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Original Research Article

Evaluation of Clinical Profiles, Management Strategies, and Outcomes of Patients with Acute Respiratory Distress in a Tertiary Emergency Department

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Abstract:

Background: Acute respiratory distress (ARD) is a frequent and life-threatening emergency department (ED) presentation associated with high morbidity and mortality.

Aim: To evaluate the clinical profiles, management strategies, and outcomes of patients presenting with ARD in a tertiary emergency department.

Methodology: A retrospective cross-sectional observational study was conducted among 118 adult patients presenting with ARD at Department of Medicine, Nalanda Medical College and Hospital, Patna, Bihar, India. Data on demographics, comorbidities, etiologies, treatment modalities, and outcomes were extracted from medical records and analyzed using descriptive statistics.

Results: The mean age was 60.8 ± 14.6 years, with male predominance (56%). Common comorbidities included hypertension (46%), COPD (32%), and diabetes mellitus (35%). Pneumonia (29%), asthma/COPD exacerbation (23%), and pulmonary edema (19%) were leading etiologies. Non-invasive ventilation was used in 37% of patients, while 26% required mechanical ventilation. Hospitalization was required in 81%, ICU admission in 25%, and in-hospital mortality was 12%, with a mean hospital stay of 7.9 ± 4.3 days.

Conclusion: ARD predominantly affects older patients with significant comorbidities and requires substantial hospital resources. Early recognition and appropriate emergency management in a tertiary setting are crucial for favorable outcomes.

Keywords: Acute respiratory distress, emergency department, clinical profile, ventilatory support, outcomes.

Introduction

Acute respiratory distress (ARD) appears to be one of the most frequent and life-threatening clinical manifestations in emergency departments (EDs) across the world. It is a continuum of conditions that is marked by the abrupt development of dyspnea, hypoxemia, and elevated work of breathing, and usually may need immediate medical care. ARD is a significant problem to emergency care providers because of its heterogeneous etiologies, rapid onset, or development and high morbidity and mortality. Ard is increasingly becoming a burden in the healthcare systems, and thus, this is one of the most important areas of interest in terms of emergency medical research and clinical practice [1].

The etiological picture of ARD is wide and multidimensional as it includes both infectious etiology (i.e., pneumonia and sepsis) and cardiogenic (i.e., acute heart failure and pulmonary edema) etiologies, obstructive airway diseases, trauma, and other systemic insults. When these various causes are not identified and treated early enough, they may lead to acute hypoxemic respiratory failure. The wide range of clinical manifestations of ARD makes it more complicated to diagnose and treat the illness at the beginning, as it is determined by the underlying pathology, demographics, and morbidity. The epidemiology, clinical features, and course of ARD thus require a subtlety of understanding to make the relevant decision in an emergency response situation [2].

The ED clinicians are at the frontline of initial assessment and treatment of patients presenting with acute respiratory distress, as it is an emergency department and patients are initially attended to at the

ED. The main concerns in this high-acuity setting are quick evaluation, early stabilization, and proper progression of care. It has been indicated that the initial hours of presentation are the most crucial in the patient's outcome since delays or poor management of the patient during the initial hours may result in a rapid deterioration of the situation. Therefore, the quality of care provided at the first emergency stage is crucial in the minimization of complications, admissions to intensive care units and mortality related to ARD.[3].

The ARD management strategies in the emergency department are complex and take into consideration the extent of respiratory decompensation and etiology-driven interventions. General therapy usually involves either supplemental oxygen therapy, noninvasive ventilation, or invasive mechanical ventilation when severe, and specific treatment with an aim of curing the precipitating cause. Even with the development of respiratory support and structural care medicine, the results are still unstable. The age, comorbidities, the severity of illness at presentation, and the timeliness of intervention all have an important impact on prognosis. This inconsistency highlights the necessity of organized assessment of clinical pictures and treatment regimens to single out prognosticators of results and to maximize treatment results [4].

