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Proportionate Frequencies of Respiratory Symptoms, Patterns and Determinants of Lung Function Abnormality Among Patients Attending a Tertiary Respiratory Clinic in Abuja, Nigeria: A Two-Year Retrospective Analysis

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Article history: Received 26 March 2026, Reviewed 11 April 2026, Accepted for publication 20 June 2026

ABSTRACT

Background: Respiratory diseases cause significant morbidity and mortality worldwide, especially in low- and middle-income countries. In Nigeria, these diseases are becoming rampant, but adequate hospital-based data are unavailable. This study examined the proportionate frequencies and associated factors of lung function abnormalities among patients at the Garki Hospital respiratory clinic in Abuja, Nigeria.

Methods: This retrospective cross-sectional study reviewed records of 264 patients who attended the clinic between January 2024 and December 2025 and satisfied the inclusion criteria. The medical records were reviewed to gather socio-demographics, symptoms, and spirometry results. Lung function was considered normal, obstructive, restrictive, or mixed, based on spirometry. The data were analyzed using descriptive statistics and a chi-square test, with $p \leq 0.05$ considered significant.

Results: Most patients were women (61%), urban dwellers (84%), and aged 30-39 years (22%). The most common symptoms were chronic cough (63%), dyspnea (56%), and sputum (43%). Abnormal lung function was found in 74% of patients. Obstructive patterns were the most common (58%), followed by restrictive (32%) and mixed (10%) patterns. Moderate lung dysfunction was most frequent (34%), while very severe impairment was least common (7%). Lung function abnormality was associated with age ($p = 0.001$), smoking status ($p = 0.045$), and marital status ($p = 0.05$), but not with sex, location, or occupation.

Conclusion: Most patients had moderate-to-severe lung problems, which may reflect delays in seeking medical care. Targeted health education, making spirometry available and affordable, and strengthening efforts to control smoking are important steps toward improving respiratory health in Nigeria.

Keywords: Respiratory symptoms, lung function abnormality, spirometry, smoking, obstructive lung disease, Nigeria, tertiary care

How to cite this article

Ulu DOO, Umar AH, Yakubu IM, Sadiq MO, Wogu NC, Umezinwa CO. Proportionate Frequencies of Respiratory Symptoms, Patterns and Determinants of Lung Function Abnormality Among Patients Attending a Tertiary Respiratory Clinic in Abuja, Nigeria: A Two-Year Retrospective Analysis. The Nigerian Health Journal 2026; 26(2). 786 – 795.
https://doi.org/10.71637/tnhj.v26i2.1391

Print ISSN: 0189-9287 Online ISSN: 2992-345X

INTRODUCTION

Each year, respiratory diseases lead to about 4 million deaths around the world.[1] In sub-Saharan Africa, the situation is made worse by environmental issues (biomass exposure and air pollution), workplace hazards, infectious diseases, and limited access to diagnostic tools and manpower.[2] According to the World Health Organization (WHO), more than 1 billion people have chronic respiratory diseases, and most of these cases are in low- and middle-income countries (LMICs).[3]

Spirometry remains the primary method for assessing lung function and diagnosing respiratory diseases.[4] The Global Lung Function Initiative (GLI) 2012 equations include reference values for different ethnic groups, thereby improving the accuracy of spirometry for diverse populations.[5] However, these international standards are rarely used in African clinics, and there is limited research on lung function patterns in specialized respiratory care centers.[6]

Nigeria is experiencing an epidemiological transition that has produced a dual burden of communicable and non-communicable respiratory diseases.[7] Although infectious diseases such as tuberculosis remain prevalent, chronic respiratory conditions, including asthma,[8] chronic obstructive pulmonary disease (COPD), and interstitial lung diseases (ILDs), are increasingly identified.[9] Environmental factors, including exposure to biomass fuels, air pollution, occupational dust, and tobacco use, are significantly associated with the respiratory disease burden.[10,11]

Although respiratory diseases are now recognized as a public health priority in Nigeria, there remains limited clinic-based spirometry data on respiratory symptoms and lung function abnormalities in tertiary care settings. Most research focuses on specific diseases, and only a few studies provide a broad view of respiratory conditions in specialist clinics.[12] Understanding these patterns is important for guiding clinical practice, making better use of resources, and planning public health actions.

