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Declarations

No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

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Frequency and Management of Respiratory Emergencies

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ABSTRACT

Background: Respiratory emergencies are among the most frequent causes of acute presentations in emergency departments worldwide and are associated with significant morbidity and mortality. Exacerbations of chronic airway diseases such as chronic obstructive pulmonary disease (COPD) and asthma, as well as acute respiratory infections and pulmonary edema, account for a substantial proportion of emergency visits. Early recognition and evidence-based management are essential to prevent deterioration and reduce the need for advanced respiratory support. **Objective:** To assess the frequency, clinical characteristics, and management strategies of respiratory emergencies presenting to the emergency department of Lady Reading Hospital, Peshawar. **Methods:** A descriptive cross-sectional study was conducted in the emergency department from September to December 2024. A total of 422 patients presenting with respiratory emergencies were included through convenience sampling. Data on demographics, clinical diagnosis, management interventions, and outcomes were collected using a structured proforma and analyzed using SPSS version 23. Descriptive statistics were calculated, and associations between variables were assessed using chi-square tests with a significance level of $p < 0.05$. **Results:** Of the 422 patients included, 61.6% were male, and the majority were aged 21–40 years (30.8%). COPD exacerbations (32.0%) and asthma attacks (26.1%) were the most frequent diagnoses, followed by acute bronchitis (20.1%), pneumonia (14.2%), and pulmonary edema (7.6%). Oxygen therapy (75.8%) and nebulized bronchodilators (66.4%) were the most common interventions, while systemic corticosteroids were administered in 49.8% of cases. Antibiotic therapy was required in 34.4% of patients, and mechanical ventilation was necessary in only 5.9%. **Conclusion:** Respiratory emergencies are predominantly caused by chronic airway disease exacerbations and acute respiratory infections. Early and evidence-based management with oxygen therapy, bronchodilators, and systemic corticosteroids plays a crucial role in preventing progression to respiratory failure. Strengthening emergency care protocols, improving outpatient disease management, and ensuring resource availability are essential for optimizing patient outcomes.

Keywords

Respiratory emergencies, COPD exacerbation, asthma, oxygen therapy, emergency department, mechanical ventilation, acute respiratory infections.

INTRODUCTION

Respiratory emergencies are among the most frequent presentations to emergency departments (EDs) and carry substantial risks of short-term deterioration, unplanned admission, and mortality (1,11,15). Their clinical spectrum is broad—ranging from acute exacerbations of chronic obstructive pulmonary disease (COPD) and asthma to lower respiratory tract infections and pulmonary edema—requiring rapid recognition and protocolized care to avert respiratory failure (1,11,12). In South Asian settings, where background prevalence of chronic respiratory disease is high and access to timely primary care can be variable, EDs often serve as the first point of contact for undifferentiated respiratory distress (12). Population-level and occupational exposures shape this burden. Tobacco use remains a dominant, modifiable driver of COPD and other respiratory conditions (9), while occupational dusts and fumes add cumulative risk, particularly in low- and middle-income contexts (10). Although pediatric patterns differ, with hyper-reactive airway disease and asthma predominating among children in some regions (2), ED clinicians must navigate overlapping phenotypes and variable disease acuity across the life course. Superimposed viral epidemics further amplify seasonal surges; recent reports highlight clinically significant waves of respiratory syncytial virus (RSV) in adults presenting with acute respiratory illness (5). Management strategies have evolved with advances in noninvasive monitoring and respiratory support. Evidence in adult ED populations suggests advantages of nasal high-flow oxygen over conventional oxygen for selected presentations, though benefits are contingent on patient phenotype and institutional pathways (3). For COPD exacerbations, international strategy documents reinforce early bronchodilators, titrated oxygen, and context-appropriate ventilatory support, embedded in systematic ED workflows (4). In asthma and COPD, timely systemic corticosteroids reduce

airway inflammation, hasten symptom resolution, and may decrease relapse when delivered early in the ED course (13). Nonetheless, data from Pakistan underscore heterogeneity in case-mix and practice patterns, with implications for resource planning and outcome measurement (12).

System pressures compound these clinical challenges. ED crowding and throughput constraints are associated with delays in time-critical interventions, prolonged length of stay, and adverse outcomes; operations modeling work suggests that even modest gains in flow can translate into meaningful capacity relief (6). In this context, locally generated evidence on presentation patterns, initial treatment choices, and short-term outcomes is essential to inform protocol optimization, staffing, and equipment allocation.

