ORIGINAL ARTICLE

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Evaluation of shortness of breath presenting to emergency department of a tertiary care centre

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Abstract

Introduction: Dyspnea, or shortness of breath (SOB), is a common reason for emergency department (ED) visits and is linked with significant morbidity. This study aimed to determine the current prevalence, time of presentation, and common provisional diagnoses of patients presenting with dyspnea at a tertiary care hospital in Nepal.

Method: A descriptive cross-sectional study was conducted in the Emergency Department of Tribhuvan University Teaching Hospital, Kathmandu, from Jan to Mar 2024. The study population comprised all emergency department visits during this period (N = 11,260). Using systematic random sampling, every 22nd patient record from all ED admissions was reviewed to reach the calculated sample size of 499. Data on demographics, time of arrival, provisional diagnosis, and disposition were analyzed descriptively.

Result: Out of 499 patients, 103 (20.64%; 95% CI: 17.07–24.19) presented with shortness of breath. The median age was 38 years (IQR: 30.5 years); 65(63.11%) were female. Most younger patients arrived in the morning, while older patients presented in the evening. Chronic obstructive pulmonary disease 25(24.27%) and bronchial asthma 24(23.30%) were the most common provisional diagnoses, followed by pneumonia and anxiety. A clear temporal pattern of presentation was noted for certain conditions, such as asthma peaking in the early morning.

Conclusion: This research shows that a growing number of emergency department visits are due to dyspnea. This condition affects a younger age group and has a noticeable gender gap, likely caused by indoor air pollution and chronic respiratory illnesses.

Keywords: Dyspnea, Emergency, Nepal, Shortness of Breath

INTRODUCTION

Dyspnea, or shortness of breath, is a prevalent symptom leading to emergency department (ED) visits worldwide. Shortness of breath includes diverse breathing-related sensations such as air hunger, chest tightness, and increased effort, with perception varying based on underlying disease and patient factors. It is a common reason for emergency department. (ED) visits across cardiorespiratory, infectious, and oncologic conditions. The severity on arrival is associated with hospital admission, longer ED stay, and increased mortality.[1] The common age group for shortness of breath presenting to emergency was 45 to 64 years (31.6%). Most visits were discharged directly from the ED (57.5%), while 8.1% required admission to an intensive care unit (ICU).[1]

The prevalence of acute-on-chronic breathlessness as a reason to present to the major emergencies area was 20.2% (245/1,212, 95% CI 17.9% to 22.5%). During this period there were 4,692 major and minor presentations; breathlessness was therefore a cause of at least 5.2% (245/4,692, 95% CI 4.6 to 5.9%) of all emergency department presentations.[2] Study from Nepal done in 2019 suggested prevalence of dyspnea in patient visiting emergency to be 8.9% and most of them were in yellow category.[3] With changing environmental context and this study intends to find the present status of patient visiting to emergency with shortness of breath. This study is to provide updated information on the prevalence and pattern of dyspnea among patients visiting the emergency department, which will help in planning and managing emergency care services more effectively. Therefore, this study aims to find the prevalence of dyspnea among patients visiting emergency department along with visiting timing and provisional diagnosis.

METHOD

This study employed a descriptive cross-sectional design and was conducted in the Emergency Department of Tribhuvan University Teaching Hospital, Kathmandu, Nepal, a tertiary care center. The study retrospectively reviewed patient records from the period of January to March 2024, which was considered the total study population of 11,260 patients for this analysis. All records in the given period were included. Incomplete records were excluded. Based on previously published literature, the prevalence of shortness of breath among emergency department presentations was reported as 8.9%.[3] Since the expected prevalence was less than 10%, a margin of error of 2.5% was applied for the sample size calculation. Utilizing an alpha level of 0.05, the calculated minimum sample size required for this study was 499 patients using Cochran's formula.