Therefore, this study aimed to determine the proportion and pattern of respiratory symptoms and lung function abnormalities among patients attending the Respiratory Clinic at Garki Hospital, a tertiary healthcare facility in Abuja, Nigeria.

METHODS

Study Setting; This study took place at the Respiratory Clinic of Garki Hospital in Abuja, Nigeria. The hospital is a 100-bed public-private partnership facility and serves as a referral center for respiratory diseases in the Federal Capital Territory and surrounding communities and states.

The respiratory clinic provides diagnostic and treatment services for patients with asthma, chronic obstructive pulmonary disease (COPD), tuberculosis, interstitial lung diseases, and other chronic respiratory conditions. The clinic routinely performs spirometry as part of respiratory evaluation and management.

Study Design: This study used a retrospective cross-sectional design. The design was considered appropriate because it enabled assessment of respiratory symptoms and lung function patterns, and of associations between sociodemographic variables and lung function abnormalities, using routinely collected clinical data from patients evaluated during the study period.

Study Population: The source population comprised all patients attending the Respiratory Clinic of Garki Hospital between January 2024 and December 2025. The study population consisted of patients whose medical records contained complete demographic information, documented respiratory symptoms, and spirometry results.

Eligibility: **Inclusion criteria** were: (1) age ≥18 years; (2) attendance during the study period; and (3) availability of complete medical records, including demographic data, respiratory symptoms, and spirometry results.

Exclusion criteria: Patients with partial records, those who did not undergo spirometry, or repeat visits by the same patient were excluded.

Sample Size Determination: As this was a retrospective study, formal sample size estimation was not performed. Instead, a census approach was adopted, in which all eligible patient records available during the study period that met the inclusion criteria were reviewed. A total of 264 patient records satisfied the eligibility criteria and were included in the analysis.

Sampling Methodology: A total population sampling technique was used to maximize statistical power and minimize selection bias associated with sampling procedures.

Study Variables

Outcome Variable: The primary outcome variable was lung function status, categorized as normal or abnormal based on spirometric assessment. Abnormal lung function was further classified as obstructive, restrictive, or mixed patterns.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Independent Variables: Independent variables included age, sex, educational level, occupation, marital status, place of residence, smoking status, and presenting respiratory symptoms.

Tool and Validation: Data were extracted using a structured data abstraction form developed in Microsoft Excel. The form was designed to ensure consistent collection of demographics, clinical, and spirometric information from electronic medical records. Prior to data extraction, the abstraction template was reviewed by the research team to ensure completeness and consistency with the study objectives. The Intraclass Correlation Coefficient (ICC) was approximately 0.7 (moderate), indicating moderate internal consistency in the data.

Data Collection/Study Procedures: Data extraction was conducted by trained members of the research team. Relevant information was retrieved from electronic medical records and entered into the data abstraction form. Variables extracted included sociodemographic characteristics, respiratory symptoms, spirometry measurements (FEV_1, FVC, and FEV_1/FVC ratio), smoking status, and clinical diagnoses. To minimize errors, extracted data were reviewed for completeness before analysis.

Spirometry and Lung Function Classification: Spirometry testing had been performed as part of routine clinical care by trained personnel following ATS/ERS recommendations. Quality-controlled spirometric measurements, including FEV_1, FVC, and FEV_1/FVC ratio, were retrieved from patient records. Lung function patterns were subsequently classified by the investigators using GLI 2012 reference standards and established spirometric criteria.[6]

Normal: $FEV_1 \geq 80\%$ predicted, FVC $\geq 80\%$ predicted, $FEV_1/FVC \geq 0.70$.

Obstructive: $FEV_1/FVC < 0.70$.

Restrictive: $FEV_1/FVC \geq 0.70$ and FVC $< 80\%$ predicted.