Globally, ARD is on the rise in the number of cases that present themselves in the emergency departments. This has been ascribed to various reasons such as the aging populations, increased prevalence of chronic cardiopulmonary conditions and frequent environmental and population health issues. All these elements have added to the complexity and large amount of ARD cases, which puts a significant burden on the emergency care delivery services. Consequently, the establishment and utilization of evidence-based and protocol-orientated methods of standardizing care and enhancing the outcomes of the patients are gaining more and more importance in healthcare systems [5].

The management techniques that include protocol-based protocols, the early warning system, and the guideline-based therapies have shown better results in patients presenting with acute respiratory distress. Early detection and early institution of favorable respiratory support has been indicated to lessen the necessity to use invasive ventilation, decrease hospitalization, and cut down mortality rates. These methods also improve consistency of care between providers and settings, which is especially significant in high-volume tertiary emergency departments in which speedy decision-making is a preliminary requirement [6].

Regardless of these developments, ARD is still difficult to manage because of differences in health services and facilities. The presence of the latest diagnostic modalities, respiratory support equipment, and well-trained staff may vary greatly between institutions and areas. Such differences not only affect management strategies selection but also have an impact on patient outcomes. Clinicians frequently use clinical judgment and simple supportive care in resource-restricted environments, which makes the local applicability of management protocols an essential priority of context-specific research to support locally applicable care recommendations [7].

Tertiary emergency departments which have a lot of diagnostic and therapeutic facilities are necessary in the treatment of severe cases of acute respiratory distress. But even under these conditions, results may vary depending on patient characteristics, disease severity and the practices of the institutions. The entire analysis of the clinical pattern, treatment procedures, and outcomes of these environments is indispensable to uncover the gaps in treatment, enhancement of resource use, and patient survival and recovery. The training, policymaking, and emergency care planning can also be informed by understanding these factors.

Since ARD is becoming a rising burden and has a serious implication on patient outcomes and healthcare systems, there is an urgent need to conduct institution-specific studies. Assessment of clinical profiles, treatment modalities, and outcomes in an emergency department environment with a high level of tertiary care can give essential information on the practice patterns and their efficiency in the real world. This kind of evidence is essential in optimizing emergency care procedures, enhancing early intervention measures, and eventually improving quality of care to patients who present with acute respiratory distress.

Thus, the current study will seek to compare clinical characteristics, treatment approaches, and outcomes within patients with acute respiratory distress in an emergency department with the highest level of expertise in the context of improving the emergency treatment process in critical patients.

Methodology

Study Design: This study was a retrospective cross-sectional observational study conducted to evaluate the clinical profiles, management strategies, and outcomes of patients presenting with acute respiratory distress (ARD) in a tertiary care emergency department.

Study Area: The study was carried out in the Department of Medicine, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, India

Study Duration: The study was conducted over a period of 12 months, from January 2024 to December 2024.

Sample Size: A total of 118 patients were included in the study.

Study Population: The study population consisted of adult patients (≥18 years) who presented to the emergency department with features suggestive of acute respiratory distress during the study period.

Data Collection: Data collection was carried out retrospectively using electronic health records and emergency department case files of patients who presented with acute respiratory distress during the study period. A structured data collection proforma was used to systematically extract relevant information, including demographic details, clinical presentation, vital parameters at admission, underlying comorbidities, laboratory and radiological findings, etiology of acute respiratory distress, treatment modalities administered in the emergency department, and patient outcomes. To ensure data accuracy and consistency, records were reviewed thoroughly, and incomplete or missing data entries were excluded. All patient identifiers were removed prior to analysis to maintain confidentiality.

Inclusion Criteria

- Patients aged 18 years and above
- Patients presenting to the emergency department with symptoms of acute respiratory distress, such as:
    - Acute dyspnea
    - Hypoxemia
    - Respiratory failure

Exclusion Criteria

- Patients aged below 18 years
- Patients with incomplete or missing medical records
- Patients referred from other hospitals with insufficient baseline data

Procedure: All patients presenting with symptoms of acute respiratory distress underwent standard clinical evaluation upon arrival at the emergency department. This included assessment of vital signs, detailed physical examination, and appropriate diagnostic investigations to determine the underlying cause of respiratory distress. Management strategies were initiated as per institutional protocols and included oxygen therapy, non-invasive ventilation, mechanical ventilation, and pharmacological interventions when indicated. Details regarding the type and duration of respiratory support, medications administered, and need for intensive care unit admission were documented. Patient outcomes were monitored until discharge, referral, or death, and these details were recorded for analysis.

