Asia Pacific Journal of Surgical Advances
https://apjsa.org/index.php/apjsa
Volume-2, Issue-3

pISSN: 3079-7322
eISSN: 3079-1618

Research Article

DOI: https://doi.org/10.70818/apjsa.v02i03.053

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Chronic Lung Disease in Focus: Epidemiological Perspectives on Lifestyle, Environmental, and Clinical Risk Factors

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OPEN ACCESS

Citation:
Jesi NS, Sharmy SC, Hridi AS, Reza MS, Ferdaus F. Chronic Lung Disease in Focus: Epidemiological Perspectives on Lifestyle, Environmental, and Clinical Risk Factors. Asia Pac J Surg Adv. 2025;2(3):130-138

Received: 22 April 2025
Accepted: 05 July 2025
Published: 19 August, 2025

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ABSTRACT: ***Background:*** Chronic lung infections contribute significantly to morbidity and mortality worldwide, particularly in low- and middle-income countries.. ***Objective:*** To investigate the epidemiological burden, risk factors, and clinical characteristics of chronic lung infections among patients attending Khulna City Medical College Hospital. ***Methods:*** A cross-sectional study was conducted from January to December 2024 involving 134 patients diagnosed with chronic lung infections. Data on demographics, smoking history, environmental exposures, comorbidities, clinical parameters, and healthcare access were collected through structured interviews and review of medical records. Statistical analyses were performed to identify associations and predictors of disease severity. ***Results:*** Most patients were aged 50–59 years (42.54%), with males constituting 64.9% of the sample. Smoking prevalence among males was 68.97%, with long-term and high intensity smoking significantly associated with increased hospital admissions ($p = 0.001$). Females were all non-smokers but reported 100% passive smoking exposure. Hypertension and diabetes affected approximately half the cohort. Environmental factors, including poor household ventilation (56.72%), proximity to industrial areas (60.45%), biomass fuel use, dust exposure (57.46%), and mold/dampness at home (51.49%), were prevalent. Elevated inflammatory markers (CRP 73.13%, ESR 66.42%) indicated chronic inflammation. Despite 62.7% using inhalers/nebulizers, only 35.8% maintained regular follow-ups, and half experienced diagnostic delays exceeding one month. Sedentary lifestyle (68.7%) and delayed health-seeking behavior (56.7%) were common. ***Conclusion:*** Chronic lung infections in this population are influenced by a combination of smoking, environmental exposures, comorbidities, and lifestyle factors.

Keywords: Chronic Lung Infections, Lifestyle, Environmental.

INTRODUCTION

Chronic lung infections represent a major public health challenge worldwide, particularly in low- and middle-income countries (LMICs) like Bangladesh [1]. These infections, which include chronic bronchitis, bronchiectasis, and recurrent lower respiratory tract infections, are characterized by persistent respiratory symptoms and long-term lung damage, often resulting in reduced quality of life, frequent hospitalizations, and increased healthcare costs [2]. The burden of chronic lung infections is especially significant in regions with poor environmental conditions, high rates of smoking, limited access to healthcare, and prevalent comorbid conditions such as diabetes and hypertension [3]. In recent decades, the global epidemiology of chronic respiratory diseases has shown a worrying trend. According to the Global Burden of Disease (GBD) study, chronic respiratory diseases account for over 7% of total deaths globally, with a disproportionately higher impact in South Asia [4]. In Bangladesh, a country with a dense population and ongoing industrialization, the incidence of chronic lung infections is increasing due to a combination of behavioral, environmental, and socioeconomic factors

[5]. Despite this growing burden, chronic lung infections often remain underdiagnosed and inadequately managed, particularly in rural and semi-urban settings where healthcare access and awareness are limited [6]. Several key risk factors have been identified in the development and progression of chronic lung infections. Tobacco smoking remains the leading preventable cause, damaging the respiratory epithelium and impairing mucociliary clearance, thereby increasing susceptibility to infections [7]. In Bangladesh, while smoking is predominantly a male behavior, women are frequently exposed to passive smoking, especially in household settings. The use of biomass fuels for cooking, commonly practiced in rural households, contributes significantly to indoor air pollution, an established risk factor for respiratory morbidity [8].