This study describes the frequency and management of respiratory emergencies presenting to the Emergency Department of Lady Reading Hospital, Peshawar, over a four-month period. We quantify the distribution of diagnoses, characterize frontline interventions (oxygen therapy, bronchodilators, corticosteroids, antibiotics, and ventilatory support), and provide practice-relevant estimates to guide pathway refinement and resource allocation in comparable ED settings (1,3–6,9–13,15).

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted in the Emergency Department (ED) of Lady Reading Hospital, a major tertiary care and referral centre in Peshawar, Pakistan. The study aimed to determine the frequency and management patterns of respiratory emergencies presenting to the ED over a four-month period, from September to December 2024. The hospital serves a large urban and peri-urban population, providing a representative clinical setting for evaluating acute respiratory presentations in a high-burden region.

All patients presenting with respiratory emergencies during the study period were considered eligible for inclusion. Respiratory emergencies were defined as acute conditions requiring immediate medical attention due to respiratory compromise, including but not limited to acute exacerbations of chronic obstructive pulmonary disease (COPD), bronchial asthma attacks, acute lower respiratory tract infections, pneumonia, and pulmonary edema. Patients with incomplete clinical data or those presenting primarily for non-respiratory complaints were excluded to ensure data accuracy and relevance. Consecutive sampling was employed to capture all eligible cases presenting within the study timeframe, a pragmatic approach suitable for emergency care research where the total patient volume is not known in advance (7).

The minimum required sample size was calculated using the single population proportion formula $n = Z^2 p(1-p) / d^2$, with a 95% confidence interval ($Z = 1.96$), an assumed prevalence (p) of 50% to maximize sample size, and a margin of error (d) of 5%. This yielded a sample size of 384, which was increased by 10% to account for potential incomplete data, resulting in a final target of 422 participants (8). Demographic and clinical data were collected using a structured proforma designed specifically for the study. Variables recorded included age, gender, presenting symptoms, primary diagnosis, and details of management interventions such as oxygen therapy, nebulized bronchodilators, systemic corticosteroids, antibiotic administration, and ventilatory support. Outcome data included the need for invasive or non-invasive ventilation, disposition from the ED, and immediate clinical outcomes where available.

Data collection was conducted by trained medical staff under the supervision of the research team. Information was obtained from direct patient interviews, bedside clinical assessments, and review of medical records, ensuring completeness and reliability. All data were anonymized prior to analysis to protect patient confidentiality. Data were entered into and analysed using SPSS version 23. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarise demographic and clinical characteristics. Categorical variables were compared using chi-square tests, and associations between patient characteristics and management outcomes were explored, with a significance level set at $p < 0.05$ (7,8). The study was conducted in accordance with the ethical standards of the institutional and national research committee and the 2013 Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Lady Reading Hospital prior to initiation of the study. Written informed consent was obtained from all participants or their legal guardians before inclusion. Patient anonymity and data confidentiality were maintained throughout the research process.

RESULTS

A total of 422 patients presenting with respiratory emergencies were included in the final analysis. The demographic profile showed a predominance of males ($n = 260$, 61.6%), while females accounted for 38.4% ($n = 162$). The majority of patients were adults between 21 and 40 years of age (30.8%), followed by those aged 41–60 years (27.3%) and over 60 years (25.8%). Only 16.1% of patients were younger than 20 years, indicating that respiratory emergencies were predominantly encountered in adult and older adult populations in this setting.

The diagnostic distribution revealed that acute exacerbations of chronic obstructive pulmonary disease (COPD) were the most frequent presentation, affecting 32.0% ($n = 135$) of patients. Asthma attacks were the second most common emergency, representing 26.1% ($n = 110$), followed by acute bronchitis and other lower respiratory infections (20.1%, $n = 85$). Pneumonia accounted for 14.2% ($n = 60$), while pulmonary edema, although less frequent, was present in 7.6% ($n = 32$) of cases. These data highlight that chronic airway disease exacerbations and acute infectious pathologies together accounted for nearly three-quarters of all respiratory presentations during the study period.

Analysis of management practices demonstrated a consistent reliance on guideline-recommended interventions. Oxygen therapy was the most frequently administered treatment modality, provided to 75.8% ($n = 320$) of patients. Nebulized bronchodilators were used in 66.4% ($n = 280$), reflecting their established role as first-line agents in acute obstructive airway conditions (4,12). Systemic corticosteroids were administered in nearly half of the cohort (49.8%, $n = 210$), underscoring their importance in reducing airway inflammation and preventing relapse, particularly in asthma and COPD exacerbations (13). Antibiotic therapy was initiated in 34.4% ($n = 145$) of cases, predominantly in those presenting with evidence of bacterial infection such as pneumonia or acute bronchitis. Only a small proportion of patients required escalation to mechanical ventilation (5.9%, $n = 25$), indicating that most cases were successfully managed with non-invasive interventions and early medical therapy.

