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CLINICAL CHARACTERISTICS, TREATMENT MODALITIES AND PROGNOSIS IN PATIENTS PRESENTING WITH ACUTE RESPIRATORY DISTRESS SYNDROME: A PROSPECTIVE OBSERVATIONAL STUDY

General Medicine

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ABSTRACT

Background: Acute Respiratory Distress Syndrome (ARDS) is a life-threatening condition characterized by acute hypoxemic respiratory failure and non-cardiogenic pulmonary edema. Despite advances in critical care, it remains associated with high mortality and long-term morbidity. Early identification, severity assessment, and appropriate management are essential to improve patient outcomes, especially in resource-limited settings. **Aim:** To study the clinical profile, treatment modalities and prognosis in patients presenting with ARDS. **Methodology:** This cross-sectional study was conducted in the Department at a tertiary care hospital. Sixty ARDS patients meeting inclusion criteria were prospectively evaluated with clinical, laboratory, and imaging investigations. qSOFA was assessed on admission, and patients were followed until discharge or death, **Results:** In this study of 60 ARDS patients, mean age was 49.58 ± 15.45 years, with 53.33% males. Breathlessness (70%), cough (58.33%), and fever (40%) were common symptoms. Diabetes (43.33%) and hypertension (36.67%) are predominated comorbidities. Pneumonia (30%) and sepsis (13.33%) were leading causes. Mechanical ventilation was required in 75%, and higher qSOFA scores strongly predicted mortality. **Conclusion:** The findings from this single-center study confirm that ARDS often affects middle-aged and older adults, shows a slight male predominance, and is mostly triggered by pneumonia or sepsis. Comorbidities such as diabetes and hypertension significantly contribute to vulnerability and poor prognosis. Mortality increased in proportion to qSOFA scores, underscoring the utility of qSOFA as a robust prognostic marker in critically ill ARDS patients.

KEYWORDS

Acute Respiratory Distress Syndrome (ARDS), Kigali's Modification, qSOFA

INTRODUCTION

Acute Respiratory Distress Syndrome (ARDS) is a severe condition characterized by diffuse inflammation and injury to the lungs, leading to acute hypoxemic respiratory failure. It presents with sudden onset breathlessness, refractory hypoxemia, and non-cardiogenic pulmonary edema, often requiring ventilatory support [1]. ARDS imposes a significant global health burden, contributing to high morbidity, mortality, and healthcare utilization. It affects over 3 million individuals annually, with mortality rates approaching 40% and a prevalence of approximately 10% among critically ill ICU patients [2].

The pathophysiology of ARDS involves damage to the alveolar epithelial and capillary endothelial barriers, resulting in leakage of protein-rich fluid into alveoli and subsequent non-cardiogenic pulmonary edema. This process triggers inflammation, coagulation abnormalities, and impaired fluid clearance. Loss of surfactant function further worsens lung injury, leading to decreased compliance, reduced functional residual capacity, hypoxemia, and radiological opacities. Recovery, when it occurs, often involves fibrotic repair over several weeks [3].

ARDS may result from direct pulmonary insults such as pneumonia, aspiration, and inhalational injury, or indirect causes like sepsis and trauma. These mechanisms lead to disruption of the alveolar–capillary membrane, impaired gas exchange, and widespread inflammation. Clinically, ARDS is characterized by acute onset dyspnea, refractory hypoxemia, and bilateral infiltrates on imaging [4].

Diagnostic criteria for ARDS have evolved over time. The American–European Consensus Conference (AECC) definition introduced in 1994 was later refined by the Berlin definition in 2012, which classifies ARDS into mild (PaO_2/FiO_2 200–300 mmHg), moderate (100–200 mmHg), and severe (≤100 mmHg), all requiring PEEP ≥5 cmH_2O. Increasing severity correlates with higher mortality [5,6]. In resource-limited settings, the Kigali modification has been proposed, utilizing an SpO_2/FiO_2 ratio ≤315 and eliminating the need for PEEP, thereby improving feasibility of diagnosis [6].

Management of ARDS primarily focuses on treating the underlying cause and providing supportive care. Mechanical ventilation remains the cornerstone of therapy, with lung-protective strategies such as low tidal volume ventilation significantly reducing mortality [7]. Prognostic assessment tools, including SOFA and APACHE II scores, are widely used to evaluate disease severity and predict outcomes in critically ill patients [8].

Despite advances in critical care, ARDS continues to be associated with substantial mortality and long-term morbidity. Survivors often experience persistent physical, cognitive, and psychological impairments, reduced exercise tolerance, and diminished quality of life, leading to increased healthcare needs [9].

