients with a low likelihood of bacterial infection, hence reducing the risk of antibiotic resistance and side effects.

While CRP levels are used to guide antibiotic treatment for CAP has been suggested, its use differs among healthcare settings and needs more validation in real world practice taking into account other variables and most importantly not taking socioeconomic condition of patient out of the equation.

While biomarker guided approach helps in managing CAP and offer other potential advantages, it comes with limitations and challenges that must be taken into account.

Factors like age, existing health conditions, and other non-infectious inflammatory issues can alter biomarker levels, making their interpretation complex.

The accuracy of biomarker assays in identifying pathogens or predicting outcomes varies, hence caution is needed when using them alongside clinical judgement.

To make biomarkers more effective in CAP management, it is crucial to standardize the assays, set appropriate cut-off values, and validate them across different patient groups.

Secondly, evaluating the cost-effectiveness of biomarker testing and its impact on patient outcomes is necessary before implementing it routinely in clinical settings as it may differ from region to region basis [14]

Importance of Early Prognostic Assessment

It is of paramount importance to make an early assessment of patients with community acquired pneumonia (CAP) in order to plan the management , distribute resources effectively (more important for 3rd world countries) , and improve patient outcomes over a period of time

Community acquired pneumonia can vary in severity from mild respiratory distress to respiratory failure and acute respiratory distress, which may necessitate ICU admission and need for mechanical ventilation.

Identifying high risk patients is of paramount importance to promptly start the necessary interventions like antibiotics, oxygen therapy, IV fluids, and other supportive management.

There hase been various scoring systems and prognostic models like the CURB-65 score, pneumonia severity index (PSI), and CURB-65 score that were used in categorizing and prioritizing patients with CAP on basis of their risk of mortality and the need for hospital care.

These scoring systems consider factors such as age, vital signs, underlying health conditions, and lab parameters to forsee the illness severity and assist in deciding the appropriate level of care.

Blood biomarkers like C-reactive protein (CRP) and procalcitonin (PCT) offer valuable insights for in assessing disease severity, monitoring management and guide effective antibiotic use.

Hence early evaluation of patient helps in prompt intervention, and it decreases the chances of complications, and improves the prognosis in CAP, hence emphasizing the importance of scoring systems in clinical settings.[15]

Current Challenges in Prognostic Prediction.

Throughout the evolution of medical science there have been many improvements and many ongoing developments in predicting outcomes for community-acquired pneumonia (CAP), but there are still challenges in accurately predicting results and making decisions on how to manage it which has huge burden on the society.

One major such problem of early assessment in patients with community acquired pneumonia, include patient diversity as initial symptoms at presentation might vary due to underlying health conditions, types of organism causing infection and variability on patient immune system response.

Despite numerous scoring systems, the current scoring methods and predictive models are not sufficient to explain all patient groups; this leads in a large variation of paired risk prediction where inconsistency generates important clinical implications.

Additionally, the complexity of community acquired pneumonia (CAP), characterized by a rapidly changing clinical course and variable treatment responsiveness, increases physicians' challenges in predicting prognosis or monitoring response to therapy.

Although biomarkers like C-reactive protein (CRP) and procalcitonin (PCT) provide valuable information about the severity of illness and response to treatment, they have their limitations particularly related with age, underlying medical comorbidities concurrent use of medications as well non infective inflammatory conditions.

To improve the efectiveness of biomarkers in managing Communityacquired pneumonia, it is crucial to standardize the assays, determine clinically relevant thresholds, and validate their effectiveness in various patient groups

Additionally, it is of paramount important to assess the cost-effectiveness of biomarker testing and its effects on patient outcomes before deciding to regularly use it in clinical and daily practice. Incorporating new biomarkers and advanced imaging techniques into prognostic models shows potential for enhancing risk assessment and treatment decisions for CAP. Nevertheless, more studies are required to tackle current hurdles and confirm the practical value of prognostic tools in various healthcare environments and for different patient groups.[16]

Serum Brain Natriuretic Peptide (BNP): Physiology and Role

BNP is a hormone produced by the cardia in response to increased heart muscle stretching and volume overload, primarily by ventricular muscle cells. It is initially made as pro-BNP and then degraded down into the active BNP and inactive NT-proBNP. BNP

works by attaching to receptors in target tissues and causing effects like widening of blood vessels, increasing salt and water diuresis, reducing fluid retention, and blocking the renin-angiotensin-aldosterone system and sympathetic nervous system.

Apart from its efects on the heart, BNP has been linked to various non-cardiac conditions, like respiratory diseases such as community-acquired pneumonia (CAP). In CAP, BNP levels can increase due to different factors, such as increased pulmonary vascular resistance, strain on the right ventricle from low oxygen levels (Hypoxia) and breathing difficulty, and a widespread inflammatory response. Elevated BNP levels in CAP have been related to more severe illness, higher risk of complications, and worse outcomes like death and the need for mechanical ventilation. BNP levels are considered as potential indicators of prognosis in CAP, providing important information on the interactions between the heart and lung tissue, fluid levels, and hemodynamic status of the patient.

The use of BNP as a predictive marker for CAP outcomes is a topic of debate among researchers due to conflicting evidence on its reliability and importance. More studies are required to understand BNP's role in CAP, its correlation with disease severity and prognosis, and how can it be used to improve clinical decisions and assess risk of worse outcomes.

Hence including BNP measurements in thorough prognostic models and scoring systems could improve the precision and effectiveness of managing CAP.[17]

BNP as a cardiac biomarker

Brain natriuretic peptide (BNP) is a recognized cardiac biomarker secreted mainly by ventricule myocytes when the heart is under strain due to increased volume. BNP, along with atrial natriuretic peptide (ANP), affects target tissues by attaching to natriuretic peptide receptors (NPR-A and NPR-B).

BNP's functions include widening of blood vessels, removing sodium and water, and blocking the renin-angiotensin-aldosterone system (RAAS) and sympathetic nervous system (SNS). Consequently, BNP helps decrease blood pressure, plasma volume, and the heart's workload.

BNP levels are increased in various heart conditions linked to heart muscle dysfunction, such as heart failure, myocardial infarction, and valve conditions, indicating the extent of cardiac stress and dysfunction. BNP is an important cardiac marker which is used for diagnosing, assessing risk, monitoring cardiovascular patients, formulating treatment decisions, and predicting outcomes.

In patuents of community acquired pneumonia (CAP), elevated BNP levels may indicate towards interactions between the cardia and the lungs, including increase in pulmonary vascular resistance, strain on the right side of the heart, and the body's inflammatory response.

This marker i.e BNP can provide insights into the severity, prognosis, and response to treatment in community acquired pneumonia.

However, further research and studies are required to fully understand the use of BNP as a prognostic marker in CAP, while considering potential factors that could affect its interpretation during acute illness and non cardiac related conditions.[18]

Mechanisms of BNP Release in Pneumonia.

The secretion of brain natriuretic peptide (BNP) during pneumonia is thought to be affected by various of factors and interactions among cardia and lung involvement inflammation , and hormonal reactions in response to stress due to sepsis

Pneumonia has been found to cause low oxygen levels and if not treated leads to respiratory distress, which in turn lead to higher resistance in lung vasculature and strain on the right side of the heart.

This results in change of heart's architecture and stretching of the cardiac muscle. Heart muscle cells react to these changes by producing and secreting B-type natriuretic peptide (BNP), which serves as a way to counteract cardiac stress and maintain heart function, by causing pressure diuresis.

Additionally, pneumonia induces an inflammatory response throughout the body, which is marked by the release of inflammatory cytokines that can directly prompt the production and release of BNP from cardiac tissues.

In addition, pneumonia causes alterations in bodily fluid compartment, electrolyte disturbance and activation of hormones like natriuretic peptides that play a major role in BNP release.

Therefore, elevated levels of BNP in pneumonia may act as an indirect evidence of lung parenchymal damage [19)]

More research is required to understand the precise reasons behind BNP elevation in pneumonia , its mechanism at cellular level, mollecular level and its significance in clinical practice as a potential predictor and guiding treatment.

Previous Studies on BNP in Respiratory Infections

Previous studies showed the use of brain natriuretic peptide (BNP) as a potential biomarker in various respiratory infections like community-acquired pneumonia (CAP), influenza, and acute respiratory distress syndrome (ARDS).

Increased BNP levels in CAP have been in linear relation to disease severity, increased patients with poor prognosis, and negative outcomes like mortality, need for mechanical ventilation, and longer hospital stays.

Several studies have revealed relation between BNP levels and markers of cardiopulmonary issues like hypoxemia, right ventricular strain, and pulmonary hypertension, suggesting BNP could be used as prognostic indicator for CAP.

However, conflicting results still exist on BNP's predictive value in CAP, with some studies showing strong links between high poor outcomes and BNP levels , while other studies have reported no significant associations or inconsistent findings.

In cases of influenza and ARDS, patients with severe respiratory illness and acute lung injury have been found to have higher levels of BNP, suggesting that BNP could be elevated in pathologies involving lung parenchyma and can be used as an indicator of heart and lung pathologies and can also be used to quantify the severity of the disease.

Further research is also needed to understand how BNP is released during respiratory infections like community acquired pneumonia and its connection to the disease process, its outcome, and its potential to use as a guiding tool for managing and assessing patient with worse clinical outcome.[20]

Using BNP measurements to prognosticate and implement in the scoring systems could improve their accuracy in respiratory infections, hence large prospective studies are necessary to verify its usefulness and set standard cutoff values for assessing risk and optimizing treatment.

A-DROP Score: Current Prognostic Tool in CAP

The A-DROP score was introduced by the Japanese Respiratory Society, it is a validated tool for estimating the severity and stratifing patients of community-acquired pneumonia at risk.

The scoring system utilizes five clinical parameters which are - age, dehydration, respiratory failure, orientation disturbance, and low blood pressure, to categorize patients into different risk categories based on risk of mortality and need for hospitalization.

Each parameter is scored from 0 to 3 points, with a total score ranging from 0 to 5, higher the score gets the disease severity and mortality risk also increases.

The A-DROP score is effective in predicting mortality and the need for ICU admission in community-acquired pneumonia patients , hence surpassing other severity scoring systems like CURB-65 and the pneumonia severity index (PSI) in specific groups.

However, this scoring system has it’s own disadvantage such as subjective parameters, overlooking comorbidities, and inconsistent performance across diverse patient groups and healthcare environments.[21]

Additionally, the A-DROP score's usefullness in contexts outside of Japan might be restricted due to variations in patient characteristics, healthcare systems, and the spread of organisms which are prevelant in Japan.

Nevertheless, as comparing to other scoring systems the A-DROP score is still considered ato be useful scoring system for determining risk and making clinical decisions in cases of community-acquired pneumonia (CAP) over others.

Our study has highlighted that the A-DROP scoring system can act as an adjunct to other predictive models and biomarkers for improving its accuracy, thus enabling appropriate patient care.

This necessitate further investigations as to customize and validate the A-DROP score in other populations or settings, combined biomarkers (BNP) and imaging tools(X-RAY) might probably improve its predicative accuracy for CAP management.(21)

Overview of the A-DROP Score

The A-DROP score (Japnese Society of Respiratory) contains five clinical factors to classify CAP patients in terms of mortality and hospitalizion probabilities.A-DROP [age, dehydration, respiratory failure (SpO2 < 90%), orientation disturbance and hypotension] as short form

Each set of symptoms and signs has been given a score from 0 to 3 points,with higher scores indicating more severe illness.

The total score ranges from 0 to 5 points,with patients classified as low risk (0-1 points), medium (2 points), or high risk (3-5 points)[21]

Components and Scoring Criteria

The A-DROP score has five clinical parameters, with every variable i.e symptoms has been assigned a specific score based on the criteria.

Age:

a. Age ≥ 70 years: 3 points
b. Age 40-69 years: 1 point
c. Age < 40 years: 0 points

Dehydration:

- Presence of signs of dehydration (e.g., dry tongue, decreased skin turgor) : 1 point

Respiratory Failure:

□ Oxygen saturation (SpO2) ≤ 90% on room air: 3 points

□ Partial pressure of oxygen (PaO2) ≤ 60 mmHg: 3 points

Need for oxygen therapy: 2 points

Orientation Disturbance

□ Altered mentation (e.g., confusion, disorientation): 2 points

Low Blood Pressure:

□ Systolic blood pressure (SBP) ≤ 90 mmHg: 3 points

Based upon the scores assigned to each parameter, the patients are categorised into different risk groups.