Mixed: $FEV_1/FVC < 0.70$ and FVC $< 80\%$ predicted.

Note: FEV_1 = Forced Expiratory Volume in 1 second; FVC = Forced Vital Capacity.

The severity of obstruction was graded according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria[13], while the severity of restriction was classified by percentage of predicted FVC.

Statistical Analysis: Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) Statistics version 27.0. Descriptive statistics summarized demographic characteristics, symptom frequency, and lung function patterns. The Shapiro-Wilk normality test was significant (all p-values < 0.05) for all of the scale variables. Therefore, scale variables were reported as either median and/or range. However, most spirometric variables were expressed as mean ± standard deviation, minimum, and maximum to conform to the classification and diagnostic standard,[13] while categorical variables were reported as frequencies and percentages. The researchers used chi-square tests to examine associations between categorical variables (sociodemographic variables) and lung function abnormality. Results were given as Chi-square, likelihood ratio (LR), or odds ratio (OR) with 95% confidence intervals. Where Chi-square assumptions were violated, the LR or Fisher's Exact test was used. Cramer's V was used for effect size reporting. A p-value of less than or equal to 0.05 was considered statistically significant.

Ethical Issues: The Federal Capital Territory Health Research Ethics Committee, Abuja, Nigeria, approved the study (FHREC/2026/01/52/24-02-2026). Since only anonymous medical records were used, informed consent was not required. All data were handled in accordance with established privacy and records protection guidelines.

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RESULTS

Demographic Characteristics

Table 1: Demographic Characteristics of Study Participants (n = 264)

Variable	Category	Frequency (n)	%
Ages (Years)	18 – 29	48	18.2
	30 – 39	57	21.6
	40 – 49	54	20.5
	50 – 59	56	21.2
	≥ 60	49	18.5
Sex	Male	103	39.0
	Female	161	61.0
Educational Level	Primary	9	3.4
	Secondary	88	33.3
	Tertiary	167	63.3
Occupation	Student	14	5.3
	Professional	96	36.4
	Trader	67	25.4
	Unemployed	44	16.7
	Others	43	16.3
Residence	Urban	222	84.1
	Rural	42	15.9
Marital Status	Single	61	23.1
	Married	142	53.8
	Divorced	34	12.9
	Widowed	27	10.2
Smoking Status	Never	209	79.2
	Former	27	10.2
	Current	28	10.6

The study included 264 patients (Table 1), whose socio-demographic profile showed an educated population (63%), predominantly urban (84%), with female dominance (61%) and a high proportion of married individuals (54%). The age distribution ranged from 19 years to 88 years, with a median of 43 years. The three most common age groups were almost equally distributed: 30-39 years (21.6%), 40-49 years (20.5%), and 50-59 years (21.2%). Both current tobacco smokers and former smokers constituted around 10% each, while those who had never smoked formed the remaining 80%.

Frequency of Respiratory Symptoms

Table 2: Frequency of Respiratory Symptoms (n = 264)