Given the high volume of patients visiting the emergency department, the total number of emergency visits during the three-month period, amounting to 11,260 patients, was considered as the accessible population. To achieve systematic random sampling, the accessible population was divided by the calculated sample size, yielding a sampling interval of approximately 22.5. Accordingly, every 22nd patient record was selected for inclusion in the study. In instances where the 22nd patient's record was incomplete or missing relevant data, the subsequent patient record (i.e., the 23rd) was chosen, and thereafter sampling continued at every 22nd record.

Data extracted from the patient records included demographic variables (age, gender), time of arrival at the emergency department, presenting symptoms, provisional diagnosis, and disposition status (admission or discharge). The provisional diagnosis was established by the attending emergency physician based on the initial clinical evaluation at presentation.

All collected data were transferred into Microsoft Excel for organization and coding. Data management was performed using Python 3.13.5, with descriptive analysis conducted using the pandas library and data visualization created with matplotlib. Descriptive statistical analyses were used to summarize the characteristics of the study population and relevant variables, including frequencies and percentages for categorical variables and medians with interquartile ranges for continuous variables.

RESULT

A total of 499 patients were enrolled in the study, of whom 200 (40.08%) were male and 299 (59.91%) were female. The median age of the study population was 50 years, with an interquartile range (IQR) of 83 years (Q1–Q3). The majority of patients presented to the emergency department during the afternoon hours (Figure 1).

The prevalence of shortness of breath among the study

Table 1. Distribution of provisional diagnoses among patients presenting with shortness of breath (n=103)

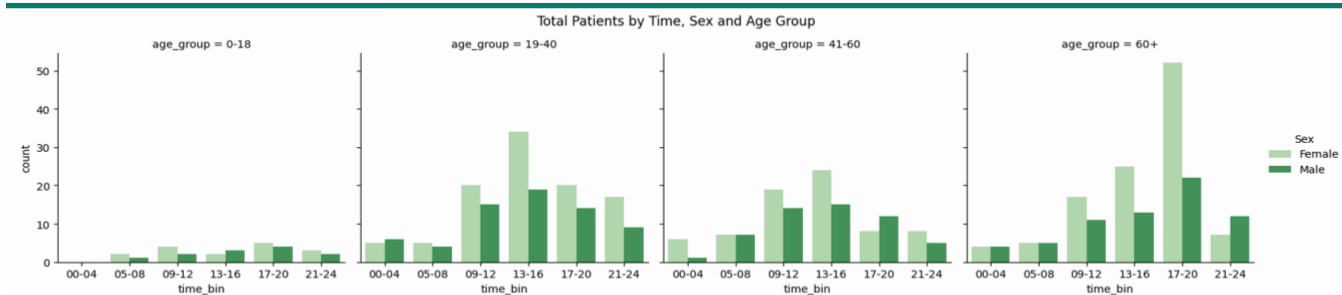| Provisional Diagnosis	ƒ (%)
COPD	25(24.27%)
Bronchial Asthma	24(23.30%)
Pneumonia	12(11.65%)
Anxiety	9(8.73%)
Myocardial infraction	6(5.82%)
Pulmonary Oedema	5(4.85%)
Sepsis	5(4.85%)
Abdominal Trauma	4(3.88%)
Heart Failure	4(3.88%)
Empyema	3(2.91%)
Diabetic Ketoacidosis	3(2.91%)
Pulmonary Embolism	3(2.91%)