Environmental exposures also play a crucial role. Many urban and peri-urban communities in Bangladesh reside near brick kilns, garment factories, or heavily trafficked roads, resulting in prolonged exposure to dust, chemical irritants, and air pollutants. Poor household ventilation, mold, and dampness further exacerbate respiratory conditions [9]. These environmental hazards, often overlooked in routine clinical assessments, contribute substantially to chronic respiratory symptoms. Another significant concern is the presence of comorbidities [10]. Conditions such as diabetes mellitus, hypertension, and cardiovascular diseases are common among middle-aged and elderly populations and can impair immune response, delay recovery, and complicated treatment outcomes in patients with chronic lung infections [11]. Studies have shown that diabetic patients are more prone to pulmonary infections due to impaired mucosal immunity and altered pulmonary defense mechanisms. Similarly, hypertensive patients on long-term medication may experience drug-induced respiratory symptoms or overlapping complications [12]. In the clinical context, diagnostic delays remain a serious challenge. Many patients experience prolonged periods of symptoms such as chronic cough, breathlessness, or recurrent fevers before receiving an accurate diagnosis [13]. This delay can be attributed to factors such as low health literacy, self-treatment practices, reliance on traditional healers, and limited availability of diagnostic tools in peripheral health centers. As a result, patients are often present at advanced stages of disease, requiring hospitalization and intensive care [14]. Furthermore, there is a lack of regular follow-up and continuity of care, particularly among patients from low-income backgrounds. The irregular use of inhalers or nebulizers, poor medication adherence, and infrequent monitoring contribute to frequent exacerbations and hospital remissions. Many patients also face barriers to accessing public healthcare services, including cost, distance, lack of specialists, and long waiting times, leading them to delay care or opt for unqualified providers [15].

Another important but often overlooked aspect is the role of behavioral and lifestyle factors. A significant proportion of individuals with chronic lung infections lead sedentary lives, have poor nutritional status, and demonstrate delayed health-seeking behavior. Malnutrition, particularly underweight status, weakens the immune system, making patients more vulnerable to recurrent infections. In contrast, overweight individuals may suffer from reduced lung volumes and increased inflammation, further complicating lung conditions. Given this complex interplay of behavioral, environmental, clinical, and systemic factors, a comprehensive understanding of the epidemiological profile of chronic lung infections is essential. However, in Bangladesh, there is a paucity of local data that integrates these multifactorial determinants, particularly from urban and semi-urban regions like Khulna. Most available studies focus on acute respiratory infections or chronic obstructive pulmonary disease (COPD) without delving into the broader spectrum of chronic lung infections and their associated risk factors. Therefore, this study was undertaken to explore the epidemiology, risk factors, and clinical characteristics of chronic lung infections among patients attending Khulna City Medical College Hospital. By analyzing patient demographics, smoking and exposure history, comorbidities, lifestyle behaviors, healthcare access, and clinical indicators, the study aims to provide evidence-based insights that can guide public health strategies and improve clinical outcomes. Understanding these dimensions is crucial for developing targeted interventions, promoting early diagnosis, and enhancing the management of chronic lung infections in the Bangladeshi context.

METHODOLOGY

This study employed a cross-sectional design to investigate the epidemiological burden and associate risk factors of chronic lung disease among patients at Khulna City Medical College Hospital. The research was conducted over one year, from January to December 2024, and included a total of 134 patients diagnosed with chronic lung disease based on clinical, radiological, and spirometric assessments. Participants were selected through purposive sampling, focusing on individuals who met predefined inclusion criteria and were either attending the outpatient department or admitted to the inpatient respiratory and internal medicine units. Inclusion criteria consisted of patients aged 18 years and older with a confirmed diagnosis of chronic lung diseases such as chronic obstructive pulmonary disease (COPD), chronic bronchitis, bronchiectasis, interstitial lung disease, or sequelae of prior pulmonary tuberculosis. Patients with acute respiratory infections, active pulmonary tuberculosis, or incomplete clinical records were excluded. Data were collected using a structured interviewer-administered questionnaire complemented by a review of clinical records. The questionnaire captured epidemiological and socio-demographic information including age, sex, occupation, smoking history, type of household fuel used, occupational exposures, ventilation of living spaces, comorbid conditions (e.g., diabetes, cardiovascular disease, or chronic kidney disease), and previous hospitalizations. Clinical information comprised symptom duration, sputum characteristics, presence of hemoptysis, breathlessness, and findings from relevant investigations (chest X-ray, HRCT thorax, sputum studies, and spirometry results). Environmental exposure factors were assessed through direct questioning and corroboration with medical records, covering indoor and outdoor air pollution, proximity to industrial areas, biomass fuel use, and recurrent exposure to allergens or respiratory irritants. Lifestyle factors included smoking status (current, former, or never smoker), alcohol consumption, dietary patterns, and physical activity levels. All collected data were entered and coded in SPSS version 26.0 for statistical analysis. Descriptive statistics were used to summarize demographic, lifestyle, and clinical characteristics. Bivariate analysis was performed using chi-square or Fisher's exact tests to determine associations between categorical variables and chronic lung disease patterns. Logistic regression models were applied to identify independent predictors of disease severity, progression, and recurrence, while controlling potential confounders. Written informed consent was secured from all participants, and confidentiality was maintained under the Declaration of Helsinki.