Although extensive research has been conducted in Western populations, data from India remain limited. The present study aims to evaluate the clinical profile, management, and outcomes of ARDS patients in this region, with the goal of improving diagnostic approaches, optimizing treatment strategies, and enhancing patient outcomes [10].

Aim:

To study the clinical profile, treatment modalities and prognosis in patients presenting with ARDS.

Objectives:

1. To study clinical features in patients with acute respiratory distress syndrome.
2. To evaluate severity and prognosis in patients with ARDS.

Methodology

A total 60 patients diagnosed with ARDS, admitted to the Emergency ward and ICU, and meeting inclusion the criteria (using SpO2/FiO2<315 with No PEEP Requirement) were enrolled excluding those who met the predefined exclusion criteria.

A demographic details such as age, sex, address, occupation, medical history, Presenting Complaints, Comorbidities, history of addiction of patients collect in standard proforma.

Upon admission, all patients underwent a comprehensive clinical evaluation, along with routine diagnostic and laboratory investigations to confirm the diagnosis of ARDS, assess its severity, and identify its aetiology.

Routine laboratory investigations included a complete blood count (CBC)), renal function tests (RFTs), CRP and blood glucose levels.

Imaging studies and cardiac assessments such as electrocardiograms

(ECG), chest X-rays, were also performed.

Daily data collection included patient-specific parameters such as the, ventilator settings and respiratory parameters, SPO2, positive end-expiratory pressure [PEEP], and FiO_2.

qSOFA Score was calculated on day 1 of admission after confirming diagnosis of ARDS

Patients were followed until an outcome was achieved, which included recovery (cured and discharged), discharge with home isolation, or death.

All relevant data were meticulously recorded in a predesigned proforma for subsequent analysis.

RESULTS

In this prospective observational study of 60 patients with acute respiratory distress syndrome (ARDS), the majority of cases occurred in middle-aged and elderly individuals, with the 51–60-year age group being the most affected (23.3%). The overall mean age was 49.58 ± 15.45 years. Males were marginally more affected than females (53.33% vs. 46.67%),

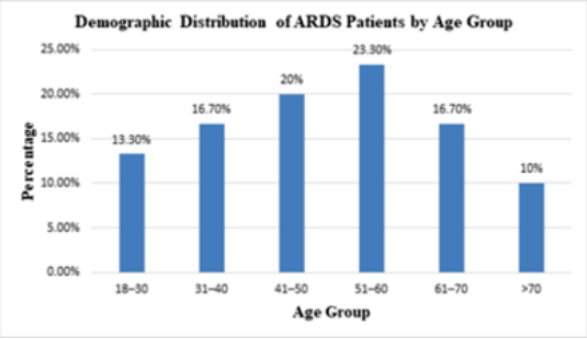

Figure 1: Demographic Data

The most common presenting symptoms were breathlessness (70%), followed by cough (58.33%), and restlessness (43.33%). Fever (40%) was also a frequent finding, particularly in cases with infectious etiologies such as pneumonia or sepsis several patients exhibited systemic and extrapulmonary manifestations, reflecting the multi-organ involvement that often complicates ARDS and

Figure 2: Presenting Complaints

A substantial proportion of patients had pre-existing comorbidities, the most common being diabetes mellitus (43.33%) and hypertension (36.67%). Other frequent contributors included anemia, chronic smoking, and alcohol use,

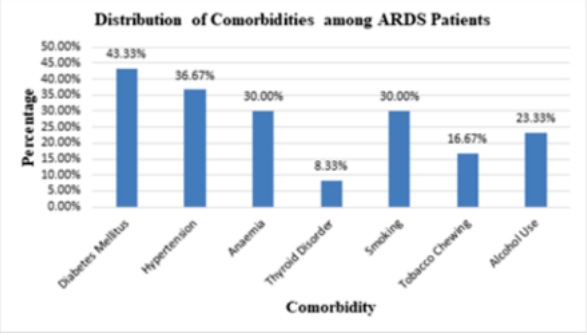

Figure 3: Comorbidities and Addiction in ARDS Patients

The etiological analysis revealed pneumonia (30%) as the leading direct pulmonary cause, underscoring the continuing global importance of lower respiratory tract infections in ARDS pathogenesis. Sepsis (13.33%) emerged as the most common indirect cause, consistent with its role as a systemic trigger of inflammation and endothelial injury. Other notable contributors in this cohort included dengue infection, acute pancreatitis, paraquat poisoning, and snake bite, highlighting the diversity of ARDS causes in the Indian subcontinent, where both infectious and toxic exposures remain clinically relevant. Interestingly, in 28.33% of patients, no definite cause could be identified, underscoring the diagnostic challenges in critically ill patients where multiple overlapping risk factors may be present.