- Low Risk: A-DROP score of 0-1 points
- Moderate Risk: A-DROP score of 2 points
- High Risk: A-DROP score of 3-5 points

The A-DROP score gives a simple and systematic approach to stratify patients of CAP, which then requires urgent clinical decision making and optimising patient management strategies.[21]

Validity and Limitations of A-DROP Score

With the passage of time the A-DROP score has been applied and verified thoroughly in different patient groups , showing it's strong predictive ability for correctly assessing mortality and ICU admission in community acquired pneumonia patients.

There has been various studies that have consistently found a link between higher A-DROP scores and negative outcomes like higher death rates, prolonged hospitalization, and more ICU admissions.

Compared to other severity scoring systems like CURB-65 and the pneumonia severity index, the A-DROP score shows superior performance and its simplicity to use in specific populations, especially in regions like Japan where it was first formulated and introduced

There is evidence that A-DROP score is much superior to PSI amd CURB 64 score but it has it's own limitations that need to be addressed.

Some of its limitations include clinical factors like dehydration and altered sensorium, which could make scoring inconsistent as it is subjective and has it's limits in usefulness in certain groups of patient.The score also doesn't consider comorbidities, and can downplay the severity the illness

Moreover, the A-DROP score might not fully reflect the severity and complexity in patients with atypical symptoms like diarrhea, vomitting or those with immunocompromised conditions.[21]

However, despite its limitations, the A-DROP score is still considered a useful scoring syatem for assessing risk and making clinical decisions in cases of CAP [1]

Literature on BNP as a Prognostic Marker in CAP

As of now there has been increased interest shown in Brain natriuretic peptide (BNP) as a possible prognostic indicator for community acquired pneumonia , indicating the severity of the disease .

Various studies have looked into the relation between high levels of BNP and negative outcomes in CAP such as need for mechanical ventilation , longer hospital stays and death . A systematic review and meta-analysis revealed that elevated BNP levels were strongly associated to higher mortality rates and disease severity in , regardless of any pre-existing cardiac conditions.

Similarly, other research have also found links between high BNP values and heart failure and lung infection in individuals with community-acquired pneumonia (CAP).[20]

Hence the studies implies that BNP could play a role in identifying risks and predicting outcomes in CAP patients.

Although , there are some conflicting results about how reliable BNP is , as a predictor in CAP. Some studies have show strong links between elevated BNP and negative results, while others do not find significant associations . The differences in study participants, BNP testing methods, cutoff levels, and research approaches may be responsible for these differences of opinion.

Despite the challenges, BNP haas shown that it can be used as a biomarker for assessing prognosis in CAP, providing vital insights into the severity of the disease and interactions between the lungs and cardia.

Previous Studies Assessing BNP Levels in CAP

There have been multiple research studies done and they have found that the levels of brain natriuretic peptide (BNP) in cases of community-acquired pneumonia (CAP) can be used to determine its predictive value and how it relates to the progress of the disease and patient outcomes.

These studies used different approaches and involved a wide range of patients to understand the significance of BNP in managing CAP.[12]

Studies done by , Linscheid et al. examined BNP levels in CAP patients and found that higher BNP levels were closely linked to the severity of the illness, as indicated by the pneumonia severity index (PSI) and CURB-65 score.

Similarly study done by Christ-Crain found that BNP levels were linked to mortality in CAP patients even after accounting for age, other illnesses, and clinical factors. [22]

Furthermore Multiple meta-analyses, have further confirmed the relation between elevated BNP levels and poor outcomes in CAP patients.

Hence , despite the differences in approach and patient profiles, these studies done collectively suggest that BNP levels can serve as important indicators of disease severity and prognosis for CAP, hence more extensive research is required in larger study groups to potentiate this finding[23]

Mechanisms Linking BNP and Prognosis in CAP

There are many mechanisms which are linked to BNP secretion in community-acquired pneumonia (CAP), involving interactions among cardiopulmonary pathways, inflammation, and disease severity.

The best known pathway of BNP secretion is that it is secreted in response to increased cardiac stress and volume overload, indicating cardiac strain in CAP and hypoxia.

High BNP levels in CAP can be attributed by factors like pneumonia-induced low oxygen levels and respiratory distress, which lead to increased strain on the cardia. Furthermore, inflammation and hormonal changes related to CAP involving cardia can also play a role in BNP production.[22]

BNP works by attaching itself to natriuretic peptide receptors (NPR-A and NPR-B) , causing vasodilation, increased sodium and water excretion, and decreased activity of the renin-angiotensin-aldosterone system (RAAS) and sympathetic nervous system (SNS)[25] When these pathways are disturbed in CAP, it leads to altered hemodynamics, retention of fluids, and challenges to heart and lung function, ultimately leading to negative outcomes and a poor prognosis.

Additionally, high levels of BNP in patients with community-acquired pneumonia (CAP) have also been linked to indicator of severe illness like low saturation, respiratory problems, and kidney injury, indicating the possible value of BNP as a predictive marker.

However, the exact mechanism in which BNP affects prognosis in CAP need to be clarified through future studies to guide precise treatments and enhance patient outcomes.

Cardiovascular Involvement in Pneumonia

Community-acquired pneumonia (CAP) is more than just a respiratory illness; it often involves important cardiovascular complications that can have negative patient outcomes. The reasons behind the cardiovascular effects in pneumonia are complex and involve various factors.[26] Inflammation and oxidative stress triggered by pneumonia can lead to problems like endothelial dysfunction, increased vascular permeability, and changes in vascular function. These factors can contribute to haemodynamic instability, heart damage, and cardiac issues. Additionally, pneumonia-related hypoxia and breathing difficulties can raise pulmonary vascular resistance, causing strain on the right ventricle and pulmonary hypertension. Moreover, pneumonia's inflammatory response can worsen existing heart conditions like heart failure, coronary artery disease, and arrhythmias.[24]

Patients with pre-existing heart conditions are at higher risk of experiencing negative cardiovascular effects from pneumonia. It is crucial to monitor and manage both respiratory and cardiac health in these patients to prevent severe complications like cardiovascular collapse, organ dysfunction, and even death. Identifying and treating cardiovascular issues early, providing adequate fluids and oxygen, and using targeted therapies to reduce inflammation and heart damage are key to improving outcomes for pneumonia patients with heart problems. Regular measurement of cardiac biomarkers like BNP can help in stratifying patients at risk of poor outcome

Inflammatory and haemodynamic pathways

The relation between inflammation and hemodynamics plays a significant role in the cardiovascular effects of community-acquired pneumonia. Inflammation caused by pneumonia prompts the production of certain proteins like IL-6 and TNF-alpha, which activate the endothelium and harm vascular functions of endothelium, leading to

increased permeability, impaired vasodilation, and thrombus formation. The stimulation of blood clotting processes and platelet activity worsens vascular damage which further leads to formation of micro blood clots.

Additionally, sepsis leads to the production of harmful substances like reactive oxygen species, causing oxidative stress that can harm the cardia and pulmonary tissue, that disrupt mitochondrial function, and lead to cell death.

At the same time, pneumonia can cause hypoxia and manifest as reathlessness, which leads to increased pressure in the lungs, blood vessels, strain on the right side of the heart, and the ventilation and perfusion mismatch .

This further worsens the condition and leading to the vicious cycle that is the low oxygen levels, puts more strain on the heart.

Additionally, pneumonia leading to sepsis and then shock make the whole body get less blood flow and oxygen, causing organ ysfunctiojn. This connection between inflammation and blood flow shows how complexly cardia can be involved in pneumonia.

Hence this stresses the importance of a comprehensive treatment approach that targets both pneumonia and cardiac dysfunction.

Recognizing these issues early and treating them with guided therapeutic approach are crucial for better outcomes in pneumonia patients with cardiac issues. [27]

MATERIALS AND METHODS

MATERIAL AND METHODS

An observational study was conducted September 2022 and December 2023 on patients referred to Department of General Medicine at R.L. Jalappa Hospital and Research Center attached to SDUMC, Kolar. Before starting the approval from institution ethics committee was obtained. An informed consent was obtained from all the cases before including them in to the study. The sample size calculation was as follows,

Sample size:

Sample size estimated is based on the sensitivity of BNP levels was 89.1% for cut off value 125 pg/ml in predicting severity of CAP as reported by study done by Jing Li et al using below formula

$n=Z_{\alpha 2)}{}^2P\hat{}(1-P\hat{})/d^2$

Where P^ is pre-determined value of sensitivity (or specificity) that is ascertained by previous published data or clinician experience/judgment and for $\alpha = 0.05$, $Z\alpha 2$ is inserted by 1.96.

P^ = 89.1% or 0.891

d = 7.5% or 0.075.

Using the above values at 95% Confidence level a sample size of 66 subjects will be included in the study

The inclusion and exclusion criteria were as follows,

Inclusion criteria

1. ≥ 18 years of age
2. Fever (≥ 37.3°C)
3. Cough of recent onset, sputum production, or other symptoms of respiratory infection, including purulent sputum, with or without chest pain
4. Leukocyte count > 10 × 109/L or < 4 × 109/L
5. Patchy infiltrative shadows or interstitial changes, with or without effusion on chest X-rays

Exclusion criteria

1. Patients who had history and clinical evidence of heart disease
2. Patients with clinical , biochemical and radiological evidence of acute kidney injury or chronic kidney disease
3. Patients with clinical and radiological evidence of COPD
4. Patients with previous history or radiological evidence of pulmonary tuberculosis
5. Patients with nosocomial pneumonia
6. Patients with history of any lung malignancy

METHOD OF DATA COLLECTION

DATA ACQUISITION

History about the beginning, length, and course of the symptoms suspecting of community acquired pneumonia was gathered, together with information about risk factors such as smoking, diabetes, hypertension, kidney failure, and other pertinent medical conditions.

All vital signs, such as heart rate, blood pressure, and respiration rate, were recorded and continuously monitored upon admission.

1. Basic blood investigations - CBC, RFT, ABG

2. BNP - measured using 3ml blood collected in lithium

3. X-RAY

Was done at the time of admission of the patient

Statistical methods:

After entering the data into an Excel sheet, the data was analysed using SPSS 22 version. Categorical data will be represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. **Independent t test** was used as test of

significance to identify the mean difference between two quantitative variables. Receiver operating characteristic curves (ROCs) was constructed for BNP and severity of CAP. Comparison of BNP levels with A-DROP score was done. Receiver operating characteristic (ROC) and optimal cut-off points was chosen for the calculation of sensitivity, specificity, positive and negative predictive values. An area under the ROC curve above 0.8 indicated fairly good prediction.

RESULTS

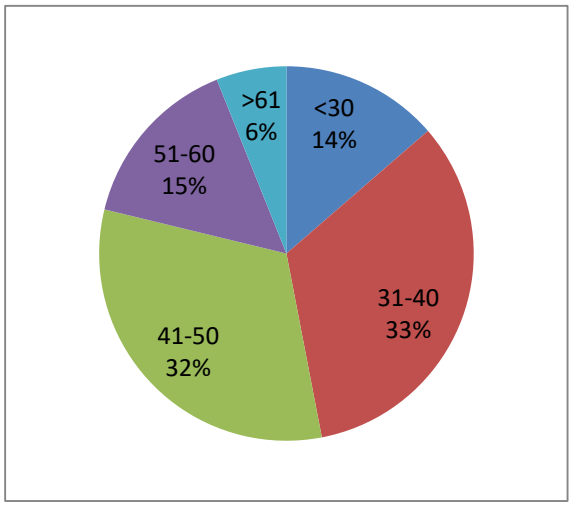
RESULTS

The age distribution of our patients were 13.6% that were below 30 years old, 33.3% were in the 31-40 age group, 31.8% were in the 41-50 age group, 15.2% were in the 51-60 age group, and 6.1% were over 61 years old

Table 1: Age distribution of patients

Age group (n=66)	Number of Patients	Percentage
<30	9	13.6%
31-40	22	33.3%
41-50	21	31.8%
51-60	10	15.2%
>61	4	6.1%

Figure 1: Pie chart representing the age distribution of patie

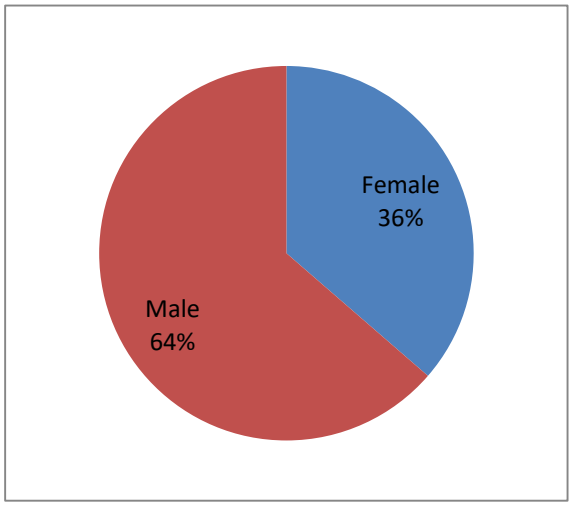


The sex distribution among our participants showed that 36.4% were female (24 patients) and 63.6% were male (42 patients) .