Statistical Analysis: The collected data were entered into Microsoft Excel and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) version [XX]. Descriptive statistical methods were employed to summarize demographic characteristics, clinical features, management strategies, and outcomes using means, standard deviations, frequencies, and percentages as appropriate. The chi-square test was used to assess associations between categorical variables, while logistic regression analysis was performed to identify predictors of adverse outcomes among patients with acute respiratory distress. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 describes the clinical profiles of 118 patients presenting with acute respiratory distress. The mean age of the study population was 60.8 ± 14.6 years, with males constituting 66 patients (56%). Common comorbidities included hypertension in 54 patients (46%), chronic obstructive pulmonary disease (COPD) in 38 patients (32%), and heart failure in 29 patients (25%). Among the primary clinical diagnoses, pneumonia was noted in 34 patients (29%), asthma/COPD exacerbation in 27 patients (23%), and pulmonary edema in 22 patients (19%). None of the variables showed a statistically significant association, as reflected by chi-square values with corresponding P values greater than 0.05. Overall, Table 1 indicates that acute respiratory distress predominantly affects older adults with a high burden of comorbid conditions, particularly cardiovascular and chronic respiratory diseases.

Table 1: Clinical Profiles of Patients with Acute Respiratory Distress (n = 118)

Variable	Value	Test of Significance	95% CI	P value
Age (years)	60.8 ± 14.6	–	–	–
Male Gender	66 (56%)	$\chi^2 = 0.18$	47% – 65%	0.67
Hypertension	54 (46%)	$\chi^2 = 0.92$	37% – 55%	0.33
COPD	38 (32%)	$\chi^2 = 0.81$	24% – 41%	0.37
Heart Failure	29 (25%)	$\chi^2 = 0.54$	17% – 33%	0.46
Pneumonia	34 (29%)	$\chi^2 = 1.64$	21% – 37%	0.2
Asthma/COPD Exacerbation	27 (23%)	$\chi^2 = 0.77$	15% – 31%	0.38
Pulmonary Edema	22 (19%)	$\chi^2 = 0.63$	12% – 26%	0.43

Table 2 summarizes the demographic characteristics and comorbidities of 118 patients presenting with acute respiratory distress. The mean age of the patients was 60.8 ± 14.6 years, with males comprising

66 patients (56%). Hypertension was the most common comorbidity, present in 54 patients (46%), followed by diabetes mellitus in 41 patients (35%) and a history of smoking in 36 patients (31%). Chronic kidney disease was observed in 26 patients (22%). None of the assessed variables demonstrated a statistically significant association, as indicated by chi-square values and P values greater than 0.05. Overall, Table 2 highlights that acute respiratory distress predominantly affects older individuals with a substantial burden of cardiovascular and metabolic comorbidities.

Table 2: Demographics and Comorbidities in Patients Presenting with Acute Respiratory Distress (n = 118)

Variable	Value	Test of Significance	95% CI	P value
Mean Age (years)	60.8 ± 14.6	–	–	–
Gender (Male)	66 (56%)	$\chi^2 = 0.18$	47% – 65%	0.67
Hypertension	54 (46%)	$\chi^2 = 0.92$	37% – 55%	0.33
Diabetes Mellitus	41 (35%)	$\chi^2 = 1.18$	26% – 44%	0.28
Smoking History	36 (31%)	$\chi^2 = 0.89$	22% – 40%	0.35
Chronic Kidney Disease	26 (22%)	$\chi^2 = 0.49$	15% – 29%	0.48

Table 3 outlines the treatment modalities used in 118 patients presenting with acute respiratory distress. Non-invasive ventilation was administered to 44 patients (37%), while 31 patients (26%) required mechanical ventilation. Antibiotics were used in the majority of cases, with 74 patients (63%) receiving antimicrobial therapy, and steroids were administered to 49 patients (42%). Vasopressors were required in 28 patients (24%). None of the treatment modalities showed a statistically significant association, as indicated by chi-square values and P values greater than 0.05. Overall, Table 3 reflects a broad utilization of respiratory support and adjunctive therapies in the management of acute respiratory distress.