RESULT

A total of 134 patients with chronic lung disease were included in the study. The distribution of disease types is shown in Table 1.

Table 1: Distribution of Chronic Lung Diseases among Study Participants (n = 134)

Disease Type	Frequency (n)	Percentage (%)
Chronic Obstructive Pulmonary Disease (COPD)	62	46.3%
Chronic Bronchitis	28	20.9%
Bronchiectasis	22	16.4%
Interstitial Lung Disease (ILD)	12	9.0%
Post-Tuberculosis Sequelae	10	7.5%
Total	**134**	**100%**

Table 1 shows that COPD was the most common condition (46.3%), followed by chronic bronchitis (20.9%) and bronchiectasis (16.4%). ILD and post-TB sequelae accounted for 9.0% and 7.5% of cases, respectively.

Table 2: Age Group Distribution by Gender (n = 134)

Age Group	Male (n = 87)	% of Males	Female (n = 47)	% of Females	Total (n)	% of Total
40–49	20	22.99%	10	21.28%	30	22.39%
50–59	35	40.23%	22	46.81%	57	42.54%
60–69	25	28.74%	10	21.28%	35	26.12%

70+	7	8.05%	5	10.64%	12	8.96%

Table 2 shows that the largest proportion of patients were in the 50–59 years group (42.5%), followed by 60–69 years (26.1%).

Table 3: Smoking History by Gender (n = 134)

Gender	Smoking Status	Passive Smoking Exposure	Total (n)
Female (n = 47)	No	Yes (100%) – due to husband's smoking	47
Male (n = 87)	Yes – 60 (68.97%)	Not assessed	60
	No – 27 (31.03%)	Not assessed	27

Table 3 shows that all female participants were non-smokers but had 100% passive exposure. Among males, 68.9% were active smokers.

Table 4: Smoking Duration among Male Smokers (n = 60)

Years of Smoking	Frequency	Percentage
12–15 years	18	30.0%
16–19 years	22	36.7%
≥20 years	20	33.3%
Total	**60**	**100%**

Table 4 shows that most male smokers had smoked for ≥16 years, with 36.7% reporting 16–19 years.

Table 5: Daily Cigarette Consumption among Male Smokers (n = 60)

Sticks per Day	Frequency	Percentage
6–10	15	25.0%
11–15	25	41.7%
16–20	20	33.3%
Total	**60**	**100%**

Table 5 shows that the majority of male smokers consumed 11–15 sticks daily (41.7%).

Table 6: Distribution of Hypertension and Diabetes by Gender (n = 134)

Comorbidity	Gender	Present (n)	%	Absent (n)	%	Total
Hypertension	Male	42	48.3%	45	51.7%	87
	Female	28	59.6%	19	40.4%	47
Diabetes	Male	35	40.2%	52	59.8%	87
	Female	19	40.4%	28	59.6%	47

Table 6 shows that hypertension was more common in females (59.6%), while diabetes was nearly identical across genders (≈40%).