Table 2: Sex distribution of patient

SEX (n=66)	Number of Patients	Percentage
FEMALE	24	36.4%
MALE	42	63.6%

Figure 2: Pie chart representing sex distribution

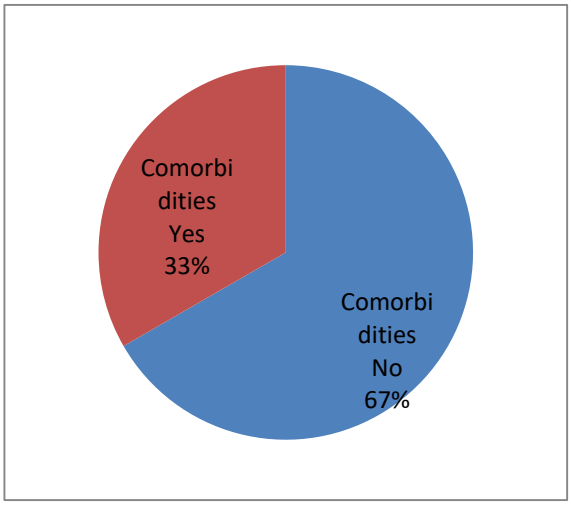


The analysis of comorbidities in our study cohort of 66 patients with Community-Acquired Pneumonia (CAP) revealed that 66.7% of individuals (44 patients) had no comorbidities, while 33.3% (22 patients) had underlying comorbid conditions.

Table 3: Comorbidities among patients

COMORBIDITIES (n=66)	Number of Patients	Percentage
NO	44	66.7%
YES	22	33.3%

Figure 3: Pie chart representing comorbidities among patients

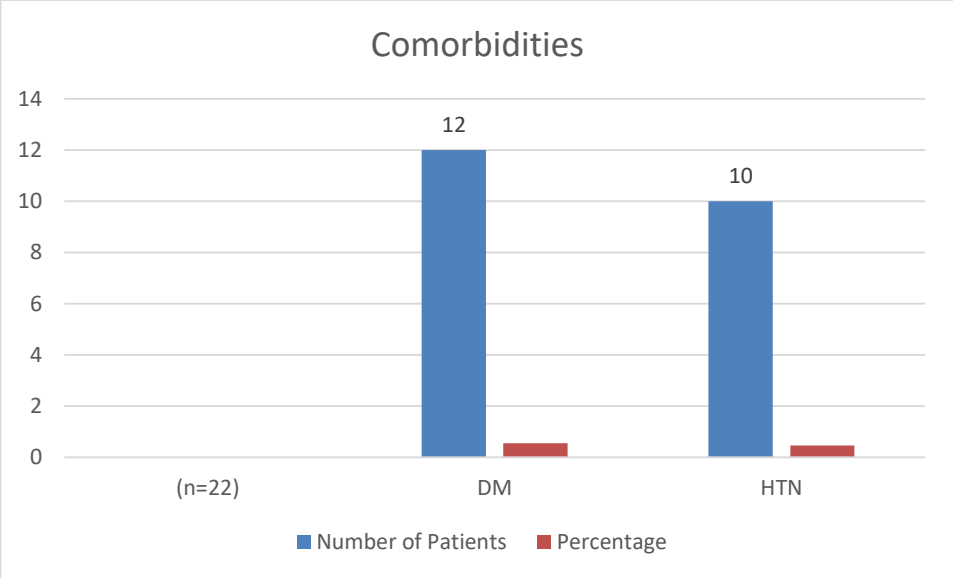


In our study, we observed that among patients with Community-Acquired Pneumonia (CAP) and comorbidities, 54.5% (12 patients) had Diabetes Mellitus (DM), whereas 45.46% (10 patients) had hypertension (HTN) .

Table 4: Type of comorbidities among patient

Comorbidities (n=22)	Number of Patients	Percentage
DM	12	54.54%
HTN	10	45.46%

Figure 4: Bar chart representing types of comorbidities

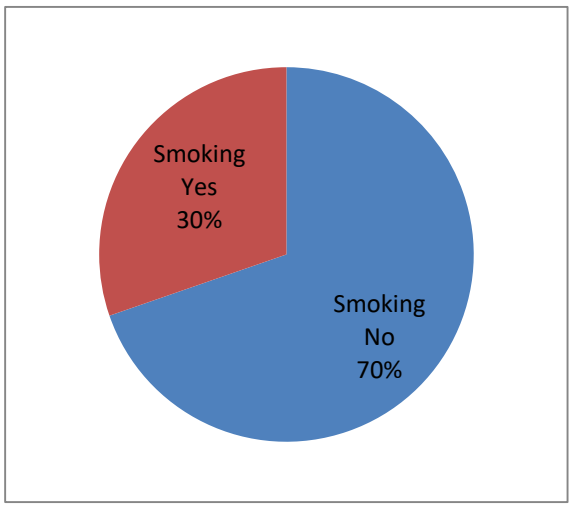


In our investigation concerning Community-Acquired Pneumonia (CAP), it was observed that 46 patients, constituting 69.7% of the cohort, were classified as non-smokers, while 20 patients, representing 30.3% of the cohort, had a history of smoking.

Table 5: Incidence of smoking in patients

Age (n=66)	Number of Patients	Percentage
No	46	69.7%
Yes	20	30.3%

Figure 5: Pie chart representing the incidence of smoking

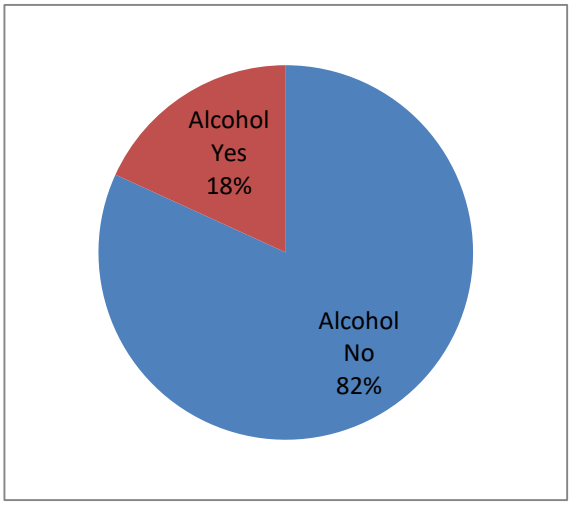


Among the patients included in our study, 54 individuals, accounting for 81.8% of the total cohort, reported no history of alcohol consumption, while 12 patients, constituting 18.2% of the cohort, acknowledged a history of alcohol use.

Table 6: Alcohol use in patients

Alcohol (n=66)	Number of Patients	Percentage
No	54	81.8%
Yes	12	18.2%

Figure 6: Pie chart representing alcohol use in patients

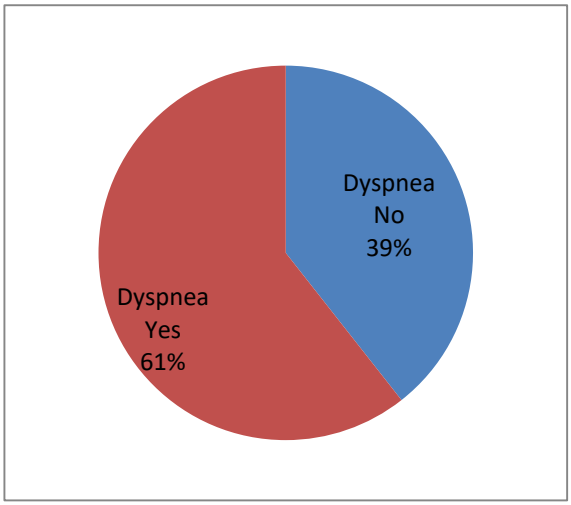


In our study, 26 patients (39.4%) reported no dyspnoea, whereas 40 (60.6%) reported dyspnoea .

Table 7: Dyspnoea among patients

Dyspnoea (n=66)	Number of Patients	Percentage
No	26	39.4%
Yes	40	60.6%

Figure 7: Pie chart representing dyspnoea in patients

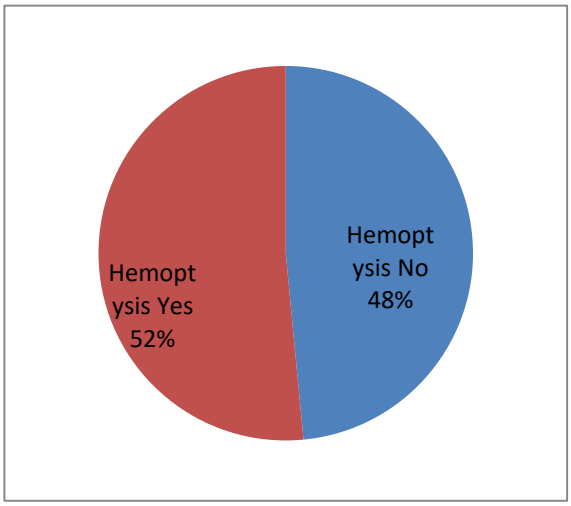


Among the patients in our study, 32 (48.5%) did not experience haemoptysis, while 34 (51.5%) did .

Table 8: Incidence of haemoptysis

Haemoptysis (n=66)	Number of Patients	Percentage
No	32	48.5%
Yes	34	51.5%

Figure 8: Pie chart representing the incidence of haemoptysis

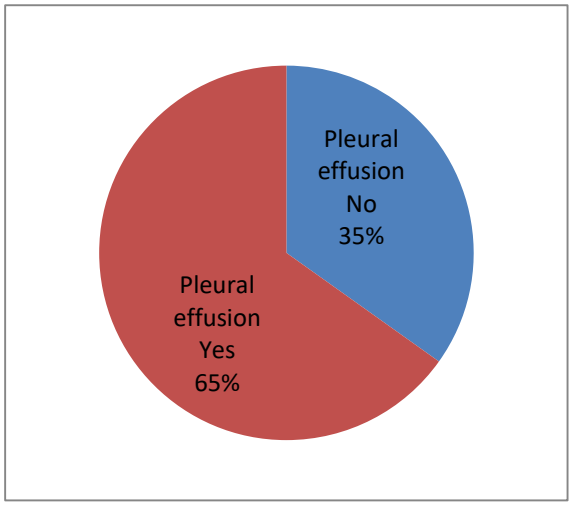


In our study, 23 patients (34.8%) did not present with pleural effusion, whereas 43 (65.2%) did.

Table 9: Pleural effusion incidence in patients

Pleural effusion (n=66)	Number of Patients	Percentage
No	23	34.8%
Yes	43	65.2%

Figure 9: Incidence of pleural effusion in patients

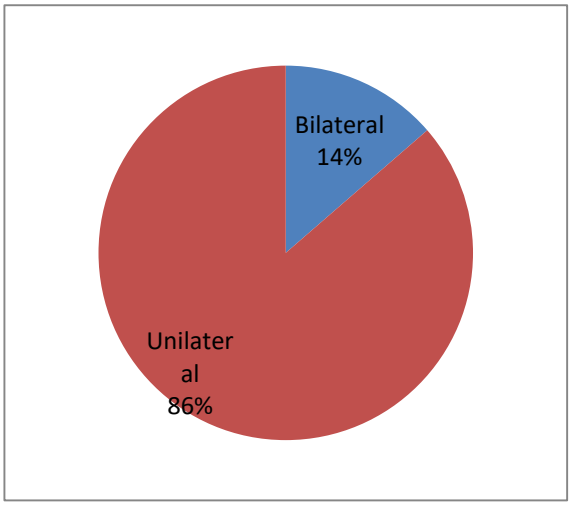


Among the patients assessed, nine (13.6%) exhibited bilateral X-ray laterality, while 57 (86.4%) displayed unilateral radiographic findings.