Figure 1. Distribution of total patients by time of arrival, sex, and age group in the emergency department is shown in hourly time bins (n=499)
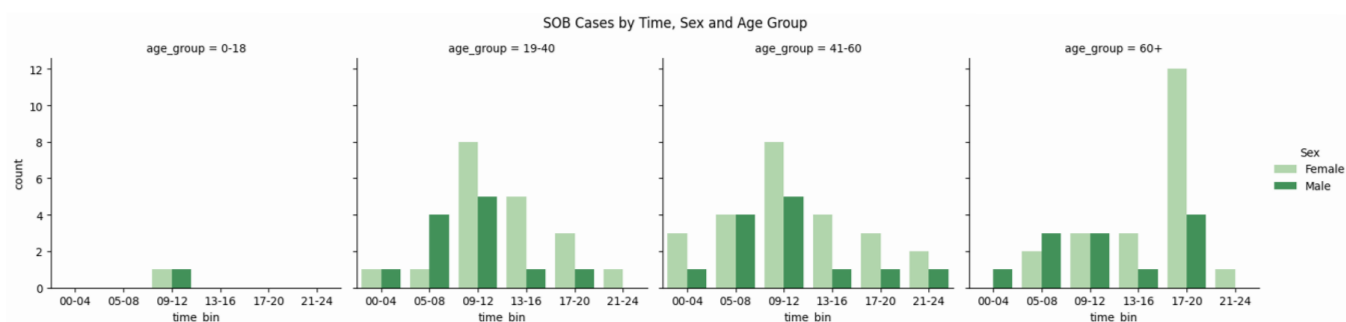

Figure 2. Distribution of patient with shortness of breath by time, gender and age (n=103)
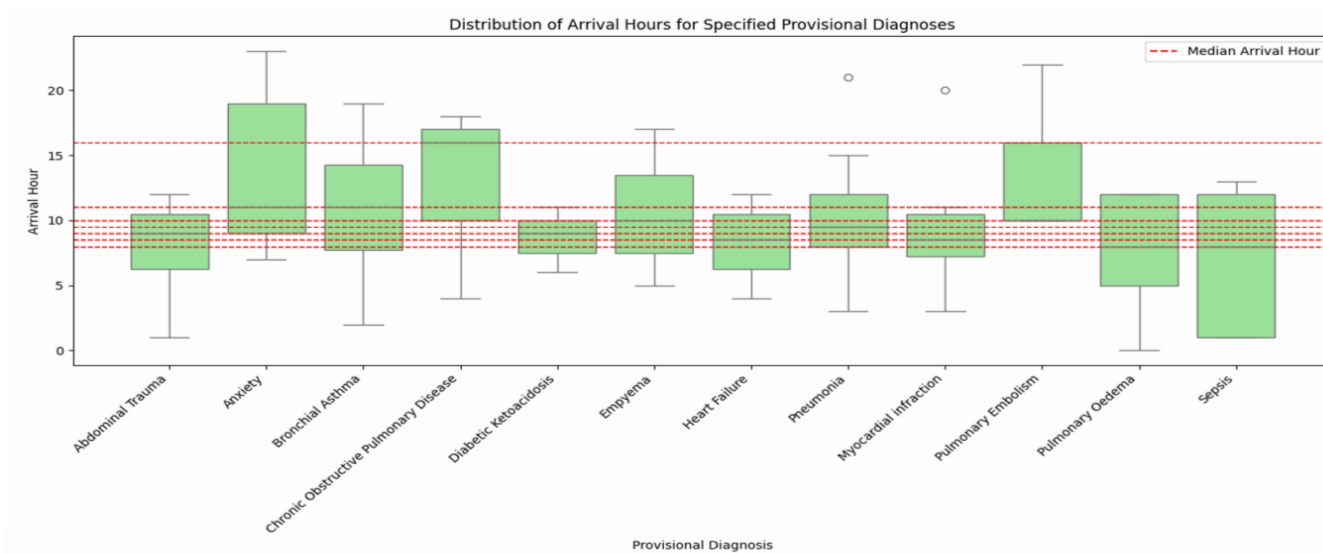