Table 3: Treatment Modalities for Patients with Acute Respiratory Distress (n = 118)

Variable	Value	Test of Significance	95% CI	P value
Non-invasive Ventilation	44 (37%)	$\chi^2 = 2.05$	28% – 46%	0.15
Mechanical Ventilation	31 (26%)	$\chi^2 = 1.62$	18% – 34%	0.2
Antibiotics Use	74 (63%)	$\chi^2 = 2.71$	54% – 72%	0.1
Steroids Use	49 (42%)	$\chi^2 = 1.06$	33% – 51%	0.3
Vasopressors Use	28 (24%)	$\chi^2 = 0.58$	16% – 32%	0.45

Table 4 presents the outcomes of management in 118 patients with acute respiratory distress (ARD). A majority of patients, 96 (81%), required hospitalization, while 30 patients (25%) needed intensive care unit admission. In-hospital mortality was observed in 14 patients (12%). The mean duration of hospital stay was 7.9 ± 4.3 days. None of the outcome variables showed a statistically significant association, as reflected by P values greater than 0.05. Overall, Table 4 indicates that ARD was associated with substantial healthcare utilization, including high hospitalization and ICU admission rates, with moderate in-hospital mortality.

Table 4: Outcomes of ARD Management (n = 118)

Variable	Value	Test of Significance	95% CI	P value
Hospitalization Rate	96 (81%)	$\chi^2 = 3.42$	73% – 89%	0.07
ICU Admission	30 (25%)	$\chi^2 = 1.72$	17% – 33%	0.19
In-hospital Mortality	14 (12%)	$\chi^2 = 1.31$	6% – 18%	0.25
Duration of Hospital Stay (days)	7.9 ± 4.3	–	–	–

Discussion

The current research assessed the clinical cases, treatment options, and outcomes of patients coming to a tertiary emergency unit with acute respiratory distress (ARD) and its findings showed that ARD is more likely to affect older adults with multiple comorbidities. The overall age of 60.8 years in our sample is rather close to the results of previous epidemiological research, which showed that ARD and acute respiratory failure are more frequent in older patients (older than 5560 years old) (Riviello et al., 2016) [8]. Older age has always been linked with a decreased physiological reserve, increased chronic disease infections, and adverse outcomes in acute respiratory disorders, which is probably why our study has a high rate of hospital and ICU admission."

There was a minor male dominance (56) but it was not significant. Other studies on ARD and ARDS also report similar male predominance explaining it

by their exposure to risk factors including smoking and workplace hazards in men (Wilson & Calfee, 2020) [9]. Nonetheless, recent findings have indicated minimal gender differences and thus it can be suggested that sex itself may not be a powerful independent predictor of ARD results and consequently by our results there are no significant gender-based differences.

In our population, comorbidities were at the center of the ARD clinical presentation. The most common comorbidity (46%), was hypertension, followed by diabetes mellitus (35%), COPD (32%), heart failure (25%), and chronic kidney disease (22%). These results correspond to previous research indicating that cardiovascular, metabolic, and chronic respiratory disease burden among patients with acute respiratory compromise is high (McAuley et al., 2014) [10]. Co-occurring hypertension and diabetes are probably associated with the aging population and is likely a cause of endothelial dysfunction and systemic inflammation, which puts the patients at risk of progressing to a more severe respiratory decompensation. Even though not statistically significant, the grouping of these comorbidities has shown the multi-functoriality of ARD presentations in the emergency department.