Table 10: X-ray laterality in patients

X-ray laterality (n=66)	Number of Patients	Percentage
No	9	13.6%
Yes	57	86.4%

Figure 10: Pie chart representing the incidence of X-ray laterality

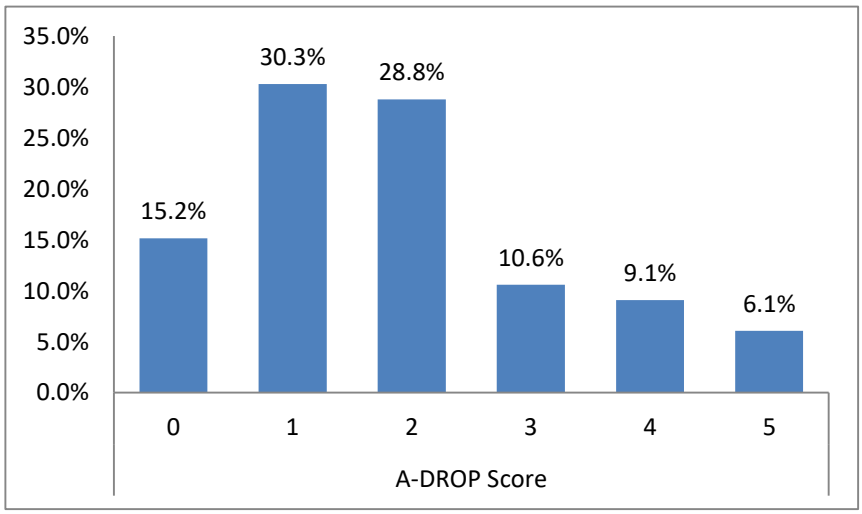


The distribution of A-DROP scores in the study population was as follows: 10 patients (15.2%) had a score of 0, 20 patients (30.3%) had a score of 1, 19 patients (28.8%) had a score of 2, seven patients (10.6%) had a score of 3, six patients (9.1%) had a score of 4, and four patients (6.1%) had a score of 5 .

Table 11: Distribution of A-DROP score

A-DROP Score B-(n=66)	Number of Patients	Percentage
0	10	15.2%
1	20	30.3%
2	19	28.8%
3	7	10.6%
4	6	9.1%
5	4	6.1%

Figure 11: A-DROP score in bar representation

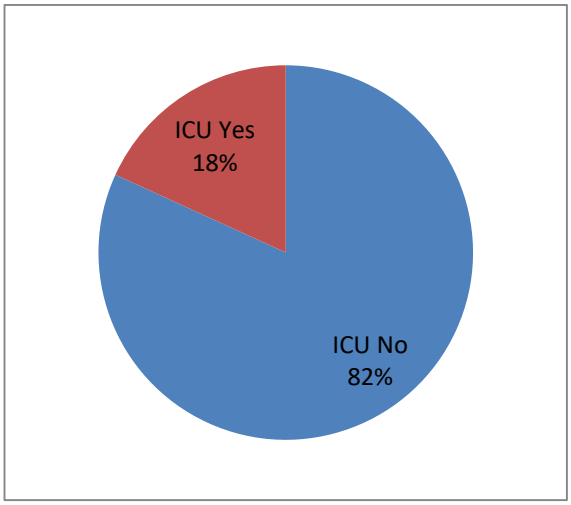


In our study, 54 patients (81.8%) did not require ICU admission, whereas 12 patients (18.2%) required ICU care.

Table 12: ICU admission in patients

ICU (n=66)	Number of Patients	Percentage
No	54	81.8%
Yes	12	18.2%

Figure 12: ICU admission in patients

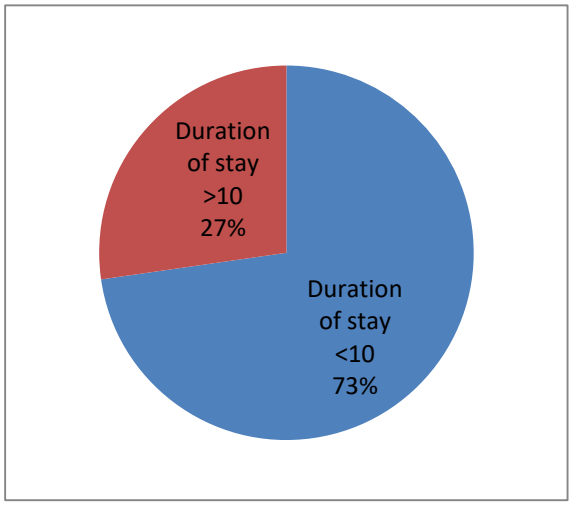


Among the patients observed, 48 (72.7%) had a duration of stay of less than 10 days, while 18 (27.3%) had a stay exceeding 10 days .

Table 13: Duration of ICU stay

Duration of stay (Days) (n=66)	Number of Patients	Percentage
< 10	48	72.7%
>10	18	27.3%

Figure 13: ICU stay duration in a pie chart

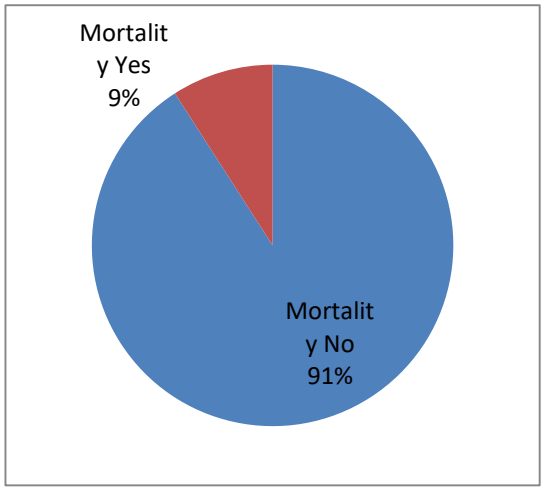


of the patients studied, 60 (90.9%) did not experience mortality, while 6 (9.1%) died.

Table 14: Mortality in patients

Mortality (n=66)	Number of Patients	Percentage
No	60	90.9%
Yes	6	9.1%

Figure 14: Pie chart representing mortality in patients

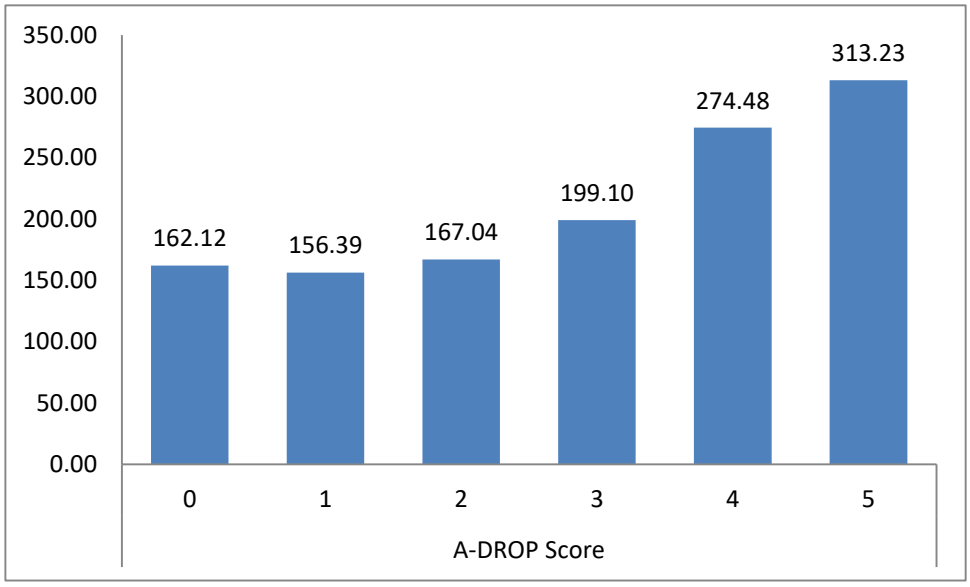


As the A-DROP score increased from 0 to 5, there was a corresponding increase in the mean BNP level, indicating a positive correlation between BNP and the severity of CAP. Notably, patients with higher A-DROP scores, particularly those with scores of 4 and 5, exhibited significantly elevated mean BNP levels than those with lower scores.

Table 15: A-DROP comparison with BNP levels

A-DROP Score (n=66)	BNP	
	Mean	Standard Deviation
0	162.12	59.57
1	156.39	45.24
2	167.04	55.43
3	199.10	78.34
4	274.48	68.43
5	313.23	42.25

Figure 15: A-DROP score comparison with BNP levels

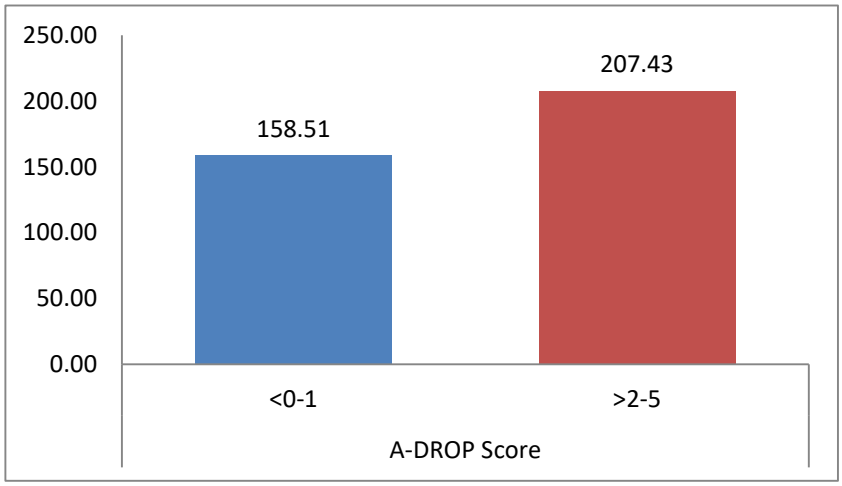


Our analysis showed distinct BNP level patterns in A-DROP scores among patients with community-acquired pneumonia (CAP). Patients with A-DROP scores ranging from 0 to 1 had a mean BNP level of 158.51 pg/mL with a standard deviation of 49.50 pg/mL. In contrast, patients with A-DROP scores ranging from 2 to 5 demonstrated a higher mean BNP level of 207.43 pg/mL with a standard deviation of 80.05 pg/mL.

Table 16: A-DROP score (0-1 and ≥2-5) comparison with BNP levels

A-DROP Score	BNP	
	Mean	Standard Deviation
0-1	158.51	49.50
≥2-5	207.43	80.05

Figure 16: Bar chart representing: A-DROP score (0-1 and ≥2-5) comparison with BNP levels

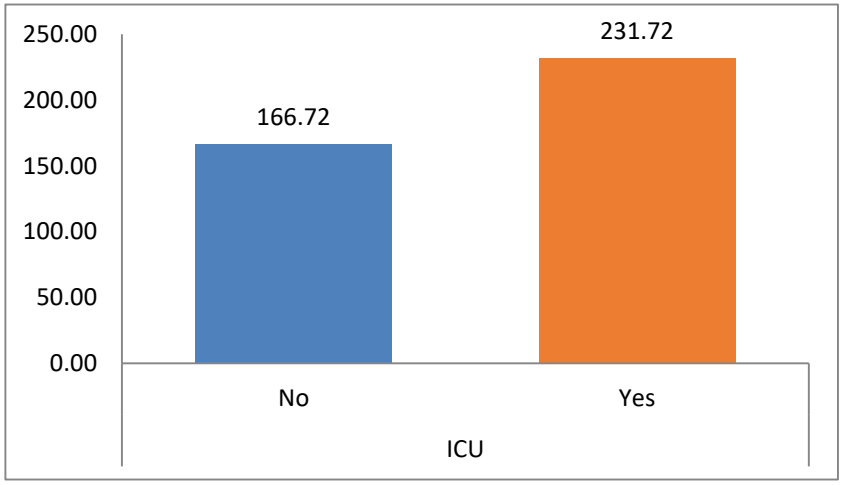


The mean BNP levels among patients in the ICU and those not in the ICU were 166.72 pg/mL with a standard deviation of 57.54 pg/mL and 231.72 pg/mL with a standard deviation of 82.98 pg/mL, respectively.