Table 1: Causes of ARDS

Direct Causes	No. of Cases	Percentage (%)
Pneumonia	18	30.00%
Near Drowning	1	1.67%
Toxic Inhalational Injury	1	1.67%
Indirect Causes		
Sepsis	8	13.33%
Acute Pancreatitis	4	6.67%
Dengue	5	8.33%
Paraquat Poisoning	3	5.00%
Snake Bite	3	5.00%
Unknown Causes	17	28.33%

In this study, hypoxemia was assessed using the SpO_2/FiO_2 ratio, an increasingly recognized non-invasive surrogate for PaO_2/FiO_2, particularly in resource-limited settings. More than half of the patients presented with moderate hypoxemia (SpO_2/FiO_2 200–315), 30% had severe hypoxemia (100–200), and 16.67% were classified as having very severe ARDS (<100).

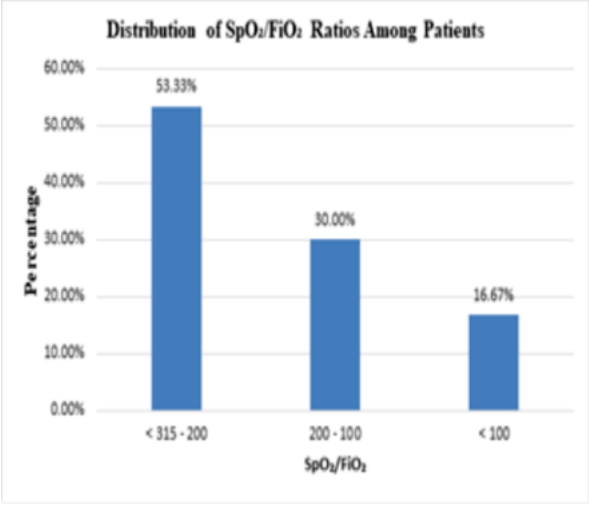

Figure 4: Distribution of Spo2/Fio2 Among Patients

All patients in the study required a fraction of inspired oxygen (FiO_2) greater than 0.6, reflecting the severity of hypoxemia. Invasive mechanical ventilation was necessary in 75% of cases, with intubation typically occurring on the first day of ICU admission, while 25% of patients were managed with non-invasive ventilation (NIV). Antibiotics were prescribed in two-thirds of patients, corresponding to the high prevalence or clinical suspicion of infectious etiologies. The duration of mechanical ventilation varied, with 35% of patients requiring ventilatory support for 5–10 days.

This study identified several poor prognostic factors, including qSOFA score >2, low hemoglobin (<11.5 ± 1.3 g/dL), elevated WBC count (>14,200 ± 3,500/mm³), low platelet counts (<150 ± 40 ×10³/μL), increased CRP (>72 ± 15 mg/L), and elevated serum creatinine (>1.8 ± 0.5 mg/dL). A particularly strong prognostic association was observed with qSOFA scoring, which stratified patients according to mortality risk: 0% mortality in patients with qSOFA scores 0–1, 44.44% with score 2, and 100% with score 3 ($p = 0.001$). This clear gradient emphasizes the predictive accuracy of qSOFA in ARDS prognosis, confirming observations from prior literature that qSOFA is a simple yet effective bedside tool to identify high-risk patients.

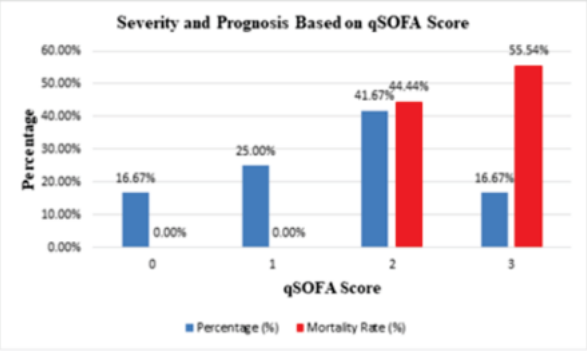

Figure 5: Severity and Outcome Based on qSOFA Score

DISCUSSION

In the present study of 60 ARDS patients, the majority were middle-aged and elderly, with the highest proportion in the 51–60 years group (23.3%), followed by 41–50 years (20%). Patients aged 31–40 and 61–70 years each constituted 16.7%, while 18–30 years accounted for 13.3%, and those >70 years comprised 10%. The mean age was 49.58 ± 15.45 years. These findings are comparable to Reddy et al. [11], who reported a mean age of 50.5 ± 16.8 years with a higher incidence in older individuals.