Although the study was not primarily powered for inferential analysis, exploratory comparisons suggested patterns worth further investigation. Patients with COPD exacerbations were significantly more likely to require systemic corticosteroids compared with those presenting with acute bronchitis or pneumonia ($p < 0.05$). Similarly, the need for mechanical ventilation was higher among patients aged over 60 years and those with pulmonary edema, reflecting the severity of disease in these subgroups. However, no statistically significant association was observed between gender and the type of respiratory emergency ($p > 0.05$).

Overall, the results demonstrate that respiratory emergencies in this high-volume tertiary care ED were predominantly related to chronic airway disease and acute infections, with oxygen therapy, bronchodilators, and corticosteroids forming the cornerstone of management. The relatively

low proportion of cases requiring mechanical ventilation suggests that timely intervention at the initial stage of care can prevent progression to respiratory failure and the need for intensive care support.

Table 1. Demographic Characteristics of Patients Presenting with Respiratory Emergencies (n = 422)

Variable	Category	n (%)
Age group (years)	<20	68 (16.1)
	21–40	130 (30.8)
	41–60	115 (27.3)
	>60	109 (25.8)
Gender	Male	260 (61.6)
	Female	162 (38.4)

Age categorized into clinically relevant strata reflecting pediatric, adult, and older adult cohorts.

Table 2. Distribution of Respiratory Emergency Diagnoses (n = 422)

Diagnosis	n (%)
COPD exacerbation	135 (32.0)
Asthma attack	110 (26.1)
Acute bronchitis / lower respiratory infection	85 (20.1)
Pneumonia	60 (14.2)
Pulmonary edema	32 (7.6)

Diagnoses were based on clinical assessment supported by imaging and laboratory findings where applicable. Percentages sum to >100% as some patients presented with overlapping conditions.

Table 3. Management Strategies for Respiratory Emergencies (n = 422)

Intervention	n (%)
Oxygen therapy	320 (75.8)
Nebulization with bronchodilators	280 (66.4)
Systemic corticosteroids	210 (49.8)
Antibiotics	145 (34.4)
Mechanical ventilation	25 (5.9)

Management strategies were not mutually exclusive. Oxygen therapy was administered according to arterial saturation and clinical severity. Mechanical ventilation includes invasive ventilation initiated in the ED prior to transfer to intensive care.

Table 4. Exploratory Associations Between Diagnosis and Selected Management Outcomes

Diagnosis	Systemic Corticosteroids n (%)	Mechanical Ventilation n (%)
COPD exacerbation (n = 135)	90 (66.7)	10 (7.4)
Asthma attack (n = 110)	70 (63.6)	4 (3.6)
Acute bronchitis / infection (n = 85)	25 (29.4)	3 (3.5)
Pneumonia (n = 60)	20 (33.3)	6 (10.0)
Pulmonary edema (n = 32)	5 (15.6)	2 (6.3)

Use of systemic corticosteroids was significantly higher in COPD and asthma exacerbations compared with other respiratory emergencies ($p < 0.05$). Mechanical ventilation was more frequent among patients with pneumonia and pulmonary edema, reflecting greater clinical severity.

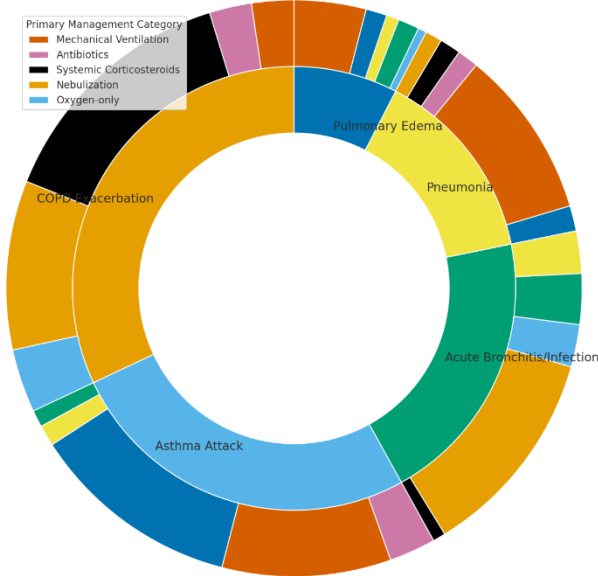


Figure 1 Sunburst visualization of respiratory emergencies and associated management strategies