Table 17: Comparison of ICU stay with BNP levels

ICU (n=66)	BNP	
	Mean	Standard Deviation
NO	166.72	57.54
YES	231.72	82.98

Figure 17: Bar chart representing a comparison of ICU stay with BNP levels

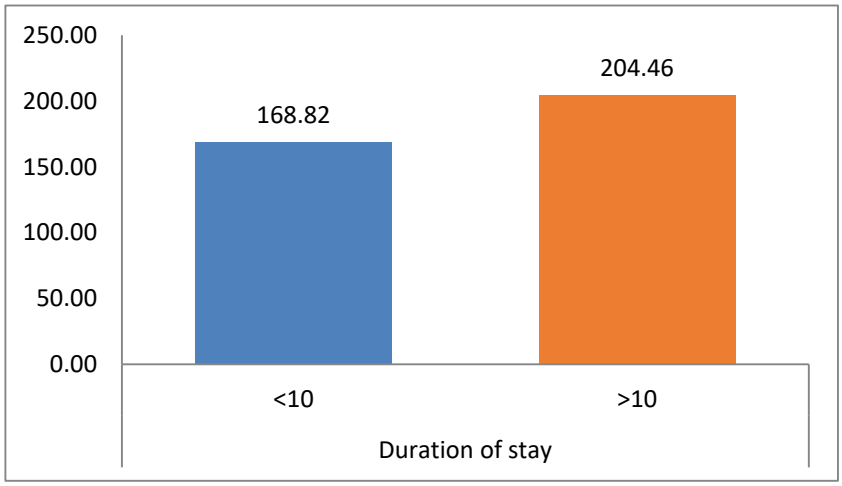


The mean BNP levels for patients with a duration of stay less than 10 days were 168.82 pg/mL with a standard deviation of 60.16 pg/mL, while for patients with a duration of stay greater than 10 days, the mean BNP level was 204.46 pg/mL with a standard deviation of 78.94 pg/ml.

Table 18: Comparison of BNP levels with duration of hospital stay

Duration of stay (In Days)	BNP	
	Mean	Standard Deviation
<10	168.82	60.16
>10	204.46	78.94

Figure 18: BNP levels comparison with hospital stay

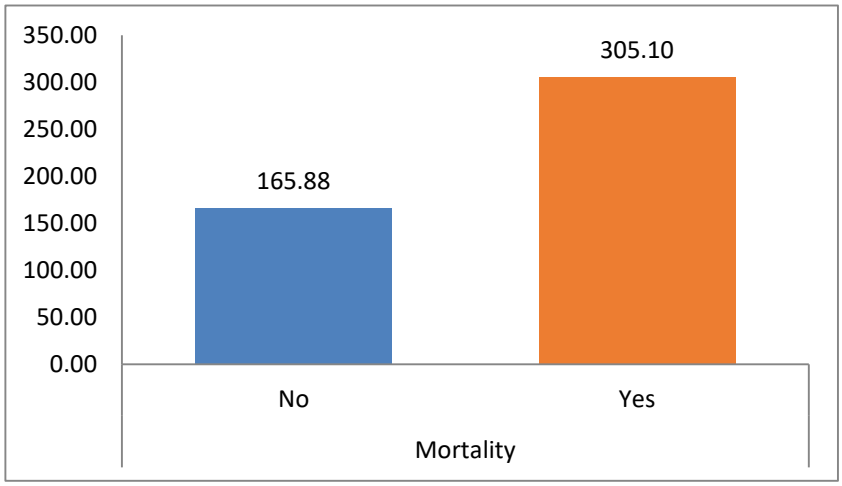


In our study, the mean BNP levels for patients who did not experience mortality were 165.88 pg/mL with a standard deviation of 54.63 pg/mL, whereas for patients who did experience mortality, the mean BNP level was 305.10 pg/mL with a standard deviation of 46.66 pg/mL

Table 19: Comparison of BNP levels with mortality

Mortality (n=66)	BNP	
	Mean	Standard Deviation
NO	165.88	54.63
YES	305.10	46.66

Figure 19: Comparison of BNP levels with mortality



The mortality rates based on BNP levels in our study indicate that among patients with BNP levels greater than 251.6 pg/mL, there were 5 deaths and 12 survivors. Conversely, among patients with BNP levels lower than 251.6 pg/mL, there was 1 death and 48 survivors. These data suggest a higher mortality rate among patients with elevated BNP levels (>251.6 pg/mL) than among those with lower BNP levels (<251.6 pg/mL) in the context of community-acquired pneumonia.

Table 20: Comparison of BNP level with mortality

BNP Level	Mortality	
	Yes	No
>251.6	5	12
<251.6	1	48

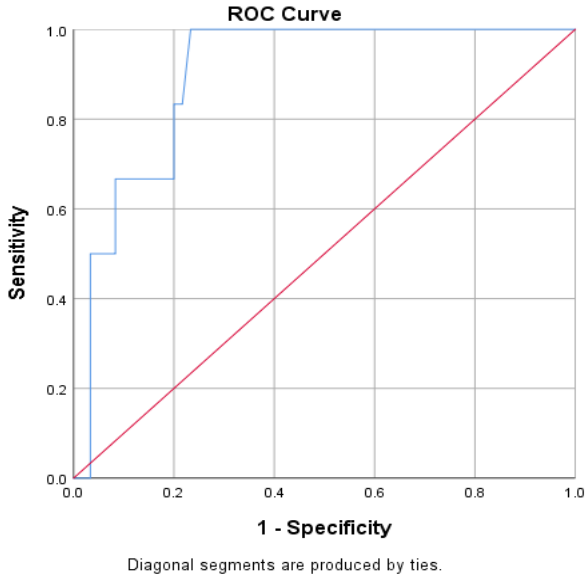
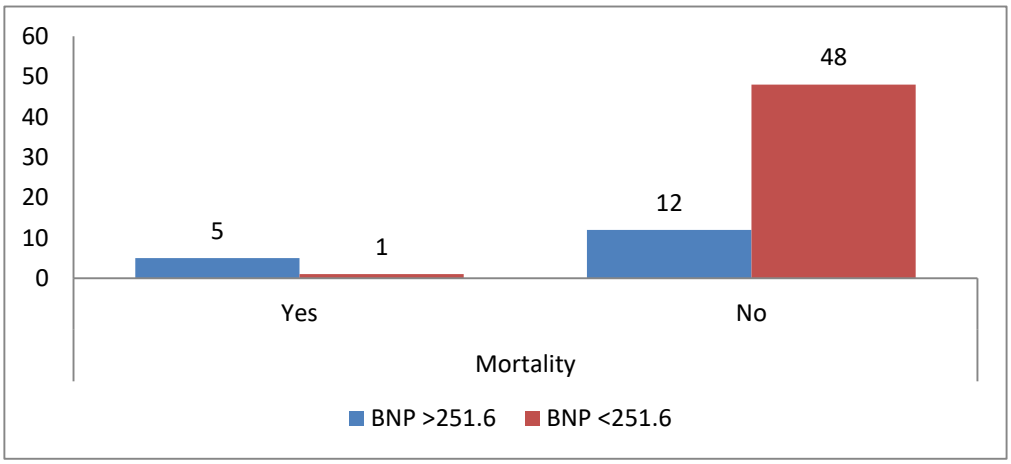


Figure 20: Receiver Operator Curve (ROC) curve for BNP levels

Figure 21: Bar chart comparing the mortality with BNP level



In our study, we identified a cut-off BNP of 251.6 pg/mL with an area under the curve (AUC) of 0.899, indicating a high level of accuracy in predicting prognosis in community-acquired pneumonia (CAP). Statistical significance was supported by a p-value of 0.001. The sensitivity of this cut-off was 83.33%, suggesting that BNP levels > 251.6 pg/mL can correctly identify 83.33% of patients with a poor prognosis. The specificity was also notable at 80.00%, indicating the ability to correctly identify 80.00% of patients with a good prognosis. The positive predictive value (PPV) was 29.41%, signifying the probability that patients with BNP levels > 251.6 pg/mL have a poor prognosis. Conversely, the negative predictive value (NPV) was high at 97.96%, indicating that patients with BNP levels < 251.6 pg/mL have a good prognosis.

Table 21: BNP analysis for sensitivity and specificity

	BNP
Cut-off value	251.6
AUC	0.899
P value	0.001
Sensitivity	**83.33%**
Specificity	**80.00%**
PPV	**29.41%**
NPV	**97.96%**

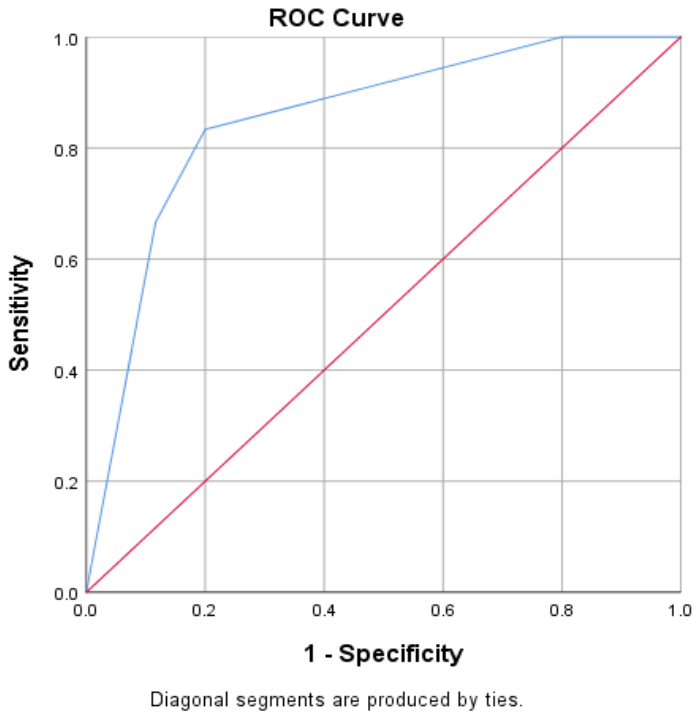


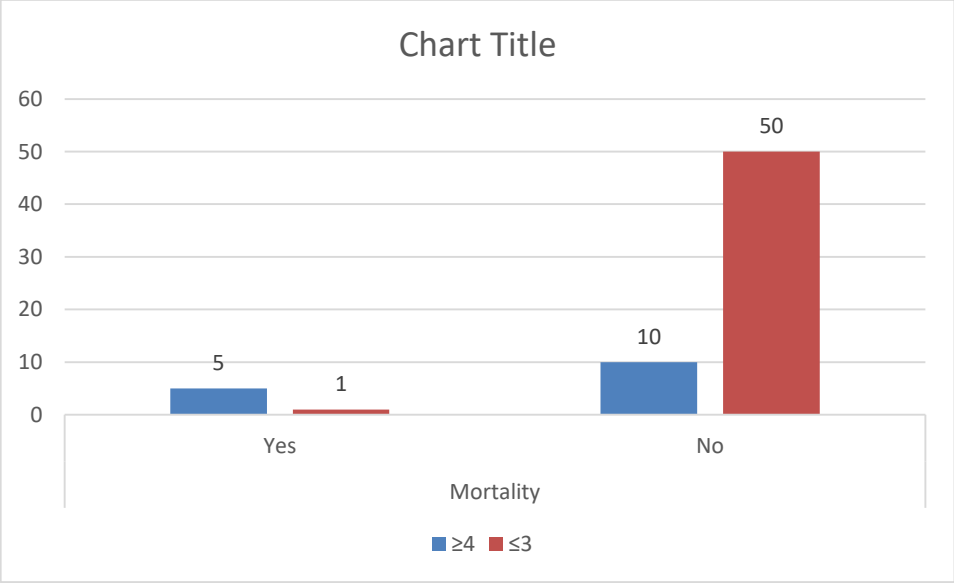
Figure 22: Analysis of ROC curve for A-DROP score

In terms of mortality, we observed that among patients with an A-DROP score ≥ 4, there were 5 deaths out of a total of 15 patients. Conversely, in patients with an A-DROP score ≤ 3, there was only one death out of 51 patients.

Table 22: A-DROP score comparison with mortality

A-DROP Score	Mortality	
	Yes	No
≥4	5	10
≤3	1	50

Figure 23: Comparison of A-DROP score with mortality



The A-DROP score, with a cut-off value of 4, demonstrated promising predictive ability for mortality in patients (CAP) patients. The area under the curve (AUC) was 0.839, indicating good discriminatory power. Statistical analysis yielded a p-value of 0.007, indicating a significant predictive capability. The sensitivity and specificity were both 83.33%, suggesting a balanced performance in identifying patients at risk. However, the positive predictive value (PPV) was relatively low at 33.33%, whereas the negative predictive value (NPV) was high at 98.04%, indicating a better ability to rule out mortality than to predict it.