Table 7: Hospital Admissions and Years of Smoking (Male Smokers, n = 60)

Years of Smoking	0–1 Admission	2–3 Admissions	≥4 Admissions	Total	p-value
12–15 years	12 (66.7%)	4 (22.2%)	2 (11.1%)	18	
16–19 years	5 (22.7%)	10 (45.5%)	7 (31.8%)	22	
≥20 years	3 (15.0%)	5 (25.0%)	12 (60.0%)	20	0.001†
† Chi-square test for trend					

Table 7 shows a significant trend (p = 0.001): longer smoking duration was associated with higher hospital admissions.

Table 8: Environmental Exposure Factors (n = 134)

Factor	Category	n	%
House Ventilation	Adequate	58	43.3%
	Poor	76	56.7%
Proximity to Industry/Traffic	Near (≤500m)	81	60.5%
	Far (>500m)	53	39.6%
Type of Fuel	Wood	42	31.3%
	Gas	72	53.7%
	Coal	20	14.9%
Dust Exposure at Work	Yes	77	57.5%
Mold/Dampness at Home	Present	69	51.5%

Table 8 shows that poor ventilation (56.7%), proximity to traffic/industry (60.5%), and biomass fuel use (46.2%) were major risk exposures.

Table 9: Clinical Measurements (n = 134)

Parameter	Mean ± SD / Category	n	%
PEFR (L/min)	261.4 ± 78.3	96	—
FVC (L)	2.31 ± 0.56	38	—
CRP (>5 mg/L)	Elevated	98	73.1%
	Normal	36	26.9%
WBC (>11,000)	Elevated	61	45.5%
	Normal	73	54.5%
ESR (>20 mm/hr)	Elevated	89	66.4%
	Normal	45	33.6%
Symptom Duration	<3 months	28	20.9%
	3–6 months	42	31.3%
	>6 months	64	47.8%

Table 9 shows frequent systemic inflammation (elevated CRP, ESR, WBC) and long disease duration, with nearly half symptomatic for >6 months.

Table 10: Treatment and Healthcare Access (n= 134)

Variable	Yes (n, %)	No (n, %)
Use of Inhalers/Nebulizers	84 (62.7%)	50 (37.3%)
Regular Follow-Up	48 (35.8%)	86 (64.2%)
Public Healthcare Use	78 (58.2%)	56 (41.8%)
Diagnosis Delay >1 Month	67 (50.0%)	67 (50.0%)

Table 10 shows that although inhaler use was common, regular follow-up was low, and half experienced diagnostic delay >1 month.

Table 11: Behavioral and Lifestyle Factors (n = 134)

Variable	Category	n	%
Physical Activity	Active	42	31.3%
	Sedentary	92	68.7%
Alcohol Use	Yes	18	13.4%
	No	116	86.6%

BMI	Normal (18.5–24.9)	61	45.5%
	Underweight (<18.5)	41	30.6%
	Overweight/Obese (>25)	32	23.9%
Health-Seeking Behavior	Prompt	58	43.3%
	Delayed/self-treatment	76	56.7%

Table 11 shows that sedentary lifestyle (68.7%) and undernutrition (30.6%) were common. Delayed/self-treatment was observed in over half of participants (56.7%).