A large number of our study cases fell within the COPD and asthma/COPD exacerbation categories, which validates their significance as underlying and precipitating factors of ARD. Al Deeb et al. (2014) [11] have also presented similar prevalence rates of COPD but have also indicated that chronic lung disease is a major risk factor that leads to acute respiratory deterioration that necessitates emergency treatment. Another significant cause was pneumonia, which was detected in 29% of our patients, which is in line with the global data that identified pneumonia as one of the causes of acute respiratory failure and ARDS (Staub et al., 2019) [12]. The fact that infectious, cardiac, and obstructive etiologies overlap in our group of patients shows the complexity of diagnosis and treatment of the emergency doctor.

Our study also had management strategies that were in line with the current evidence-based practice in ARD. The non-invasive ventilation (NIV) was applied in 37 percent of the patients, which means that it can be considered a first-line supportive treatment of the moderate respiratory patients. This utilization rate is consistent with the ERS/ATS recommendations that suggest the use of NIV to treat acute hypercapnic respiratory failure and chosen hypoxemic conditions to decrease the prevalence of intubation (Rochwerg et al., 2017) [13] provides the recommended utilization rates for NIV. The need in mechanical ventilation was 26% versus 26% previously reported cases based on emergency department and ICU-based studies, indicating that a considerable number of patients arrive or develop severe respiratory failure despite initial care (Riviello et al., 2016) [8].

The usage of antibiotics in our cohort (63.7-63.8) is in accordance with the significant rate of pneumonia and presumed infectious pathogenesis. The practice is informed by the available literature that focuses on early antimicrobial therapy when acute respiratory presentation is observed to enhance the outcomes, especially when the infection cannot be excluded at the presentation (Staub et al., 2019) [12]. The use of steroid therapy (42 percent of patients) was probably prompted by COPD and asthma attacks, along with inflammatory lung complications. The same trends have been cited in previous research, even though the influence of steroids in non-obstructive ARD is controversial (McAuley et al., 2014) [10]. The application of vasopressor to almost a quarter of patients represents the prevalence of the related hemodynamic instability, which is commonly secondary to sepsis or cardiogenic shock, and is comparable to other tertiary care emergency departments (Wilson and Calfee, 2020) [9].

Our study outcome measures also further highlight ARD severity. The hospitalization rate of 81 is similar to the one observed by Caputo et al. (2020) [14] and indicates that a majority of ARD cases have to be treated inpatient. The patient required ICU admission in 25 percent of cases, which is not inferior to the international statistics that one-fourth to one-third of patients with ARD require critical care assistance (Riviello et al., 2016) [8]. Our in-hospital mortality rate of 12% in our cohort falls within the lower mortality rates which are reported to be between 10 and 40 percent based on the severity and comorbidity of the disease (Wilson and Calfee, 2020) [9]. This fairly intermediate mortality could be indicative of the timely emergency interventions and non-invasive approach to the correct patients.

The average eight days in the hospital that we have found are comparable to the results of the other studies and probably indicate a complexity of the disease, comorbid conditions, and the effectiveness of treatment (Staub et al., 2019) [12]. In general, we largely find the results of the current literature and support the idea that ARD in the emergency department is a heterogeneous disease with high morbidity and mortality. The fact that our findings are similar to the previous studies is confirmation of our findings whereas slight differences in prevalence and the outcomes could be explained by the fact that the patient demographics, healthcare resources, and local practice patterns differ.

Conclusion

In this paper, the issue of acute respiratory distress that is reported to a tertiary emergency has been noted to impact mainly the elderly with a significant number of comorbid conditions, especially cardiovascular and chronic respiratory diseases.

Aetiologies of infectious and cardiopulmonary origin became typical, which highlights the variability in clinical manifestations. The approach of management was mostly supportive and the ventilatory support, pharmacological therapy, and the hemodynamic stabilization based on the severity of the disease were mostly used. The acute and potentially life-threatening character of the condition was demonstrated by the fact that the majority of patients had to be admitted to hospitals, and a considerable number of them had to be provided with intensive care. However, the overall results were satisfactory, which proves that the early identification, the proper emergency treatment, and the intensifying treatment in a tertiary facility are important factors that can positively impact patient outcomes.

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