Table 23: A-DROP sensitivity and specificity analysis

	A-DROP Score
Cut-off value	3.5 (4)
AUC	0.839
P value	0.007
Sensitivity	**83.33%**
Specificity	**83.33%**
PPV	**33.33%**
NPV	**98.04%**

DISCUSSION

DISCUSSION

Studies Evaluating the Predictive Performance of BNP vs. A-DROP Score

Christ-Crain M et all in his study mentioned that increased levels of B-type natriuretic peptide (BNP) is not well understood.[22]

Our study found out that BNP of patients getting admitted to ICU was 231.72pg/ml as compared to 166.72pg/ml , which was in line with the study carried out by Christ-Cairn which was 274pg/ml in patients getting admitted to ICU , the stark diference in BNP values in our study could be due to patient inclusion as in our study only Community acquired pneumonia patients were taken while in study done by Cairn included all patients with other primary disease.

Nowak.A et all explained that BNP has various functions in the body, including regulating fluid balance, vascular tone, and electrolyte levels.[23] Its release is believed to be triggered by low oxygen levels, leading to problems like pulmonary vasoconstriction, pulmonary arterial hypertension, and strain on the right ventricle. In severe sepsis and septic shock, high BNP levels are a reliable indicator of heart issues related to sepsis.

Nowak et all in his study mentioned that BNP of above 378pg/ml was associated with higher mortality rate which was in more that that which our study found which was 305pg/ml , the difference could be because of patients inclusion criteria , which was different in our and the study done by Nowak et all, our study involved only Community acquired pneumonia patients without any comorbid conditions. Whereas community acquired pneumonia patients along with other comorbid conditions was included.

Leli C et all[29] explained that factors like proinflammatory cytokines and the sympathetic nervous system also play a role in raising BNP levels. In cases of community-acquired pneumonia (CAP), the cardiovascular system experiences stress due to changes like decreased vascular resistance, increased cardiac output, and shunting of blood in inflamed areas, causing localized low oxygen levels. These factors contribute to elevated BNP levels in CAP patients, indicating cardiac stress, inflammation, and other health conditions such as chronic heart problems.[28]

Leli in his study found out that patients with high BNP on initial presentation i.e 223pg/ml were having hospital stay of more than 1 week , which was linearly associated with our findings , our study found out that patient with BNP more than 204.46 usually had stay of more than 10 days, the difference could be due to better health infrastructure.

Scali MC et all mentioed in her work that elevated BNP levels in CAP patients with existing heart failure help predict BNP's effectiveness as a diagnostic tool. However, there is limited research on how BNP levels increase in cases of acute pneumonia (AP), healthcare-associated pneumonia (HCAP), and pneumonia-related heart failure (PAHF).

Scali MC et all in his study involving all community acquired pneumonia cases exclusively without any comorbid conditions found out that BNP > 261pg/ml could predict mortality accurately which was in line with the findings of our study , which was BNP > 251.6.

This study is one of the few studies to compare BNP levels in predicting CAP in patients and how it relates to A-DROP scores, providing valuable insights into using BAP as a prognostic marker for CAP and infection.

The demographic analysis of 66 CAP patients showed interesting findings. In terms of age distribution, a percentage breakdown was observed across different age groups. When it came to comorbidities, a significant portion of patients had underlying conditions like DM and HTN. The study by Usuda et all involving 369 patients evaluated the predictive ability of plasma BNP levels on admission for adverse outcomes in patients with various conditions. The study found that BNP levels played a role in predicting mortality, particularly in cases of CAP . A-DROP scores showed a positive correlation with BNP levels, with higher scores corresponding to higher mean BNP levels, especially in patients with scores of 4 and 5.

Which was in line with the findings of Usuda et all [24] where moratality increased with rising A-DROP score

Patients in the ICU and those with longer hospital stays had higher BNP levels, as did patients who experienced mortality compared to those who did not.

The A-DROP score, with a cut-off of 4, also proved to be effective in predicting mortality, showing sensitivity and specificity of 83.33% and an NPV of 98.04%.

In non-CAP cases, the optimal BNP cut-off for prognosis was 179.3 pg/mL, while Christ-Crain et al [22] reported a BNP cut-off value of 279 pg/mL for predicting death in a group of 302 CAP patients. Our research found that a BNP level of 251.6 pg/mL which could be due to pateint population variation , was a strong predictor of prognosis in CAP patients, with an accuracy of 0.899. This cut-off had a sensitivity of 83.33% and specificity of 80.00%, along with a PPV of 29.41% and NPV of 97.96%.

In single-variable analysis, BNP was significantly linked to prognosis in both non-CAP cases and when considering PCT and A-DROP scores. However, in multiple-variable analysis, only BNP was notably correlated. Various studies have emphasized the effectiveness of BNP as a predictor in non-CAP patients.

Limapichat et all [1] and other previous researches have indicated that the A-DROP score may have less prognostic value in NHCAP than CAP, suggesting the need for further exploration of its use in non-CAP contexts. This supports the use of BNP as a prognostic marker in non-CAP cases, either alone or in combination with pneumonia scoring systems.

Takeshima K et al [24] in his study mentioned that while most patients survived, factors linked to mortality like older age (>60 years), higher A-DROP scores (>3), and elevated BNP levels (>300 pg/mL) are crucial warning signs for clinicians, prompting intense monitoring and intervention.

Our study was conclusive ≥≥with study of Takeshima K et al [24] the mortality in our study was age > 70 years , A-DROP Score ≥ 4 and serum BNP > 251.6pg/ml the variation in BNP could be due to inclusion of only pneumonia patients in our study

Sensitivity and Specificity Comparisons

Investigations comparing the sensitivity and specificity of brain natriuretic peptide (BNP) levels and the A-DROP score in community-acquired pneumonia (CAP) offer important information on their diagnostic accuracy and predictive capabilities. Research by Usuda et all [24] assessed the sensitivity and specificity of BNP levels and A-DROP scores in predicting outcomes like mortality, requirement for mechanical ventilation, and

admission to the ICU in CAP patients which found out that A-DROP score of more than ≥ 4 and BNP > 245pg/ml was more likely to be admitted to ICU and were supposed to have worse outcome which was in linearity of the study and corresponded to A-DROP score of ≥ 4 and BNP >231.72pg/ml

Choi.EY et all [27] conducted a study comparing the effectiveness of BNP levels and the A-DROP score in predicting mortality in patients with CAP and found that while BNP levels were more sensitive 87.45% but they had lower specificity of about 76% as compared to the A-DROP score which was in line with our study which showed sensitivity of 83.33% and specificity of 80 %.

Similarly, Sangen et all[24] examined the accuracy of BNP levels and the A-DROP score in predicting severe outcomes in patients with CAP and concluded that BNP levels were more sensitive and had similar specificity to the A-DROP score in predicting mortality and ICU admission which was ≥ and 267pg/ml which was closely related to the A-DROP Score of ≥ and BNP of > 251pg/ml for ICU admission and mortality

Moreover, pooled estimates from meta-analyses and systematic reviews show that BNP levels and the A-DROP score in CAP offer different levels of diagnostic accuracy and predictive performance. Even with differences in study approaches and patient groups, the consistent results across various studies emphasize the potential of BNP as a valuable prognostic marker in CAP, enhancing traditional clinical parameters and scoring systems.

Implications for Early Intervention

Early identification of cardiovascular insult in community acquired pneumonia (CAP) is essential to provide earlier intervention and better patient outcomes. Early detection of cardiac ischaemia, hypotension and deteriorating cardiovascular functions are very

important to institute appropriate treatment options in a timely manner (which includes assessing potential risks).

Early identification of these problems allows for specific therapies to target inflammation, improve oxygenation, and stabilize worsening hemodynamics thus leading to fewer complications with improved survival.

Cardiac marker monitoring, such as BNP can also help predict risks and treatment options.

Likewise, the burden of CAP related cardiovascular morbidity and mortality should be ameliorated through preventive measures eg vaccination network for pneumococcus & influenza, smoking cessation program as well as optimizing cardiovascular risk factors.

Recognition of cardiac status is the first stone on improved outcomes in patients with CAP.

Potential for Risk Stratification

In community acquired pneumonia (CAP) patients, measuring brain natriuretic peptide(BNP) levels can help health care providers determine prognosis and tailor treatment to individual circumstances. In CAP patients, elevated BNP levels indicate a state of instability and reflect the severity of disease with clear implications for prognosis in CAP.

Measuring BNP on admission can help stratify the patients into low and high risk for appropriate management strategy as well as predict prognosis. When patients show rising BNP levels, however, they may need regular monitoring with strict fluid balance and more aggressive interventions like vasopressors to maintain blood pressure in sepsis or ventilatory support for respiratory distress and failure. Measuring BNP levels during an illness at multiple time points can help to assess whether treatments are working, monitor

the course of disease and make decisions on appropriateness for therapy escalation / de-escalation based upon patient status.

Implementation of BNP assays in commonly used scores the A-DROP score for predicting mortality due to CAP could substantially increase their performance characteristics .

This may provide more individualized treatment approaches and therefore better results for patients as well. It may also help identify patients who could benefit from specific interventions by using BNP for risk assessment.

These could include the timely administration of appropriate antibiotics, the addition of therapies like corticosteroids, and supportive measures to manage inflammation and cardiac dysfunction.

However, the application of BNP for risk evaluation should always be considered alongside other clinical indicators and should be validated across various patient groups. Despite these necessary considerations, the use of BNP for risk stratification in cases of community-acquired pneumonia appears promising, suggesting it could be a valuable method for improving patient care.

Integration with Existing Clinical Protocols

Evaluating of BNP measurements, systematically in addition to the current scoring systems when diagnosing and managing a patient with CAP can increase risk prediction during hospitalization for affected patients as well help guide ancillary treatments thereby optimizing outcomes

Therefore, BNP levels can offer prognostic service and guide therapeutic decisions thereof to the treating physician andintensivist.

Integrating BNP measurements in established prognostic models like the A-DROP score may improve their accuracy, and overall will give a clear idea about the prognosis of patient over long term

To ensure consistency and reliability of results, any integration of BNP measurements into clinical protocols should go hand in hand with standardized procedures for sample collection, processing, and interpretation across different healthcare settings.

Furthermore, it is crucial to educate and train healthcare providers on how to interpret and understand the clinical significance of BNP levels along with other scoring sytem A-DROP order to effectively incorporate BNP-guided management strategies into clinical practice.

Despite the obstacles, incorporating BNP measurements into current clinical protocols shows potential as a beneficial method for enhancing patient care and outcomes in individuals with CAP.

LIMITATIONS

LIMITATIONS

The limitations of our study include, limited sample size, and single-centre design. Future prospective studies with larger cohorts and multicentre collaborations are required.

CONCLUSION

CONCLUSION

This study has examined various demographic and clinical parameters in patients with Community-Acquired Pneumonia (CAP), shedding light on key trends and associations.

In our study age distribution , in which patients were grouped were 31-40 (33.3%) and 41-50 (31.8%), with smaller proportions in the younger and older age categories. In terms of sex, males comprised a larger percentage (63.6%) than females (36.4%).

In terms of severity markers, the A-DROP score distribution showed that a substantial number of patients had scores of 0-1 (45.5%) and scores ≥2-5 (54.5%). Additionally, ICU admission was required in 18.2% of patients.

Furthermore, our study highlighted the prognostic value of BNP, with a cut-off value of 251.6 pg/mL showing high sensitivity (83.33%), specificity (80.00%), and an area under the curve (AUC) of 0.899 for predicting mortality in patients with CAP this was closely corelated with the cutt of value of BNP by Christ-Crain M et all thats is 274pg/ml this suggests that BNP levels above this threshold can accurately identify patients at risk for poor prognosis. In comparison, the A-DROP score, with a cut-off value of 4, demonstrated good sensitivity and specificity (both 83.33%), but had a lower positive predictive value (33.33%) than BNP.

Overall, our findings underscore the clinical significance of BNP as a prognostic biomarker for CAP, offering valuable insights for risk stratification and management decisions in this patient population.