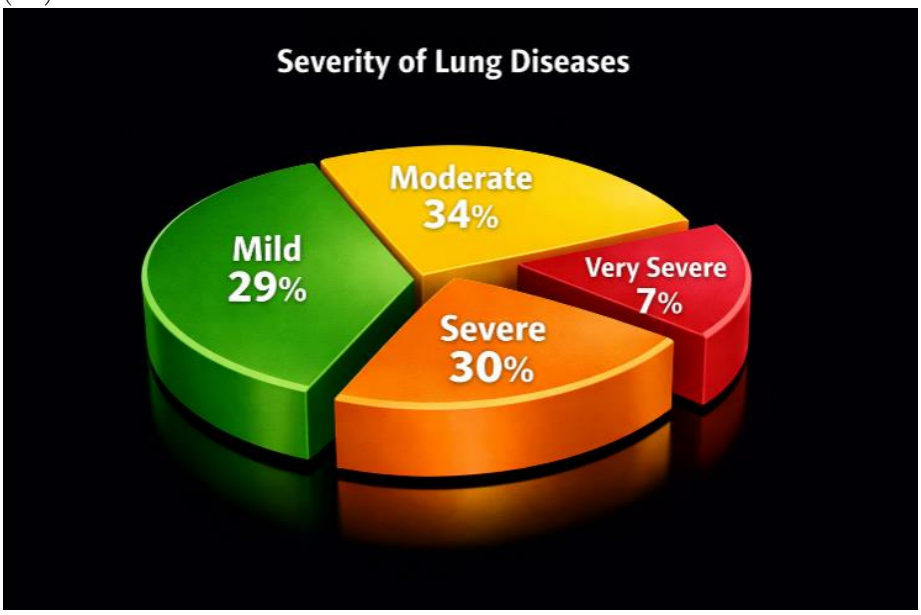
Symptom	Yes n (%)	No n (%)
Chronic cough (≥ 2 weeks)	166 (62.9)	98 (37.1)
Shortness of breath	147 (55.9)	117 (44.1)
Sputum production	113 (42.8)	151 (57.2)
Chest pain/tightness	104 (39.4)	160 (60.6)
Wheezing	96 (36.4)	168 (63.6)

The most common respiratory symptoms (Table 2) were chronic cough (63%), shortness of breath (dyspnea) (56%), sputum production (43%), chest pain (39%), and wheezing (36%).

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Proportion and Severity Patterns of Lung Function Abnormality based on Spirometry

The majority of patients (74%) had abnormal lung function, while only 26% had normal lung function. Obstructive lung disease was the most common abnormality (58%), followed by restrictive disease (32%) and mixed patterns (10%). The severity patterns of abnormal lung function (Figure 1) were mild (29%), moderate (34%), severe (30%), and very severe (7%).



Spirometry Parameters

Figure 1: Severity of Lung Function Impairment

Table 3: Summary of Spirometry measurements

Parameters	Mean ± SD	Minimum	Maximum
FEV_1 (% predicted)	57.03 ± 25.62	0.11	121.75
FVC (% predicted)	78.82 ± 28.53	0.16	196.04
FEV_1/FVC Ratio	73.05 ± 22.38	4.75	128.72
*PEF (L/min)	35.94 ± 22.19	0.55	120.25

*PEF = Peak Expiratory Flow

The mean FEV_1 was 57.03, indicating a predominantly moderate-to-severe disease presentation. Mean FVC (78.82) was substantially higher than mean FEV_1 (57.03), with a disproportionate reduction in FEV_1 relative to FVC, suggestive of obstructive lung disease.

Associations Between Demographics and Lung Function Abnormality

Pearson's Chi-square was used for categorical variables with adequate cell counts (sex, residence, age). For variables with small cell counts (marital status, occupation), the LR Chi-square was applied. For smoking status, Fisher's Exact Test was used because of very small cell counts (Table 4).

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Table 4: Relationships between Demographics and Lung Function Abnormality

Variable	Lung Function Normal - n (%)	Lung Function Abnormal n (%)	Total n (%)	χ^2/LR	p-value
Sex					
Female	45 (28)	116 (72)	161 (100)	0.7645	0.3819
Male	23 (22)	80 (78)	103 (100)		
Total	68 (26)	196 (74)	264 (100)		
Place of Residence					
Urban	54 (24)	168 (76)	222 (100)	1.0649	0.3021
Rural	14 (33)	28 (67)	42 (100)		
Total	68 (26)	196 (74)	264 (100)		
Marital Status					
Single	21 (34)	40 (66)	61 (100)	7.8139	0.05*
Divorced	12 (35)	22 (65)	34 (100)		
Married	32 (23)	110 (77)	142 (100)		
Widowed	3 (11)	24 (89)	27 (100)		
Total	68 (26)	196 (74)	264 (100)		
Age					
18 – 29	13 (27)	35 (73)	48 (100)	18.0618	0.0012*
30 – 39	25 (44)	32 (56)	57 (100)		
40 – 49	5 (9)	49 (91)	54 (100)		
50 – 59	12 (21)	44 (79)	56 (100)		
≥ 60	13 (27)	36 (73)	49 (100)		
Total	68 (26)	196 (74)	264 (100)		
Occupation					
Students	5 (36)	9 (64)	14 (100)	1.2465	0.8704
Professional	23 (24)	73 (76)	96 (100)		
Trader	18 (27)	49 (73)	67 (100)		
Unemployed	10 (23)	34 (77)	44 (100)		
Others	12 (28)	31 (72)	43 (100)		
Total	68 (26)	196 (74)	264 (100)		
Smoking Status					
Never	60 (29)	149 (71)	209 (100)	6.2015	0.045*
Former	6 (22)	21 (78)	27 (100)		
Current	2 (7)	26 (93)	28 (100)		
Total	68 (26)	196 (74)	264 (100)		