A slight male predominance was observed (53.33% vs. 46.67%), consistent with Reddy et al. [11], who also noted a male majority (57%), possibly due to hormonal and immunological differences. However, sex-based differences in outcomes remain inconsistent.

Breathlessness (70%) was the most common presenting symptom, followed by cough (58.33%), restlessness (43.33%), and fever (40%). Chest pain (30%) and palpitations (25%) were also noted. These findings agree with Rashid et al. [12], who reported fever (70.9%), breathlessness (56.9%), and cough (45%) as predominant symptoms.

Comorbidities were frequently observed, particularly diabetes (43.33%) and hypertension (36.67%), followed by anaemia (30%) and thyroid disorders (8.33%). Lifestyle factors such as smoking (30%), alcohol use (23.33%), and tobacco chewing (16.67%) were also common. Similar trends were reported by Rashid et al. [12], who identified diabetes (22.3%) and hypertension (25.2%) as major comorbidities.

Pneumonia (30%) was the leading direct cause of ARDS, while sepsis (13.33%) was the most common indirect cause. Other etiologies included dengue (8.33%), acute pancreatitis (6.67%), paraquat poisoning (5%), and snakebite (5%), with 28.33% of cases having no identifiable cause. These findings are comparable to Kadam et al. [13], who reported pneumonia (35%) and sepsis (27.5%) as leading etiologies.

Assessment of hypoxemia using the SpO_2/FiO_2 ratio revealed that 53.33% of patients had moderate hypoxemia (200–315), 30% had severe hypoxemia (100–200), and 16.67% had very severe hypoxemia (<100). Festic et al. [14] demonstrated that lower SF ratios are associated with increased mortality, supporting its role as a prognostic indicator.

All patients required FiO_2 >0.6, with 75% managed on invasive mechanical ventilation and 25% on non-invasive ventilation. Antibiotics were administered in 66.7% of cases. These findings are consistent with Pujari et al. [15], who reported poorer outcomes among patients requiring invasive ventilation.

qSOFA scores at admission were 0 (16.67%), 1 (25%), 2 (41.67%), and 3 (16.67%). Mortality increased significantly with higher scores: 0% for scores 0–1, 44.44% for score 2, and 100% for score 3 ($p = 0.001$). Similar observations were reported by Qin et al. [16], confirming qSOFA as a reliable prognostic tool in ARDS.

CONCLUSION

The present study demonstrated that ARDS predominantly affects middle-aged and elderly individuals, with a slight male predominance.

Clinically, breathlessness and cough were the most frequently observed symptoms.

Pneumonia and sepsis emerged as the major contributing aetiologies

The qSOFA score showed a strong correlation with disease severity, laboratory abnormalities, and clinical outcomes.

Poor prognostic factor in our study was qSOFA score >2, haemoglobin (<11.5 ± 1.3 g/dL), WBC (>14,200 ± 3,500/mm³, platelet counts (>150 ± 40 ×10³/µL), CRP (>72 ± 15 mg/L) creatinine (>1.8 ± 0.5 mg/dL)

If the qSOFA <2 but requiring NIV support should be monitored in ICU, to detect deterioration and early invasive ventilatory support and for better outcomes.

Patients having comorbidities like Diabetes, Hypertension are major contributory factors for increase in morbidity and mortality

Higher qSOFA scores were significantly associated with increased mortality, reinforcing its utility as a simple and effective bedside prognostic tool.

Similarly, the SpO_2/FiO_2 (SF) ratio proved to be a valuable non-invasive marker for assessing hypoxemia severity and classifying ARDS, particularly in settings where arterial blood gas analysis is not readily available.

The criteria of SpO_2/FiO_2 (SF) ratio for diagnosis ARDS patient which is used in our study is included in Global Definition of ARDS which was published in 2023.

Most patients required high FiO_2 and invasive mechanical ventilation. Intravenous antibiotics were frequently administered due to the predominance of infectious aetiologies.

The findings underscore the need for early identification, risk stratification, and prompt, aggressive supportive care—especially for patients presenting with higher qSOFA scores.

Overall, this study highlights the clinical relevance of using qSOFA and SF ratios as practical tools to guide early diagnosis, prognostication, and management of ARDS, particularly in resource-limited healthcare settings.

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