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ANNEXURES

PROFORMA

Particulars of the patients

NAME:

AGE: ____ YEARS

SEX: MALE/FEMALE

OCCUPATION:

LOCATION:

HOSPITAL NUMBER:

DATE AND TIME OF ADMISSION : __/__/20__ AT __:__ AM/PM

DATE OF DISCHARGE:__/__/20__

ADMISSION DIAGNOSIS:

BRIEF HISTORY:

SYMPTOMS ON PRESENTATION:

□ Fever
□ Cough
□ Chest Pain

PRIOR TREATMENT:

□ **YES** □ **NO**

PROVIDER : SUPPORTIVE : TREATMENT :

PAST HISTORY:

□ DIABETES MELLITUS
□ HYPERTENSION
□ LIVER DISORDER
□ CARDIOVASCULAR DISEASE
□ RENAL DISORDER
□ TUBERCULOSIS
□ BRONCHIAL ASTHMA

PERSONAL HISTORY:

- DIET:
- APPETITE:
- SLEEP:
- BOWEL AND BLADDER:
- HABITS:
- SOCIOECONOMIC STATUS

GENERAL PHYSICAL EXAMINATION: Height: ____Cms , Weight: ____ kgs ,

BMI: ____kg / m^2

Pallor/Cyanosis/Icterus/Clubbing/edema/Generalized lymphadenopathy/Gynaecomastia/ Testicular atrophy/ Spider navi/ Pupura/ Petechiae/ Caput medusae

VITAL DATA

A. Pulse: ___ bpm
B. Temperature:____^{o}F
C. BP: ____ mmHg
D. Respiration rate: ____ cpm
E. SpO2: ____% @ RA

Systemic examination :

- Per abdomen:
- Respiratory system:
- Cardio vascular system:
- Central nervous system:

INVESTIGATIONS:

Routine

- CBC
- RFT
- ABG
- X-RAY
- BNP

INFORMED CONSENT FORM

Title: - **SERUM BRAIN NATRIYRETIC PEPTIDE AS AN EARLY MARKER FOR PREDECTING PROGNOSIS IN COMMUNITY ACQUIRED PNEUMONIA AS COMPARED WITH A-DROP SCORE**

Principal investigator: Dr.Bilal Ahmad Khan

I, Mr/Ms/Mrs. …….. Have been explained in my own understandable language, that I will be included in a study which is

I have been explained that my clinical findings, investigations, findings will be assessed and documented for study purpose.

I have been explained my participation in this study is entirely voluntary and I can withdraw from the study any time and this will not affect my relation with my doctor or treatment for my ailment.

I have been explained about the risk/ benefit of the study.

I understand that the medical information produced by this study will become part of institutional records and will be kept confidential by my said institute.

I agree not to restrict the use of any data or result that arise from this study provided such a use is only for scientific purpose(s).

I have principal investigator mobile number for enquiries.

I have been informed that standard of care will be maintained throughout the treatment period.

I, in my sound mind, give full consent to be added in the part of this study.

Investigator:

Dr. Bilal Ahmad Khan

Phone number- 267811226

Participant's signature/ thumb impression

Name:

Signature/thumb impression of the witness:

Date:

Name:

Relation to patient

ಮಾಹಿತಿ ನೀಡಿದ ಒಪ್ಪಿಗೆ ನಮೂನೆ

ಶೀರ್ಷಿಕೆ: - ಎ-ಡ್ರಾಪ್ ಸ್ಕೋರ್‌ಗೆ ಹೋಲಿಸಿದರೆ ಸಮುದಾಯ ಸ್ವಾಧೀನಪಡಿಸಿಕೊಂಡಿರುವ ನ್ಯುಮೋನಿಯಾದಲ್ಲಿ ಮುನ್ನರಿವು ಮುಂಗಾಣುವ ಆರಂಭಿಕ ಮಾರ್ಕರ್ ಆಗಿ ಸೀರಮ್ ಬ್ಯೈನ್ ನ್ಯಾಟ್ರಿಯುರೆಟಿಕ್ ಪೆಪ್ಟೈಡ್

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ: ಡಾ.ಮರಮ್ ಸಂಜನಾ

ನಾನು, ಶ್ರೀ/ಮತಿ/ಶ್ರೀಮತಿ. …….. ನನ್ನ ಸ್ವಂತ ಅರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ, ಅದು ಒಂದು ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನನ್ನು ಸೇರಿಸಿಕೊಳ್ಳಲಾಗುವುದು

ನನ್ನ ಕ್ಲಿನಿಕಲ್ ಸಂಶೋಧನೆಗಳು, ತನಿಖೆಗಳು, ಸಂಶೋಧನೆಗಳನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುತ್ತದೆ ಮತ್ತು ಅಧ್ಯಯನ ಉದ್ದೇಶಕ್ಕಾಗಿ ದಾಖಲಿಸಲಾಗುತ್ತದೆ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಭಾಗವಹಿಸುವಿಕೆಯು ಸಂಪೂರ್ಣವಾಗಿ ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ ಮತ್ತು ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು ಮತ್ತು ಇದು ನನ್ನ ವೈದ್ಯರೊಂದಿಗಿನ ನನ್ನ ಸಂಬಂಧ ಅಥವಾ ನನ್ನ ಕಾಯಿಲೆಯ ಚಿಕಿತ್ಸೆಯ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಅಧ್ಯಯನದ ಅಪಾಯ/ಪ್ರಯೋಜನದ ಬಗ್ಗೆ ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಈ ಅಧ್ಯಯನದಿಂದ ಉತ್ಪತ್ತಿಯಾಗುವ ವೈದ್ಯಕೀಯ ಮಾಹಿತಿಯು ಸಾಂಸ್ಥಿಕ ದಾಖಲೆಗಳ ಭಾಗವಾಗುತ್ತದೆ ಮತ್ತು ನಾನು ಹೇಳಿದ ಸಂಸ್ಥೆಯು ಗೌಪ್ಯವಾಗಿಡುತ್ತದೆ ಎಂದು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.

ಈ ಅಧ್ಯಯನದಿಂದ ಉಂಟಾಗುವ ಯಾವುದೇ ಡೇಟಾ ಅಥವಾ ಫಲಿತಾಂಶದ ಬಳಕೆಯನ್ನು ನಿರ್ಬಂಧಿಸದಿರಲು ನಾನು ಸಮ್ಮತಿಸುತ್ತೇನೆ, ಅಂತಹ ಬಳಕೆಯನ್ನು ಕೇವಲ ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶ(ಗಳಿಗೆ)

ವಿಚಾರಣೆಗಾಗಿ ನಾನು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಮೊಬೈಲ್ ಸಂಖ್ಯೆಯನ್ನು ಹೊಂದಿದ್ದೇನೆ.

ಚಿಕಿತ್ಸೆಯ ಅವಧಿಯುದ್ದಕ್ಕೂ ಆರೈಕೆಯ ಗುಣಮಟ್ಟವನ್ನು ನಿರ್ವಹಿಸಲಾಗುವುದು ಎಂದು ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ.

ನಾನು, ನನ್ನ ಉತ್ತಮ ಮನಸ್ಸಿನಲ್ಲಿ, ಈ ಅಧ್ಯಯನದ ಭಾಗದಲ್ಲಿ ಸೇರಿಸಲು ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆಯನ್ನು ನೀಡುತ್ತೇನೆ.

ತನಿಖಾಧಿಕಾರಿ: ಡಾ ಬಿಲಾಲ್ ಅಹ್ಮದ್ ಖಾನ್

ದೂರವಾಣಿ ಸಂಖ್ಯೆ- 7267811226

ಭಾಗವಹಿಸುವವರ ಸಹಿ/ಹೆಬ್ಬೆರಳಿನ ಗುರುತು
ಹೆಸರು:
ಸಾಕ್ಷಿಯ ಸಹಿ/ಹೆಬ್ಬೆರಳಿನ ಗುರುತು: ದಿನಾಂಕ:
ಹೆಸರು:
ರೋಗಿಗೆ ಸಂಬಂಧ

PATIENT INFORMATION SHEET

STUDY TITLE: "SERUM BRAIN NATRIYRETIC PEPTIDE AS AN EARLY MARKER FOR PREDECTING PROGNOSIS IN COMMUNITY ACQUIRED PNEUMONIA AS COMPARED WITH A-DROP SCORE."

STUDY SITE: R.L Jalappa Hospital and Research Centre, Tamaka, Kolar.

This is to inform you that, you require Basic blood investigations CBC , RFT Serum electrolytes, BNP, Chest X-RAY and ABG for making treatment plan for you condition that is community acquired pneumonia. The above mentioned investigations are required for the making the diagnosis of the disease extent of the disease and for planning of the treatment. The patient with history fever, cough , chest pain referred to department of General Medicine at R.L Jalappa hospital and research Centre, Tamaka, Kolar to undergo above mentioned investigations and of those patients who meet the inclusion criteria will be taken for the study.

We are conducting this study to predict the onset and severity of this condition.

If you are willing you will be enrolled in this study and we will do above mentioned investigations and other relevant investigations.

This will facilitate the comparirison of BNP with A-DROP score for predicting it's usefullness. It will also benefit other patients with similar condition in future. You are free to opt-out of the study at any time if you are not satisfied or apprehensive to be a part of the study. Your treatment and care will not be compromised if you refuse to be a part of the study. The study will not add any risk or financial burden to you if you are part of the study. In case of any complication during procedures patient will be treated accordingly.

Your identity and clinical details will be confidential. You will not receive any financial benefit for being part of the study. Principal investigator will bear the cost of all investigations. You are free to contact Dr. Bilal Ahmad Khan or any other member of the above research team for any doubt or clarification you have.

Dr. Bilal Ahmad Khan
Mobile no: 7267811226

ರೋಗಿಯ ವಿವರ ಪತ್ರ

ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ: "ಎ-ಡ್ರಾಪ್ ಸ್ಕೋರ್‌ಗೆ ಹೋಲಿಸಿದರೆ ಸಮುದಾಯ ಸ್ವಾಧೀನಪಡಿಸಿಕೊಂಡಿರುವ ನ್ಯುಮೋನಿಯಾದಲ್ಲಿ ಮುನ್ನರಿವುಗಳನ್ನು ಊಹಿಸಲು ಸೀರಮ್ ಬ್ರೈನ್ ನ್ಯಾಟ್ರಿಯುರೆಟಿಕ್ ಪೆಪ್ಟೈಡ್ ಆರಂಭಿಕ ಮಾರ್ಕರ್"

ಸ್ಟಡಿ ಸೈಟ್: ಆರ್.ಎಲ್ ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ಟಮಕ, ಕೋಲಾರ.

ಸಮುದಾಯ ಸ್ವಾಧೀನಪಡಿಸಿಕೊಂಡಿರುವ ನ್ಯುಮೋನಿಯಾ ಸ್ಥಿತಿಗೆ ಚಿಕಿತ್ಸೆ ನೀಡಲು ನಿಮಗೆ ಮೂಲಭೂತ ರಕ್ತ ಪರೀಕ್ಷೆಗಳು CBC, RFT ಸೀರಮ್ ಎಲೆಕ್ಟ್ರೋಲೈಟ್‌ಗಳು, BNP, ಎದೆಯ X-RAY ಮತ್ತು ABG ಅಗತ್ಯವಿದೆ ಎಂದು ನಿಮಗೆ ತಿಳಿಸಲು ಇದು. ರೋಗದ ವ್ಯಾಪ್ತಿಯನ್ನು ಪತ್ತೆಹಚ್ಚಲು ಮತ್ತು ಚಿಕಿತ್ಸೆಯನ್ನು ಯೋಜಿಸಲು ಮೇಲೆ ತಿಳಿಸಿದ ತನಿಖೆಗಳು ಅಗತ್ಯವಿದೆ. ಇತಿಹಾಸದಲ್ಲಿ ಜ್ವರ, ಕೆಮ್ಮು, ಎದೆನೋವು ಹೊಂದಿರುವ ರೋಗಿಯನ್ನು ಆರ್.ಎಲ್.ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ಟಮಕ, ಕೋಲಾರದ ಜನರಲ್ ಮೆಡಿಸಿನ್ ವಿಭಾಗಕ್ಕೆ ಈ ಮೇಲೆ ತಿಳಿಸಲಾದ ತನಿಖೆಗೆ ಒಳಪಡಿಸಲು ಮತ್ತು ಸೇರ್ಪಡೆ ಮಾನದಂಡಗಳನ್ನು ಪೂರೈಸುವ ರೋಗಿಗಳನ್ನು ಅಧ್ಯಯನಕ್ಕೆ ತೆಗೆದುಕೊಳ್ಳಲಾಗುತ್ತದೆ.