*Statistically significant

Age, smoking status, and marital status were the significant predictors of lung function abnormality (Table 4).

Age group, though significant ($\chi^2 = 18.06$, $p = 0.0012$), showed a non-linear relationship: the 40-49 age group had the highest rate of abnormality (91%), while those aged 30-39 had the lowest (56%).

Smoking status was significantly associated with lung function abnormality ($\chi^2 = 6.20$, $p = 0.045$), with those who had never smoked having lower odds than current smokers (OR ≈ 0.19, 95% CI: 0.04–0.80). Additionally, there was a clear exposure gradient from never-smokers (71%) to former smokers (78%) and current smokers (93%).

Finally, marital status, marginally significant ($\chi^2 = 7.81$, $p = 0.05$), showed a weak effect size (Cramer's V ≈ 0.10). Widowed individuals showed the highest rate of abnormality (89%), followed by married (78%), divorced (65%), and single individuals (66%).

In contrast, sex ($\chi^2 = 0.7645$, $p = 0.3819$), residence ($\chi^2 = 1.0649$, $p = 0.3021$), and occupation ($\chi^2 = 1.2465$, $p = 0.8704$) were not statistically significant determinants of abnormal lung function.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

DISCUSSION

Principal Findings

This study revealed that obstructive lung disease was the predominant abnormality (58%), substantially exceeding restrictive disease (32%) and mixed pattern (10%). The most common symptoms were chronic cough (62%), dyspnea (56%), and sputum production (43%), with most patients presenting with multiple concurrent symptoms. Age, smoking, and marital status were associated with lung function abnormality.

Symptomatology Patterns

The study revealed a high frequency of chronic cough (62%) and dyspnea (56%). A chronic cough is one that lasts more than two to eight weeks.[14] In LMIC settings, including Nigeria, an unexplained chronic cough may indicate pulmonary tuberculosis, and needs to be thoroughly investigated. This high frequency aligns with regional and global patterns, with some studies reporting rates as high as 60%.[15] The high proportion of chest pain (39%) is consistent with findings across divergent geographical backgrounds and clinical settings, and reflects a wide range of underlying pathologies, including non-pulmonary conditions, such as musculoskeletal disorders, pericardial diseases, acute coronary syndrome, and anxiety-related symptoms.[16] The frequency of multiple concurrent symptoms (67% reporting ≥ 3 symptoms) illustrates the complex clinical presentation of pulmonary disorders and the need for comprehensive diagnostic evaluation.

The relatively high frequency of hemoptysis (12.8%) may be associated with the burden of tuberculosis and other infectious respiratory diseases in Nigeria.[17] This highlights the importance of high clinical suspicion for tuberculosis in patients presenting with hemoptysis and other respiratory symptoms in Nigeria and other endemic settings.

