Clinical Audit

Clinical profile and outcomes of patients presenting with acute breathlessness and pulmonary infiltrates in the emergency department of a tertiary care centre

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Abstract

Background

Acute breathlessness is a common and potentially life-threatening presentation in the emergency department and contributes significantly to ICU admissions. It is frequently seen in elderly patients with underlying cardiorespiratory comorbidities and requires prompt evaluation and early respiratory support to improve outcomes. This study aimed to describe the clinical profile, etiological spectrum, radiological findings, respiratory support requirements, and short-term outcomes of patients presenting with acute breathlessness to a tertiary care emergency department.

Methods

A retrospective observational study was conducted at a tertiary care centre in Tamil Nadu during December 2025. Medical records of 16 adult patients presenting with acute onset breathlessness, lung infiltrates on chest imaging, and requiring ICU admission were reviewed. Patients with acute coronary syndrome, troponin-I positivity, pulmonary embolism, and traumatic hemopneumothorax were excluded. Data on demographic characteristics, comorbidities, clinical and hemodynamic status, modified Medical Research Council (mMRC) dyspnea grading, microbiological and viral profiles, radiological findings, neutrophil–lymphocyte ratio (NLR), respiratory support, duration of hospital stay, and in-hospital outcomes were analysed using descriptive statistics.

Results

A retrospective observational study was conducted at a tertiary care centre in Tamil Nadu during December 2025. Medical records of 16 adult patients presenting with acute onset breathlessness, lung infiltrates on chest imaging, and requiring ICU

admission were reviewed. Patients with acute coronary syndrome, troponin-I positivity, pulmonary embolism, and traumatic hemopneumothorax were excluded. Data on demographic characteristics, comorbidities, clinical and hemodynamic status, modified Medical Research Council (mMRC) dyspnea grading, microbiological and viral profiles, radiological findings, neutrophil–lymphocyte ratio (NLR), respiratory support, duration of hospital stay, and in-hospital outcomes were analysed using descriptive statistics.

Conclusion: Patients with acute breathlessness were mainly elderly with comorbidities like COPD and hypertension; most were stable with infective radiology. Non-invasive ventilation was associated with better in-hospital outcomes. Early, timely treatments improves outcomes.

Keywords: Acute breathlessness; Emergency department; Intensive care unit; Non-invasive ventilation; Respiratory failure

1. Introduction

Breathlessness is one of the most common clinical presentations to the emergency department and represents a major cause of acute hospital admissions.[1] Owing to its significant prognostic value, breathlessness warrants careful and timely evaluation. The differential diagnosis of dyspnea is often complex due to its nonspecific nature and the weak correlation between symptom severity and the extent of the underlying pathological process.[2] Consequently, the initial assessment of dyspnea requires prompt diagnostic evaluation, identification of appropriate monitoring strategies, and early decision-making regarding the most suitable level of care.[3]

Dyspnea refers to an unpleasant or distressing sensation of breathing and may manifest as air hunger, increased work of breathing, with or without associated chest tightness.[4,5] It reflects dysfunction across a wide spectrum of disease processes involving the respiratory and cardiovascular systems. In clinical practice, a substantial proportion of patients presenting to the emergency department with acute breathlessness have acute exacerbations superimposed on chronic cardiorespiratory illnesses.1

Epidemiological data highlight the substantial global burden of breathlessness. Across 15 countries, the overall prevalence of breathlessness, defined as a modified Medical Research Council (mMRC) dyspnea grade of ≥1, among individuals aged over 40 years was reported to be 27%, with marked variation between countries, ranging from 10% in China to nearly 50% in Turkey.[6] This wide variation underscores the influence of demographic, environmental, and healthcare-related factors on the prevalence and presentation of dyspnea.