Figure 3. Box plot of arrival hours by provisional diagnosis among patients with shortness of breath (n=103)
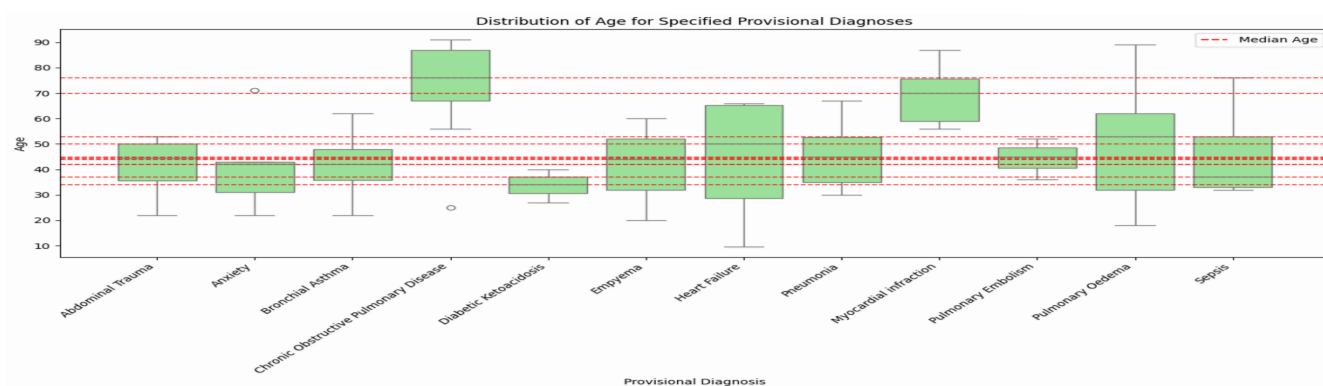

Figure 4. Box plot of age and diagnosis of patient with shortness of breath (n=103)

participants was 103 cases, corresponding to 20.64% (95% Confidence Interval [CI]: 17.07–24.19). Within this subgroup, 38 (36.89%) were male and 65 (63.11%) were female, with a median age of 38 years (IQR: 30.5 years, Q1–Q3). A temporal pattern was observed in patient arrivals: younger patients more frequently presented in the morning hours, whereas elderly patients predominantly arrived in the evening (Figure 2).

Regarding provisional diagnoses in patients presenting with shortness of breath, chronic obstructive pulmonary disease (COPD) accounted for 25(24.27%), followed closely by bronchial asthma at 24(23.30%). Other common diagnoses included pneumonia 12(11.65%) and anxiety disorder 9(8.73%) (Table 1). The timing of presentation varied by diagnosis: most patients with sepsis arrived between late night and early morning hours, while anxiety cases were predominantly seen in the morning.

Two notable outliers were observed among patients with pneumonia and myocardial infarction diagnoses (Figure 3). Additionally, the majority of patients with shortness of breath fell within the 40 to 50-year age group. One outlier was identified in the COPD group and another in the anxiety disorder group (Figure 4).

Time Perspective
There is a pattern in the timing of patient presentations based on the provisional diagnosis. Critical conditions like Pulmonary Oedema, Heart Failure, Myocardial Infarction, and Sepsis tend to present earlier in the day, with median times around 08:15 to 08:53. In contrast, conditions such as Chronic Obstructive Pulmonary Disease and Bronchial Asthma had later median presentation times, around 11:20 to 16:15. This distribution may reflect circadian variations in symptom onset or patient behavior in seeking emergency care, with life-threatening conditions prompting earlier visits (Figure 3)

Age Perspective
The median age of patients presenting with different provisional diagnoses varies significantly. Older patients were more frequently diagnosed with chronic respiratory or cardiovascular conditions—Chronic Obstructive Pulmonary Disease had the highest median age at 76 years, followed by Myocardial Infarction at 70 years and Pulmonary Oedema at 53 years. On the other hand, younger age groups were more commonly associated with acute conditions such as Diabetic Ketoacidosis (median age 34), Sepsis (37), and Anxiety or Bronchial Asthma (both at 42). This suggests a trend where chronic or degenerative diseases are more prevalent among the elderly, whereas acute or stress-related conditions are more frequent in younger adults (Figure 4).

DISCUSSION

This study demonstrated that the prevalence of shortness of breath among ED presentations was (20.644%: 95% CI 17.07-24.19), which is notably higher than the prevalence reported in the previous studies, including 8.9% prevalence observed by Shrestha, et al. in 2019 in Dhulikhel Hospital and 11.3% in the study conducted in South Asia by Bishwajit et al.[3,4] This finding indicates that dyspnea represents a significant and potentially increasing burden in our setting, which may be largely influenced by seasonal variation, as the study was conducted during winter when COPD exacerbations and respiratory symptoms peak.