ಈ ಸ್ಥಿತಿಯ ಆಕ್ರಮಣ ಮತ್ತು ತೀವ್ರತೆಯನ್ನು ಊಹಿಸಲು ನಾವು ಈ ಅಧ್ಯಯನವನ್ನು ನಡೆಸುತ್ತಿದ್ದೇವೆ.

ನೀವು ಸಿದ್ಧರಿದ್ದರೆ ನೀವು ಈ ಅಧ್ಯಯನಕ್ಕೆ ದಾಖಲಾಗುತ್ತೀರಿ ಮತ್ತು ನಾವು ಮೇಲೆ ತಿಳಿಸಿದ ತನಿಖೆಗಳು ಮತ್ತು ಇತರ ಸಂಬಂಧಿತ ತನಿಖೆಗಳನ್ನು ಮಾಡುತ್ತೇವೆ.

ಇದು BNP ಅನ್ನು ಅದರ ಉಪಯುಕ್ತತೆಯನ್ನು ಊಹಿಸಲು A-DROP ಸ್ಕೋರ್‌ನೊಂದಿಗೆ ಹೋಲಿಕೆ ಮಾಡಲು ಅನುಕೂಲವಾಗುತ್ತದೆ. ಭವಿಷ್ಯದಲ್ಲಿ ಇದೇ ರೀತಿಯ ಸ್ಥಿತಿಯನ್ನು ಹೊಂದಿರುವ ಇತರ ರೋಗಿಗಳಿಗೆ ಇದು ಪ್ರಯೋಜನವನ್ನು ನೀಡುತ್ತದೆ. ಅಧ್ಯಯನದ ಭಾಗವಾಗಲು ನೀವು ತೃಪ್ತರಾಗದಿದ್ದರೆ ಅಥವಾ ಭಯಪಡದಿದ್ದರೆ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹೊರಗುಳಿಯಲು ನೀವು ಸ್ವತಂತ್ರರಾಗಿದ್ದೀರಿ. ನೀವು ಅಧ್ಯಯನದ ಭಾಗವಾಗಲು ನಿರಾಕರಿಸಿದರೆ ನಿಮ್ಮ ಚಿಕಿತ್ಸೆ ಮತ್ತು ಕಾಳಜಿಗೆ ಧಕ್ಕೆಯಾಗುವುದಿಲ್ಲ. ನೀವು ಅಧ್ಯಯನದ ಭಾಗವಾಗಿದ್ದರೆ ಅಧ್ಯಯನವು ನಿಮಗೆ ಯಾವುದೇ ಅಪಾಯ ಅಥವಾ ಆರ್ಥಿಕ ಹೊರೆಯನ್ನು ಸೇರಿಸುವುದಿಲ್ಲ. ಕಾರ್ಯವಿಧಾನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ತೊಡಕುಗಳ ಸಂದರ್ಭದಲ್ಲಿ ರೋಗಿಗೆ ಅನುಗುಣವಾಗಿ ಚಿಕಿತ್ಸೆ ನೀಡಲಾಗುತ್ತದೆ.

ನಿಮ್ಮ ಗುರುತು ಮತ್ತು ಕ್ಲಿನಿಕಲ್ ವಿವರಗಳು ಗೌಪ್ಯವಾಗಿರುತ್ತವೆ. ಅಧ್ಯಯನದ ಭಾಗವಾಗಿರುವುದರಿಂದ ನೀವು ಯಾವುದೇ ಹಣಕಾಸಿನ ಪ್ರಯೋಜನವನ್ನು ಪಡೆಯುವುದಿಲ್ಲ. ಎಲ್ಲಾ ತನಿಖೆಗಳ ವೆಚ್ಚವನ್ನು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ ಭರಿಸುತ್ತಾರೆ. ನೀವು ಹೊಂದಿರುವ ಯಾವುದೇ ಸಂದೇಹ ಅಥವಾ ಸ್ಪಷ್ಟೀಕರಣಕ್ಕಾಗಿ ಡಾ.

ಬಿಲಾಲ್ ಅಹ್ಮದ್ ಖಾನ್ ಅಥವಾ ಮೇಲಿನ ಸಂಶೋಧನಾ ತಂಡದ ಇತರ ಸದಸ್ಯರನ್ನು ಸಂಪರ್ಕಿಸಲು ನೀವು ಮುಕ್ತರಾಗಿದ್ದೀರಿ

ಡಾ ಬಿಲಾಲ್ ಅಹ್ಮದ್ ಖಾನ್

ಮೊಬೈಲ್ ಸಂಖ್ಯೆ: 7267811226

MASTER CHART

Sno	Age	Gender	X-ray laterality	X-ray Zone	Hb	Platelet	Albumin	CRP	BNP	A-DROP Score	ICU	Duration of stay	Mortality
1	36	Female	Unilateral	Left lower zone	11.7	1.6	2.3	12.7	84.1	0	No	11	No
2	30	Female	Unilateral	Left upper zone	12.1	1.6	2.8	10.5	127.7	3	Yes	9	No
3	51	Female	Unilateral	Left middle zone	12.0	2.5	2.7	8.5	96.6	2	Yes	10	No
4	41	Female	Unilateral	Right upper zone	10.8	1.6	2.1	13.9	675.2	2	No	11	No
5	56	Female	Bilateral	Right and left middle zone	10.2	5.0	4.3	9.6	480.2	1	No	7	No
6	45	Female	Unilateral	Right upper zone	11.7	2.8	3.1	16.6	222.1	2	Yes	10	Yes
7	28	Female	Unilateral	Right lower zone	11.0	2.3	2.8	8.7	128.1	1	No	10	No
8	52	Female	Unilateral	Left upper zone	15.0	4.8	2.0	23.8	192.5	3	No	10	No
9	52	Female	Unilateral	Right upper zone	13.1	1.6	2.0	9.9	267.4	3	Yes	9	Yes
10	38	Female	Unilateral	Right middle zone	10.0	5.2	2.3	7.4	96.6	1	No	11	No
11	28	Male	Unilateral	Left lower zone	11.7	3.3	2.2	11.6	69.4	1	No	12	No
12	68	Male	Unilateral	Right upper zone	10.3	3.1	2.1	16.9	497.1	2	No	8	No
13	39	Male	Unilateral	Right lower zone	13.5	4.5	2.2	8.0	192.5	2	No	9	No

14	49	Female	Unilateral	Left middle zone	14.4	5.3	3.4	7.3	322.7	2	No	8	No
15	25	Male	Unilateral	Whole of right lung	16.5	2.8	3.5	6.6	151.4	2	No	10	No
16	33	Male	Unilateral	Left lower zone	12.9	1.6	2.5	10.8	516.7	3	No	8	No
17	33	Male	Unilateral	Left upper zone	11.5	4.3	3.4	8.0	454.3	1	No	8	No
18	37	Male	Bilateral	Right and Left lower zone	13.1	3.5	2.4	19.3	218.7	3	No	12	No
19	66	Male	Unilateral	Right lower zone	12.0	6.5	1.5	17.6	457.2	1	No	7	No
20	42	Female	Unilateral	Right lower zone	14.0	4.1	1.6	11.6	228.6	3	No	10	No
21	17	Male	Unilateral	Left lower zone	11.3	2.6	3.0	8.0	559.0	1	No	8	No
22	51	Female	Unilateral	Right middle zone	10.7	1.6	2.2	8.5	152.1	2	No	10	No
23	61	Male	Unilateral	Left lower zone	10.5	3.3	3.2	7.9	156.2	2	No	10	No
24	33	Female	Unilateral	Left upper zone	10.4	1.5	3.5	22.8	386.6	2	No	10	No
25	54	Female	Unilateral	Right upper zone	11.4	1.1	1.8	18.8	95.0	2	No	7	No
26	46	Female	Bilateral	Right and left middle zone	13.0	1.2	2.0	22.9	450.9	2	No	7	No
27	41	Male	Unilateral	Left lower zone	11.9	1.8	3.7	13.8	151.8	3	No	8	No
28	53	Male	Unilateral	Left lower zone	11.2	2.8	2.4	16.5	414.8	1	No	12	No
29	35	Male	Unilateral	Right lower zone	10.0	2.7	1.8	14.9	69.4	3	Yes	12	Yes
30	33	Male	Unilateral	Right lower zone	11.2	2.2	4.1	18.0	329.3	3	No	9	No

31	44	Male	Unilateral	Left middle zone	12.6	1.5	3.6	10.5	450.8	2	No	7	No
32	42	Male	Bilateral	Right and left upper zone	10.2	1.1	2.7	8.7	743.2	2	No	9	No
33	52	Male	Unilateral	Right lower zone	12.1	3.5	1.9	9.9	151.8	1	No	7	No
34	41	Male	Unilateral	Left lower zone	11.9	5.6	3.2	20.7	188.9	2	No	7	No
35	45	Male	Unilateral	Left middle zone	15.4	1.5	4.0	12.5	151.4	3	No	7	No
36	37	Male	Unilateral	Left middle zone	14.1	1.4	3.4	17.7	332.0	2	No	12	No
37	29	Female	Bilateral	Right and left upper zone	12.7	2.2	3.7	12.7	506.6	2	Yes	12	Yes
38	42	Female	Unilateral	Right upper zone	12.8	3.1	4.3	7.9	156.2	2	No	10	No
39	63	Male	Unilateral	Whole of left lung	9.5	1.6	3.4	7.4	166.2	2	No	9	No
40	46	Male	Unilateral	Left middle zone	13.2	1.8	2.6	22.9	502.3	2	No	11	No
41	35	Female	Unilateral	Left lower zone	16.1	4.1	3.9	7.4	117.8	3	Yes	12	Yes
42	36	Male	Unilateral	Left lower zone	12.8	5.3	4.3	10.2	153.7	1	No	8	No
43	33	Female	Unilateral	Right middle zone	11.5	1.4	2.7	8.5	84.1	3	Yes	9	No
44	34	Male	Unilateral	Right middle zone	11.5	5.8	3.7	25.9	95.0	3	Yes	8	No
45	24	Female	Unilateral	Right lower zone	11.0	1.7	2.7	12.2	127.7	2	No	8	No
46	43	Male	Unilateral	Right lower zone	10.1	1.2	1.9	7.0	84.1	2	No	9	No
47	38	Male	Unilateral	Right middle zone	14.1	1.4	2.0	12.4	244.2	1	No	8	No

48	56	Male	Unilateral	Right lower zone	11.7	1.6	3.0	10.2	468.1	2	No	9	No
49	40	Male	Unilateral	Right lower zone	11.1	4.4	3.5	10.8	596.6	2	No	11	No
50	37	Male	Unilateral	Right lower zone	13.1	1.2	3.2	8.5	96.6	1	No	10	No
51	49	Male	Unilateral	Right lower zone	11.5	4.2	2.2	12.6	188.9	3	No	7	No
52	14	Male	Unilateral	Right lower zone	10.1	1.4	3.0	9.6	95.0	3	Yes	11	No
53	51	Female	Unilateral	Right lower zone	11.3	1.2	3.3	7.9	117.8	2	No	11	No
54	47	Male	Unilateral	Right lower zone	9.3	2.6	2.2	11.3	460.6	2	No	7	No
55	50	Male	Unilateral	Right middle zone	15.8	2.2	4.7	19.0	737.8	3	No	9	No
56	42	Male	Bilateral	Right and left upper zone	15.0	4.2	4.6	11.8	152.1	2	No	10	No
57	33	Male	Unilateral	Right middle zone	11.4	3.6	2.7	6.4	228.6	2	No	10	No
58	33	Female	Unilateral	Right middle zone	11.5	4.1	2.2	11.3	222.1	3	No	11	No
59	45	Male	Bilateral	Left lower zone	11.1	1.1	3.4	16.4	153.7	2	No	7	No
60	31	Female	Unilateral	Left lower zone	12.4	2.5	1.4	7.3	166.2	3	Yes	12	Yes
61	50	Male	Unilateral	Right lower zone	11.9	1.8	3.1	14.4	128.1	1	No	7	No
62	46	Male	Unilateral	Right lower zone	9.1	2.3	1.4	20.2	117.8	3	Yes	12	No
63	43	Male	Bilateral	Right and left lower zone	14.8	1.8	3.4	25.1	399.5	3	No	9	No
64	38	Male	Unilateral	Left lower zone	13.6	1.5	3.1	14.5	649.9	2	No	10	No

65	37	Male	Bilateral	Right and left middle zone	11.4	3.0	3.1	14.6	352.1	1	No	12	No
66	27	Male	Unilateral	Left lower zone	14.0	1.7	2.7	11.8	69.4	2	No	7	No