Breathlessness, as a human and lived experience, arises through a complex interplay of multiple genetic and environmental factors. Its pathophysiology involves several levels, including abnormalities in ventilation, pulmonary mechanics, cardiac function, vascular regulation, peripheral tissues and muscles, as well as central neural processing.[7,8] Psychological, situational, and social factors further modulate symptom perception and severity. An understanding of this multifactorial nature is essential when investigating and interpreting the epidemiology and clinical presentation of breathlessness.[9]

Despite its high prevalence and clinical significance, there is limited data describing the clinical profile, etiological spectrum, radiological findings, and short-term outcomes of patients presenting with acute breathlessness requiring intensive care, particularly from tertiary care centres in India. Characterizing these parameters may assist in early risk stratification, appropriate allocation of critical care resources, and optimization of management strategies in emergency settings. This study was therefore undertaken to evaluate patients presenting with acute breathlessness to a tertiary care emergency department.

1.1. Aim

This study aimed to describe the demographic and clinical profile of patients presenting with acute breathlessness to the emergency department, to evaluate their etiological, radiological, and laboratory characteristics, and to assess the respiratory support requirements and in-hospital outcomes of these patients.

2. Materials and Methods

This descriptive study was conducted in 16 patients at Kauvery Hospital, Tirunelveli, Tamil Nadu, India, during the month of December 2025. Institutional approval was obtained prior to data collection, and all investigations included in the study were performed as part of routine clinical care.

2.1. Inclusion criteria

Adult patients presenting with acute onset breathlessness, with lung infiltrates evident on chest imaging, who required ICU admission and were admitted during the study period were included in the study**.**

2.2. Exclusion criteria

Patients with acute coronary syndrome, troponin I–positive status, road traffic accident–related hemopneumothorax, and those diagnosed with pulmonary embolism were excluded from the study.

2.4. Methods

Data were collected retrospectively from hospital medical records. Information regarding demographic details (age and sex), clinical presentation, and hemodynamic status at admission was recorded. Breathlessness severity was assessed using the modified Medical Research Council (mMRC) dyspnea scale.

Details of underlying comorbidities such as chronic obstructive pulmonary disease, hypertension, diabetes mellitus (DM), and other associated illnesses were documented. Laboratory parameters reviewed included complete blood count, with special emphasis on the neutrophil–lymphocyte ratio (NLR), along with blood and urine cultures where available. Microbiological evaluation included sputum or bronchoalveolar lavage (BAL) cultures, and viral marker testing.

Radiological findings were assessed based on chest imaging, documenting features such as infiltrates, consolidation, pleural effusion, bronchiectasis, collapse, atelectasis, emphysema, and atypical viral patterns. Details regarding respiratory support requirements,

including oxygen therapy, non-invasive ventilation, and invasive mechanical ventilation, were recorded. The length of ICU stays and in-hospital outcomes (recovery, discharge against medical advice, or death) were also documented.

2.5. Statistical analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Categorical variables were expressed as frequencies and percentages.

3. Results

In gender distribution males and females were equally distributed (8 each, 50%). Age distribution included 3 (18.8%) participants aged 18–39 years, 4 (25%) aged 40–59 years, 7 (43.8%) aged 60–79 years, and 2 (12.5%) aged ≥80 years (Table 1).

Table 1: Demographic profile of patients

Variable	Category	n (%)
Sex	Male	8 (50%)
	Female	8 (50%)
Age group (years)	18–39	3 (18.8%)
	40–59	4 (25%)
	60–79	7 (43.8%)
	≥80	2 (12.5%)

Hemodynamic stability was observed in 13 (81.3%) participants, while 3 (18.7%) were unstable. Major comorbidities included COPD in 6 (37.5%), hypertension in 6 (37.5%), DM in 3 (18.8%), and other comorbidities in 10 (62.5%) (Table 2).

Table 2: Clinical characteristics at presentation

Parameter	Category	n (%)
Hemodynamic status	Stable	13 (81.3%)
	Unstable	3 (18.7%)
Major comorbidities*	COPD	6 (37.5%)
	Hypertension	6 (37.5%)
	DM	3 (18.8%)
	Other comorbidities	10 (62.5%)

Sputum/BAL analysis showed no growth or negative results in 12 (75%), while MDR organisms, Acinetobacter, empyema, and other findings were each observed in 1 (6.3%). Urine and blood analysis was negative in 14 (87.5%) and positive for Candida/DCS in 2 (12.5%). Viral markers were negative in 15 (93.8%), with Influenza A detected in 1 (6.2%) (Table 3).