The prevalence of shortness of breath was 65 (63.11%) females, which is comparable to the study done in Nepal (62.6%) by Shrestha, et al.[3] This could be attributed to factors such as indoor pollution and biomass fuel exposure, which is seen higher in women.[5] They are more frequently exposed to indoor smoke, yet their condition often goes unrecognized and untreated, making them more susceptible to respiratory failure when faced with a respiratory infection.[6]

The median age of patients with shortness of breath in this study was 38 years (IQR: 30.5 years), significantly younger than that of patients in other similar studies. The previous research conducted in Nepal found that the median age of patients with dyspnea was 64 years (IQR: 54–73), while studies conducted in Asia-Pacific found that the median age was 67 years (IQR: 49–80).[3,7]

The high prevalence of indoor air pollution and communicable respiratory diseases among Nepal's younger adults may be the cause of this lower median age. The age distribution of patients presenting with dyspnea may also have been impacted by local demographics and healthcare-seeking behavior.

There was a clear temporal trend based on our study where younger patients were likely to seek healthcare in the morning hours while elderly patients predominantly presented in the evening. This could be related to the dynamics of family support, activity levels, and symptom perception in cases like bronchial asthma where patients present with dyspnea in the early morning.[8]

The most common provisional diagnosis among patients presenting with shortness of breath was chronic obstructive pulmonary disease (COPD), accounting for 25 cases (24.2%). The majority of these patients presented to the emergency department between 10:00 AM and 6:00 PM, with a median presentation time of 4:00 PM. Notably, there was an outlier in this cohort—a young patient aged 28 years who was provisionally diagnosed with COPD. Such an early onset of COPD may be attributable to sequelae of prior pulmonary tuberculosis or underlying primary ciliary dysfunction. However, the possibility of misdiagnosis in this case cannot be ruled out and warrants further evaluation. Another study in Nepalese tertiary hospitals reported a 6.6% prevalence of COPD among emergency patients, with dyspnea being a common symptom. [9] The study conducted by Shrestha, et al. highlighted suboptimal emergency care for acute exacerbations of COPD (AECOPD), noting gaps such as the absence of written clinical guidelines and low rates of pulmonary rehabilitation advice and vaccination in Nepal. [10]

Bronchial asthma emerged as the second most common provisional diagnosis in our study, accounting for 23.3% of patients presenting with shortness of breath. Most asthma cases were seen between 7 am and 2 pm, with a median presentation time of 8 am. This timing aligns well with the well-documented circadian variation of asthma

symptoms, which typically worsen in the early morning hours due to increased airway inflammation, bronchial hyperresponsiveness, and nocturnal bronchoconstriction.[8]

Asthma patients in this study had a median age of 42 years, which is comparable to the study conducted in western Nepal. [11] Non-respiratory causes such as diabetic ketoacidosis, trauma, anxiety, and sepsis, as well as cardiac causes like heart failure and myocardial infarction, are recognized contributors to dyspnea presentations worldwide.[12]

This single-center study with a small sample size might not be generalizable to other contexts. Relying solely on tentative ED diagnoses in the absence of sophisticated diagnostics may have affected the accuracy of the diagnosis. The evaluation of long-term patient outcomes was not possible due to its cross-sectional design. Furthermore, a thorough assessment of behavioral and environmental risk factors was lacking, which limited our knowledge of the factors causing shortness of breath.

CONCLUSION

This research shows that a growing number of emergency department visits are due to dyspnea. This condition affects a younger age group and has a noticeable gender gap, likely caused by indoor air pollution and chronic respiratory illnesses.

DECLARATIONS

Acknowledgement

Conflict of Interest

Funding

Consent for Publication
All authors have approved the final version of the manuscript.

Consent of Study
It is not applicable because of retrospective study.

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