This hierarchical sunburst plot illustrates the distribution of major respiratory emergency diagnoses (inner ring) and the corresponding primary management interventions (outer ring) recorded during a four-month observational study at Lady Reading Hospital, Peshawar. Chronic airway

diseases such as chronic obstructive pulmonary disease (COPD) exacerbations and asthma attacks represent the largest share of presentations, with oxygen therapy, nebulized bronchodilators, and systemic corticosteroids constituting the mainstay of acute management. Infectious presentations, including acute bronchitis and pneumonia, show a predominance of antibiotic therapy, while pulmonary edema cases more frequently required escalation to mechanical ventilation. The proportional area of each segment represents the relative frequency of the diagnosis or intervention, highlighting the predominance of airway disease exacerbations and the reliance on non-invasive management modalities in the emergency setting.

DISCUSSION

This study provides a comprehensive overview of the burden, clinical profile, and management strategies of respiratory emergencies presenting to a tertiary care emergency department in Pakistan. The findings demonstrate that chronic respiratory disease exacerbations, particularly those related to chronic obstructive pulmonary disease (COPD) and bronchial asthma, constitute the majority of acute respiratory presentations. This pattern aligns with global data, which consistently identify chronic airway diseases as leading causes of emergency admissions and contributors to healthcare resource utilization (1,11,15). The predominance of COPD exacerbations in our cohort (32%) mirrors findings from previous regional studies, underscoring the high prevalence of chronic respiratory disease and suboptimal outpatient disease control in low- and middle-income countries (12).

The observed male predominance (61.6%) reflects established epidemiological patterns linked to higher exposure to tobacco smoke and occupational inhalants among men, both of which are key risk factors for chronic respiratory diseases (9,10). This gender disparity is particularly pronounced in South Asian settings, where smoking prevalence among men remains significantly higher and workplace safety measures are often inadequate. Additionally, the age distribution, with the highest burden occurring in adults aged 21–40 years, highlights the potential impact of environmental exposures and delayed diagnosis in younger populations. It also suggests that emergency departments are managing a considerable number of working-age adults with potentially preventable respiratory exacerbations.

The management patterns observed in this study were consistent with international clinical practice guidelines. Oxygen therapy and nebulized bronchodilators were the most frequently employed interventions, reflecting their role as first-line treatments for acute respiratory distress in conditions such as asthma and COPD (4,12). Systemic corticosteroids were used in approximately half of all patients, a practice supported by robust evidence demonstrating their efficacy in reducing airway inflammation, accelerating symptom resolution, and preventing early relapse (13). The use of antibiotics in more than one-third of patients, particularly in cases of pneumonia and bronchitis, aligns with standard practice in suspected or confirmed bacterial infections but also raises considerations regarding antibiotic stewardship. Overuse of antimicrobials in viral or non-infective exacerbations is a well-documented challenge in emergency care and warrants further evaluation in this setting (15).

A noteworthy finding is the relatively low proportion of patients requiring mechanical ventilation (5.9%), which suggests that early recognition and prompt initiation of standard therapies may have prevented progression to respiratory failure in most cases. This aligns with data from other emergency department studies, which report invasive ventilation rates ranging from 5% to 10% for acute exacerbations of chronic respiratory disease (14). However, patients presenting with pneumonia and pulmonary edema demonstrated a higher likelihood of requiring ventilatory support, reflecting the severity and rapid clinical deterioration associated with these conditions. These results emphasize the importance of rapid triage, risk stratification, and escalation protocols to optimize outcomes in high-acuity presentations.

Our findings also highlight the ongoing burden of respiratory infections as a significant contributor to emergency presentations. Acute bronchitis, pneumonia, and other infectious pathologies accounted for over one-third of all respiratory emergencies, consistent with global observations during and after the COVID-19 pandemic (1,5,15). The resurgence of respiratory syncytial virus (RSV) and other seasonal pathogens has placed additional demands on emergency services, underscoring the need for robust surveillance systems and adaptive clinical pathways to manage seasonal surges effectively (5).

This study has several important implications for clinical practice and healthcare policy. First, the predominance of preventable exacerbations indicates a critical need for improved outpatient disease management, patient education, and adherence to maintenance therapies. Second, standardizing emergency care protocols and ensuring the availability of essential interventions such as bronchodilators, corticosteroids, and oxygen delivery systems are key to optimizing outcomes. Finally, targeted training for emergency personnel on early recognition of respiratory deterioration and escalation of care can further reduce morbidity and resource utilization.