Table 3: Etiology and Microbiological/Viral Profile

Investigation	Finding	n (%)
Sputum/BAL	No growth/Negative	12 (75%)
	MDR organism	1 (6.3%)
	Acinetobacter	1 (6.3%)
	Empyema	1 (6.3%)
	Other	1 (6.3%)
Urine/Blood analysis	Negative	14 (87.5%)
	Positive (Candida/DCS)	2 (12.5%)
Viral markers	Negative	15 (93.8%)
	Influenza A	1 (6.2%)

Radiological findings included lower lobe infiltrates in 5 (31.25%), pleural effusion in 3 (18.75%), consolidation in 2 (12.5%), bronchiectasis in 2 (12.5%), collapse in 2 (12.5%), atelectasis in 1 (6.25%), and emphysema in 1 (6.25) (Table 4).

Table 4: Radiological findings on chest imaging

Radiological finding	n (%)
Lower lobe infiltrates	5 (31.25%)
Pleural effusion	3 (18.75%)
Consolidation	2 (12.5%)
Bronchiectasis	2 (12.5%)
Collapse	2 (12.5%)
Atelectasis	1 (6.25%)
Emphysema	1 (6.25%)

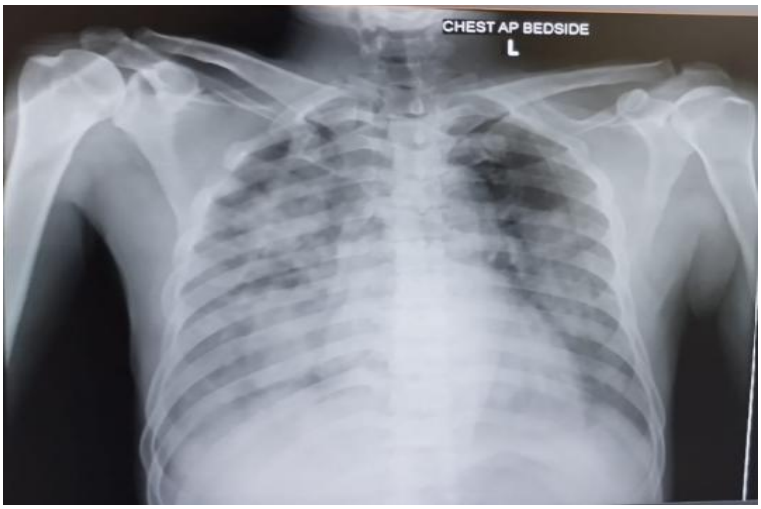

Fig (1): Bilateral Lung infiltrates (Chest X-ray AP View

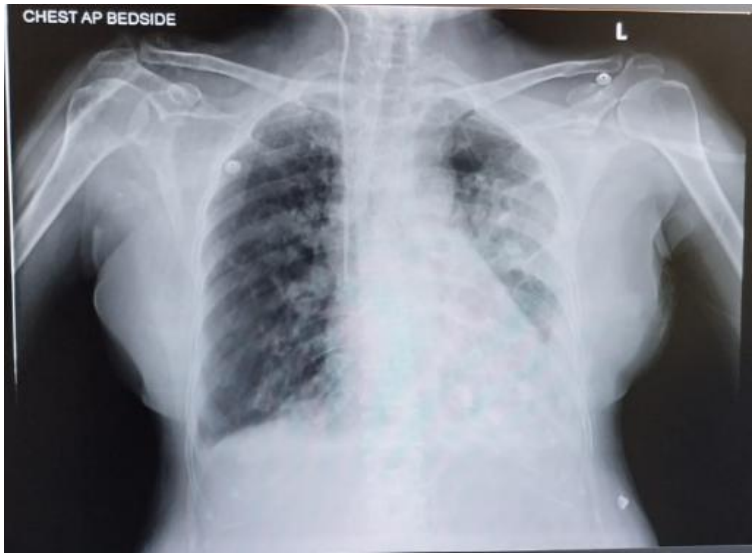

Fig (2): Left Lung infiltrates (Chest X-ray AP View)