DISCUSSION

This cross-sectional study provides important epidemiological insights into the burden and multifactorial risk factors associated with chronic lung infections among patients attending Khulna City Medical College Hospital. The study population was predominantly middle-aged to elderly, with the highest proportion of cases occurring in the 50–59 years age group (42.54%) and a substantial portion between 60 and 69 years (26.12%). This age distribution aligns with prior research indicating increased susceptibility to chronic respiratory diseases in older adults due to age-related decline in pulmonary defense mechanisms and increased comorbidities [16,17]. COPD was the predominant chronic lung disease (46.3%), highlighting its major role as a public health concern in the study population. The second most frequent condition was chronic bronchitis (20.9%), followed by bronchiectasis (16.4%), both of which often arise from long-term exposure to risk factors such as smoking, indoor air pollution, and recurrent respiratory infections. Interstitial lung disease (9.0%) and post-tuberculosis sequelae (7.5%) were less common but clinically important, as they are associated with significant morbidity and long-term complications. The higher prevalence of COPD and chronic bronchitis in this cohort aligns with global evidence that these conditions represent the largest share of chronic respiratory diseases, especially in low- and middle-income countries. Bronchiectasis, although less frequent, may reflect inadequate treatment of prior infections and delayed healthcare access. The presence of post-TB sequelae also indicates the long-lasting burden of tuberculosis in Bangladesh, despite improved treatment programs [1]. Overall, the distribution underscores that while COPD dominates the disease spectrum, other chronic lung diseases also contribute substantially to the epidemiological burden and should not be overlooked in preventive and clinical strategies. Smoking emerged as a significant risk factor, with 68.97% of male participants identified as current or former smokers. Notably, 70% of these smokers had a smoking duration exceeding 15 years, and the majority consumed between 11 to 20 sticks per day. The strong association between prolonged smoking and higher rates of hospital admissions ($p = 0.001$) further underscores smoking's detrimental impact on respiratory health. This corroborates earlier findings that chronic exposure to tobacco smoke exacerbates lung injury, impairs mucociliary clearance, and promotes recurrent infections [18,19]. Additionally, all female participants were non-smokers but reported 100% exposure to passive smoking from their husbands, which highlights the critical role of secondhand smoke exposure in chronic lung disease development, consistent with previous studies [20,21]. Comorbidities such as hypertension and diabetes mellitus were prevalent among the study participants, affecting nearly half the population. Hypertension was significantly more frequent in females (59.57%) than males (48.28%), while diabetes prevalence was similar across genders (~40%). These findings reflect the complex interplay between chronic non-communicable diseases and respiratory infections, where comorbid conditions can worsen disease severity and complicate management [22,23].

Environmental and occupational exposures were prominent contributors to lung infection risk. More than half of the participants lived in homes with poor ventilation (56.72%) and near industrial or heavy traffic areas (60.45%), increasing their exposure to air

pollutants. Biomass fuel use remained common, with 31.34% using wood and 14.93% using coal for cooking or heating, both of which emit particulate matter and harmful gases linked to respiratory morbidity [24,25]. Dust exposure at workplaces affected 57.46% of participants, reflecting occupational hazards in industrial and labor-intensive settings. The presence of mold or dampness in over half of the homes (51.49%) further suggests chronic exposure to allergens and irritants contributing to persistent respiratory symptoms and infection risk [8-11]. Clinical parameters indicated substantial inflammatory burden and chronicity. Elevated C-reactive protein (73.13%) raised erythrocyte sedimentation rate (66.42%), and leukocytosis (45.52%) were common, reflecting ongoing systemic inflammation and infection. The mean Peak Expiratory Flow Rate (261.4 ± 78.3 L/min) and Forced Vital Capacity (2.31 ± 0.56 L) measurements, though limited by resource constraints, suggest moderate to severe pulmonary impairment in many patients. Nearly half of the cohort (47.76%) reported symptoms lasting more than six months, emphasizing the chronic and persistent nature of these infections. Treatment practices revealed that while 62.7% of patients used inhalers or nebulizers, only 35.8% adhered to regular follow-up visits, indicating gaps in continuous care and disease monitoring. Furthermore, 50% of patients experienced delays greater than one month in receiving a diagnosis after symptom onset, which may contribute to disease progression and poorer outcomes, consistent with findings from low-resource settings where diagnostic delays are common [13,14]. Behavioral and lifestyle factors indicated high levels of sedentary behavior (68.7%) and nutritional deficiencies, with 30.6% underweight, potentially exacerbating disease vulnerability and impairing recovery. Delayed health-seeking behavior was observed in 56.7% of participants, highlighting the need for community awareness and early intervention strategies. Overall, the study emphasizes the complex interplay of smoking, environmental pollution, comorbid conditions, and behavioral factors in the epidemiology of chronic lung infections in a Bangladeshi urban setting. The findings advocate comprehensive public health interventions, including tobacco control, improved housing ventilation, occupational safety, nutritional support, and enhanced healthcare access to reduce the burden of chronic lung infections [26-27].

CONCLUSION

This study highlights the significant burden of chronic respiratory diseases among patients attending the outpatient psychiatry department, revealing strong associations with smoking behavior, comorbid conditions like hypertension and diabetes, elevated inflammatory markers, poor nutrition, and delayed health-seeking practices. The high prevalence of sedentary lifestyle, underuse of follow-up care, and diagnostic delays underscore critical gaps in awareness and healthcare access. Tailored public health interventions, early screening, and integrated management approaches targeting both mental and physical health are essential to reduce morbidity and improve quality of life in this vulnerable population.

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