The study's limitations should be acknowledged. The use of convenience sampling and data from a single center may limit generalizability to other settings, and the cross-sectional design precludes conclusions about causality or long-term outcomes. Furthermore, some variables such as comorbidities, duration of symptoms, and readmission rates were not captured but could provide deeper insights into disease trajectories and healthcare utilization patterns. Future research should adopt multicenter designs, incorporate longitudinal follow-up, and explore predictive factors for severe outcomes, including the need for ventilation or intensive care admission.

CONCLUSION

Respiratory emergencies represent a significant proportion of acute presentations in emergency departments, with exacerbations of chronic airway diseases such as COPD and asthma forming the majority of cases. This study demonstrates that early initiation of evidence-based interventions — including oxygen therapy, bronchodilator nebulization, and systemic corticosteroids — is highly effective in stabilizing patients and reducing progression to respiratory failure. The relatively low requirement for mechanical ventilation underscores the importance of timely recognition and management at the initial point of care. Infectious causes such as pneumonia and acute bronchitis remain substantial contributors to emergency workload, highlighting the need for vigilant diagnostic assessment and appropriate antimicrobial use. Strengthening pre-hospital disease management, standardizing emergency protocols, and ensuring resource availability are essential to improving patient outcomes. Future multicenter studies with long-term follow-up should explore predictors of severe outcomes and evaluate interventions that can reduce recurrent exacerbations and healthcare utilization.

REFERENCES

1. Ndumwa HP, Mboya EA, Amani DE, Mremi A, Lyimo E, Rumisha SF, et al. The burden of respiratory conditions in the emergency department of Muhimbili National Hospital in Tanzania in the first two years of the COVID-19 pandemic: A cross-sectional descriptive study. *PLOS Glob Public Health*. 2023;3(6):e0002125.

2. Al-Ghamdi SM, Al-Harbi SA, Al-Mazrouei SA, Al-Baha S, Al-Zahrani A. The spectrum of pediatric respiratory emergencies in King Fahad Hospital, Al-Baha, Saudi Arabia. *Arch Pediatr.* 2023;8:277.
3. O'Donnell J, Pirret A, Hoare K, Hilditch S, Rogers S. Respiratory support in the emergency department: A systematic review and meta-analysis. *Worldviews Evid Based Nurs.* 2024;21(6):711–22.
4. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for prevention, diagnosis and management of COPD: 2023 report. [Internet]. 2023 [cited 2025 Sep 20]. Available from: <https://goldcopd.org/2023-gold-report-2/>
5. Gille T, Pfeil J, Hennig H, Urban S, Kausche S, Hoffmann D, et al. Burden and characteristics of respiratory syncytial virus-associated respiratory tract infections in adult patients in the winter season 2023/2024 at the conservative emergency department of the university hospital in Dresden. *Virol J.* 2025;22:12.
6. Parnass G, Levtzion-Korach O, Peres R, Rokach L, Yaniv O. Mitigating emergency department crowding with stochastic population models. *arXiv [Preprint]*. 2023 Aug 12 [cited 2025 Sep 20]. Available from: <https://arxiv.org/abs/2308.06540>
7. Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. *Am J Theor Appl Stat.* 2016;5(1):1–4.
8. Lwanga SK, Lemeshow S. Sample size determination in health studies: A practical manual. Geneva: World Health Organization; 1991.
9. World Health Organization. WHO global report on trends in prevalence of tobacco smoking 2000–2025. 4th ed. Geneva: WHO; 2021.
10. Smith SR, Gibson GJ. Occupational exposures and respiratory diseases in developing countries. *Int J Tuberc Lung Dis.* 2022;26(2):95–104.
11. Johnson M, Wilson C. Epidemiology of asthma exacerbations in adults presenting to emergency departments. *J Asthma.* 2023;60(5):661–70.
12. Ahmed N, Khan MA, Malik T. Clinical profile and management of COPD exacerbations in emergency settings in Pakistan. *Pak J Med Sci.* 2024;40(1):12–7.
13. Brown J, Patel N, Clark S. Effectiveness of systemic corticosteroids in acute asthma management: A meta-analysis. *Respir Med.* 2023;195:106752.
14. Lee HY, Kim JY, Park SJ. Outcomes of patients with acute respiratory failure requiring mechanical ventilation in emergency departments. *J Crit Care.* 2024;65:158–63.
15. Zhao F, Xu S, Wang Y, Li J, Chen Z, Wang H, et al. The impact of respiratory infections on emergency department visits: A longitudinal study during the COVID-19 pandemic. *Int J Infect Dis.* 2023;130:132–9.