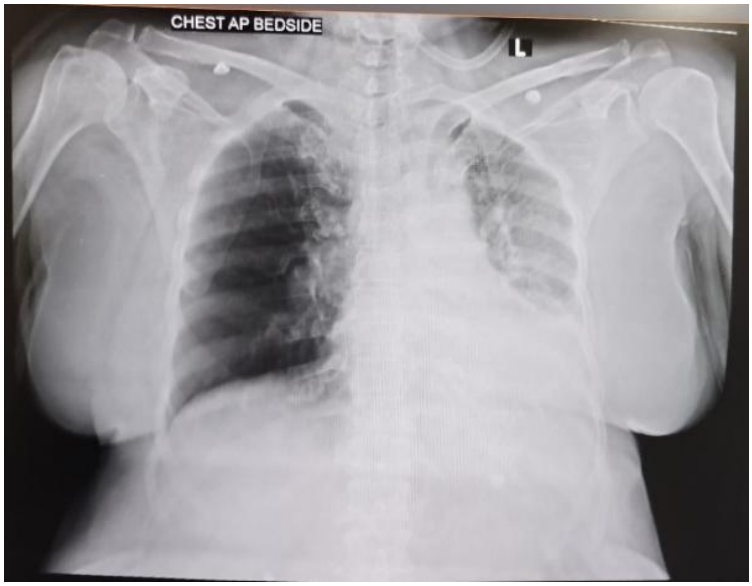

Fig (3): Left lower lobess infiltrates (Chest X-ray AP View)

Community-acquired pneumonia was the predominant diagnosis (31.3%), followed by bronchiectasis with acute exacerbation and pulmonary edema (18.8% each). Other diagnoses including viral pneumonitis, aspiration pneumonitis, acute exacerbation of COPD, tubercular empyema, and extrapulmonary tuberculosis were infrequent (6.3% each) (Table 5).

Table 5: Diagnosis-wise distribution

Diagnosis	n (%)
Community-acquired pneumonia (CAP)	5 (31.3%)
Bronchiectasis with acute exacerbation	3 (18.8%)
Pulmonary edema (with/without CKD)	3 (18.8%)
Viral pneumonitis	1 (6.3%)
Aspiration pneumonitis	1 (6.3%)
Empyema – tubercular	1 (6.3%)
Extrapulmonary TB – pleural effusion	1 (6.3%)
Acute exacerbation of COPD (AECOPD)	1 (6.3%)

Respiratory support included NIV in 7 (43.8%), intubation in 5 (31.3%), and oxygen inhalation in 4 (25%). NLR ratio was ≤8 in 4 (25%), 9–18 in 7 (43.8%), and >18 in 5 (31.2%). Hospital stay was 1–5 days in 9 (56.3%), 6–10 days in 5 (31.3%), 11–15 days in 1 (6.2%), and 16–20 days in 1 (6.2%). Overall outcomes showed recovery in 14 (87.5%), discharge/AMA in 1 (6.3%), and death in 1 (6.3%) (Table 6).

Table 6: Respiratory support, hospital course and outcome

Parameter	Category	n (%)
Respiratory support	NIV	7 (43.8%)
	Intubation	5 (31.3%)
	Oxygen inhalation	4 (25%)
NLR ratio	≤8	4 (25%)
	9–18	7 (43.8%)
	>18	5 (31.2%)
Hospital stay	1–5 days	9 (56.3%)
	6–10 days	5 (31.3%)
	11–15 days	1 (6.2%)
	16–20 days	1 (6.2%)
Overall Outcome	Recovered	14 (87.5%)
	Discharged / AMA	1 (6.3%)
	Death	1 (6.3%)

Among patients receiving NIV, recovery was observed in 7 (100%), with no deaths or discharges against medical advice. In the intubation group, recovery occurred in 3 (60%), death in 1 (20%), and discharge against medical advice in 1 (20%). All patients receiving oxygen inhalation recovered (4, 100%), with no deaths or discharges against medical advice (Table 7).

Table 7: Relation to respiratory support

Respiratory support	Recovered n (%)	Death n (%)	AMA n (%)
NIV	7 (100%)	0	0
Intubation	3 (60%)	1 (20%)	1 (20%)
Oxygen inhalation	4 (100%)	0	0

4. Discussion

Our study, which demonstrate that dyspnea in the emergency setting predominantly affects older adults with a high burden of cardiopulmonary comorbidities. Most patients were hemodynamically stable, had limited microbiological yield, showed heterogeneous radiological patterns, and experienced favorable outcomes with timely supportive management, particularly noninvasive ventilation.