Lung Function Abnormality

The predominance of obstructive lung disease (58%) is striking and in line with global epidemiological patterns in which obstructive diseases typically predominate in respiratory clinic populations.[18,19] This finding may be related to similar associated factors in the Nigerian context, with the regional and global context. However, environmental exposures to biomass fuel smoke, widely used for cooking and heating in Nigerian households, are associated with the development of restrictive lung disease and interstitial lung abnormalities.[20] Occupational exposures to organic and inorganic dusts in agricultural, mining, and factory settings may also be associated with the burden of respiratory diseases in Nigeria and other LMICs, thereby accounting for the relatively high proportion of restrictive lung disease observed in the study (32%).[21-23]

The relatively lower proportion of mixed patterns (10%) is expected, given that COPD and asthma are typically the most common respiratory conditions globally.[18] These patients often have more severe disease, worse prognosis, and greater functional impairment compared to those with isolated patterns.[24] Mixed patterns may indicate severe disease, coexisting pathologies, or complications such as pulmonary hypertension, requiring comprehensive evaluation and specialist care.

Significant Relationships with Age, Smoking, and Marital Status

The study identified three statistically significant factors associated with lung function abnormality: age, smoking status, and marital status. Age showed a non-linear relationship (χ^2 = 18.06, p = 0.0012). The highest rate (93%) of lung function abnormality was observed in people aged 40 to 49, consistent with previous research in pulmonary pathogenesis.[15,24] Lung development peaks around age 25, then declines after about 35, and worsens after 40 as gas exchange becomes less efficient and the immune system ages.[25-28] Around late middle age, the effects of long-term environmental exposures and the deteriorating aging process jointly influence lung function.[15,24,27]

Secondly, smoking status was significant (χ^2 = 6.20, p = 0.045), with an increasing abnormality rate of 71% for never-smokers, 78% for former smokers, and 93% for current smokers. Never-smokers were less likely to have abnormal lung function than current smokers (OR ≈ 0.19, 95% CI: 0.04–0.80). The pattern of increased risk with more smoking is consistent with previous studies. Around the world, diseases associated with tobacco are still a major problem,[1] and COPD affects about 10.3% of adults over 30 years of age.[2] The 71% rate of lung function abnormality among never-smokers agrees with documented evidence that 30-40% of COPD cases are in people who have never smoked.[28-30] This may be associated with exposure to biomass fuels,[26] indoor air pollution,[8,10,20] workplace hazards,[21] and poor lung development in childhood.[30] In Nigeria, biomass fuel use,[10] exposure to gas flaring,[11] and indoor air pollution are important risk factors to respiratory disease.[8] Never-smokers with respiratory problems usually have milder symptoms, less emphysema, and better lung function than smokers, though flare-ups can still happen often.[30] The causes include inflammation, oxidative stress, changes in the airways, and accelerated lung aging, but these mechanisms operate differently from tobacco-related effects.[15,28]

Lastly, marital status was marginally significant (χ^2 = 7.81, p = 0.05, Cramer's V ≈ 0.10). Widowed individuals had the highest rate of abnormality (89%), followed by married (78%), divorced (65%), and single (66%) individuals. The high rate of abnormalities among widowed people (89%) may be partly because they are usually older.[27] Other factors, such as social isolation, reduced utilization of healthcare facilities, and shared home environments, may also be associated factors.[3] Worldwide, COPD affects 12.64% of people aged 40 years and above, with higher rates in men (15.47%) than women (8.79%).[29]

Insignificant Associations

There were no significant associations between sex, urban/rural residence, and occupation. Sex showed no association with lung function abnormality (χ^2=0.76, p=0.38),

Print ISSN: 0189-9287 Online ISSN: 2992-345X

with similar proportions in females (72%) and males (78%), as reported by some studies.[5] Place of residence demonstrated no statistically significant difference (χ^2=1.06, p=0.30) between urban (76%) and rural (67%) residents. This observation may be due to possible overlapping exposures to indoor and outdoor air pollution.[10,11,20] Occupation showed no association (χ^2=1.25, p=0.87) with abnormal lung function, with rates ranging from 64% to 77% across occupation categories.[21]

Clinical Implications

This study has several important considerations for respiratory healthcare in Nigeria. The high proportion of obstructive lung disease highlights the need to strengthen diagnostic capacity for ILDs, including high-definition computed tomography and bronchoscopy with transbronchial biopsy.[25,31,32] Early diagnosis of ILDs is essential for initiating appropriate treatment, including antifibrotic therapies, and to improve clinical outcomes.