In our study, males and females were equally represented, with most patients belonging to the older age groups, particularly those aged 60–79 years, followed by middle-aged adults. Younger adults formed a smaller proportion, while very elderly patients constituted the least represented age group. Similarly, *Swetha et al*. reported that patients presenting to the emergency department with dyspnea had a median age of 64 years (IQR 54–72), with 69% aged ≥60 years, and a female predominance (62.6%) over males.[10] In *Jemt et al*. evaluated a large cohort of emergency department patients and reported that those presenting with dyspnea were older, with a mean age of 64.2 years, and were more often female (54.7%) compared to patients presenting with chest pain.[11] Dyspnea in the emergency setting predominantly affects older adults, with age being a consistent demographic characteristic across studies, while sex distribution shows variability.

In our study, most patients were hemodynamically stable at presentation, with a smaller proportion showing instability. Comorbidities were common, particularly COPD and hypertension, while DM and other associated conditions were also frequently observed. Likewise, *Vermi et al*. reported that most elderly patients with dyspnea had multiple comorbidities, commonly hypertension (74.4%), COPD (48.1%), heart failure (45.8%), coronary artery disease (37.9%), and DM (34.8%), with only 5.2% having no comorbid illness.[12] Debernardi et al. reported that 94.3% of patients had at least one comorbidity, commonly cardiovascular conditions like hypertension (81.5%), heart failure (39.2%), arrhythmias (37.9%), and CHD (35.7%), with frequent respiratory comorbidities COPD (38.4%), prior pneumonia (22.8%), and COVID-19 (21.2%); DM in 30.2%.[13] Majority of patients were hemodynamically stable but had significant comorbidity burden, predominantly cardiovascular and respiratory conditions, a pattern that is consistent with findings from other studies in elderly patients presenting with dyspnea.

In our study, most microbiological investigations were negative; however, isolated pathogens included multidrug-resistant organisms such as Acinetobacter, fungal isolates like Candida, and a viral etiology with Influenza A, indicating a low overall microbiological yield with few identifiable organisms. *Cartuliares et al*. reported that microorganisms were identified in 37% of respiratory samples, with common community-acquired pathogens including Haemophilus influenzae, Streptococcus pneumoniae, and Moraxella catarrhalis, while Staphylococcus aureus and Pseudomonas aeruginosa were also detected; notably, 37.7% of samples showed no pathogen growth.[14] *Saubolle and McKellar* noted that Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis are the common bacterial causes of community-acquired pneumonia and bronchitis, viral agents predominate in acute bronchitis, and microbiological diagnosis fails in over

50% of cases.[15] Microbiological yield in community-acquired respiratory infections remains limited, with many cases showing no identifiable pathogen, underscoring the challenges of etiological diagnosis and the need for empiric, clinically guided management.

In our study, lower lobe infiltrates were the most common radiological finding, while pleural effusion, consolidation, bronchiectasis, and lung collapse were also observed. Less frequent findings included atelectasis, emphysema, and atypical viral patterns. *Arnold et al*. reported that chest radiograph consolidation had a low positive predictive value (12.3%) but a high negative predictive value (96.1%) for typical bacterial CAP, making its absence useful to rule out bacterial infection, while pleural effusion though uncommon was the strongest radiological predictor.[16] *Boersma et al*. reported that lobar alveolar opacity was common radiological finding (72–90%), patchy alveolar opacities were frequent in atypical infections (17% vs 2%), unilobar involvement was seen in 86% of chlamydial pneumonia compared with 49% of pneumococcal pneumonia, and pleural effusion occurred in 10–24% of cases, most often in pneumococcal pneumonia (27%).[17] Radiological findings in dyspnea are heterogeneous, with lower lobe infiltrates and pleural effusion being common, and imaging patterns providing supportive rather than definitive evidence for etiological diagnosis, emphasizing the need for clinical correlation.

In our study, community-acquired pneumonia emerged as the most common diagnosis, followed by bronchiectasis with acute exacerbation and pulmonary edema. Other etiologies, including viral pneumonitis, aspiration pneumonitis, acute exacerbation of chronic obstructive pulmonary disease, tubercular empyema, and extrapulmonary tuberculosis, were observed less frequently. These findings are closely comparable to *Shahzad Hussain Arastu et al*. study pneumonia was common etiological factor (23.33%), followed by chronic obstructive airway disease (16.67%), aspiration pneumonia (6.67%), and severe ARDS (6.67%).[18] Thus, both studies consistently identify pneumonia as the leading cause of acute respiratory failure, reinforcing its dominant role in respiratory morbidity requiring hospital or ICU-level care.

In our study, varying levels of respiratory support were required, ranging from oxygen therapy alone to non-invasive ventilation and intubation. Patients showed a wide range of NLR values and hospital stays, with most having shorter durations of admission. Overall outcomes were favorable, with the majority of patients recovering, while only a small number experienced adverse outcome. Consistently, *Arsude et al.* reported NIV failure in 12% (6/50) of patients, significantly associated with DM and renal disease; successful NIV was marked by greater improvement in dyspnea, respiratory rate, pH, and PaO_2 within 4 hours, with no difference in hospital stay or NIV duration between type I and II respiratory failure.[19] And *Sharma et al*. reported a median hospital stay of 3.9 days, with 3.1% ICU admission and 7.9% in-hospital mortality; patients with NLR >12 had higher mortality (10.3% vs 6.4%), ICU admission (3.7% vs 2.6%), and vasopressor use (3.6% vs 1.7%), though NLR did not improve the prognostic performance of CURB-65.[20] Most patients had favorable outcomes with supportive respiratory care, and disease severity and comorbidities remained key determinants of outcomes, consistent with previous studies.

In our study, all patients managed with noninvasive ventilation or oxygen therapy alone had favorable outcomes with complete recovery. In contrast, patients who required intubation experienced poorer outcomes, including mortality and discharge against medical advice, indicating greater disease severity in this group. The *Ruzsics et al*. conducted a systematic review and meta-analysis of 5 RCTs (121 adults) with pneumonia-associated

respiratory failure, showing that NIV significantly reduced ICU mortality (OR 0.22; 95% CI 0.07–0.75; P = 0.015) and the need for endotracheal intubation (OR 0.22; 95% CI 0.09–0.53; P = 0.001); although overall hospital mortality was lower (OR 0.39), it was not statistically significant (P = 0.085).[21] Likewise, *Kshatriya et al.* reported NIV was successful in 74% of patients, while 26% required invasive ventilation [22]. Noninvasive ventilation was associated with favorable outcomes, while the need for intubation reflected greater disease severity and poorer prognosis, a finding consistent with prior studies demonstrating the effectiveness of NIV and its role in reducing invasive ventilation and mortality.

This study provides a comprehensive real-world evaluation of patients presenting with dyspnea to the emergency department, integrating clinical, microbiological, radiological, and outcome data with existing literature. Dyspnea predominantly affected older patients with multiple cardiopulmonary comorbidities, showed limited microbiological yield, and demonstrated heterogeneous radiological patterns requiring careful clinical correlation. Most patients had favorable outcomes with timely supportive care, particularly non-invasive ventilation, while the need for intubation reflected greater disease severity and poorer prognosis.

5. Limitations

This study was limited by its single-centre design and small sample size, which may restrict generalizability. In addition, the retrospective nature and short-term in-hospital follow-up limited longitudinal assessment of outcomes and causal inferences.

6. Conclusion

Patients presenting with acute breathlessness to the emergency department were predominantly elderly with multiple comorbidities, especially COPD and hypertension. Most patients were hemodynamically stable and had infective radiological patterns. Non-invasive ventilation was associated with better in-hospital outcomes, Patients requiring invasive ventilation had higher mortality, likely reflecting greater disease severity. Early recognition, appropriate respiratory support, and intensive care management contributed to high overall recovery rates. In future multicentre prospective studies with longer follow-up are needed to validate findings and assess long-term outcomes.

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Conflict of Interest: We declare no conflict of interest relate to our study.

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