The relative proportion of restrictive patterns suggests the need for advanced lung function testing beyond basic spirometry. Measuring lung volumes with body plethysmography or gas dilution, and assessing diffusing capacity, would help improve understanding of restrictive disease and make the diagnosis easier.[33] However, these advanced tests are not widely available in Nigerian hospitals, which is a major gap in respiratory care.

The large number of symptoms and the complexity of cases support the need for a team approach to respiratory care that involves pulmonologists, radiologists, pathologists, and specialized nurses.[34] Comprehensive rehabilitation programs, with breathing exercises, physical training, and patient education, should be part of regular care to help patients function better and improve their quality of life.[35]

The findings highlight the need for handling environmental and occupational risk factors for respiratory disease through public health interventions, such as promoting clean cooking devices to reduce exposure to biomass fuels, implementing occupational health and safety measures to minimize dust exposure, and implementing tobacco control initiatives.[36]

In clinical practice, the high rate of abnormal spirometry results underscores the need for routine lung function testing in patients with chronic respiratory symptoms. Expanding access to spirometry, improving clinician training, and encouraging earlier specialist referral can support timely diagnosis and management.

Public health efforts should strengthen tobacco-control programs, smoking cessation services, and community respiratory education. Policies that promote cleaner household energy and better air quality could reduce diseases linked to biomass fuel and pollution in Nigeria. Enhanced occupational health surveillance and stricter safety enforcement would limit exposure-related respiratory illness. Large, multicenter studies that integrate environmental, occupational, and socioeconomic data with advanced pulmonary testing are needed to clarify disease determinants and guide national respiratory health strategies.

Limitations

The retrospective design may limit the depth of available clinical information. The evaluation of disease progression and therapeutic outcomes is limited by this design. A single tertiary center limits generalizability. Referral bias may lead to overrepresentation of certain cases and demographics.

Despite standard spirometer calibration and strict adherence to international guidelines (ATS/ERS), measurement bias cannot be completely eliminated.

Finally, the lack of complete lung volume measurements and diffusing capacity testing in all patients limits the accuracy of restrictive disease characterization.

Future studies that follow patients over time, collect detailed exposure information, and use advanced diagnostic tests would give a better understanding of respiratory disease patterns and outcomes. Community-based studies are also needed to show the full range of respiratory disease in the communities.

CONCLUSION

This study demonstrates that obstructive lung disease is the predominant lung function abnormality among patients attending a tertiary respiratory clinic in Abuja, Nigeria. The proportion of restrictive patterns may be associated with significant exposure to indoor pollution in the Nigerian context. The complex clinical presentations underscore the need for enhanced diagnostic capacity, including advanced lung function testing and imaging, as well as multidisciplinary approaches to respiratory care.

The results reveal significant gaps in Nigeria's respiratory health system and call for targeted actions to address environmental risks, improve diagnostics, expand access to specialized care, and improve affordability. Future research needs to examine the causes of restrictive lung disease, assess how environmental and occupational exposures affect risk, and evaluate ways to reduce respiratory disease in sub-Saharan Africa and other LMICs.

Declarations

Authors' contribution: All authors substantially contributed to different parts of the article, including conceptualization, proposal, data processing, data analysis, and manuscript drafting and editing, thereby justifying their authorship.

Acknowledgments: The authors express their sincere gratitude to the Management and Staff of Garki Hospital, Abuja, for providing a conducive environment for the study and for demonstrating a steadfast commitment to research and excellence in healthcare. Their support and the accessibility of pertinent clinical records were instrumental to the success of this work.

Funding: No funding was received for this study.

Conflict of Interest: None.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Use of Artificial Intelligence (AI) Tools: The authors disclose that AI tools were used to edit the manuscript and correct grammatical and typographic errors. All AI assistance output was carefully reviewed, verified, and edited. The authors take full responsibility for the content of the manuscript, including all parts refined with the assistance of AI tools.

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