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Original Article

Risk Factors and Determinants of Pulmonary Function Impairments in Chronic Respiratory Diseases in Ethiopia: A Hospital-based Cross-Sectional Study

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Abstract

Introduction: *Chronic respiratory diseases (CRDs) are diseases of the airways and lung parenchyma. Although they are leading causes of morbidity and mortality globally, chronic respiratory diseases have received relatively little public attention. This study aimed to characterize the common chronic respiratory diseases, along with their lung function and possible determinants in symptomatic patients attending clinics at Bishoftu General Hospital, Ethiopia.*
Methods*: A cross-sectional study was conducted at the outpatient department of Bishoftu Hospital from June 2019 to March 2020. Consecutive adult patients aged 18 and above with chronic respiratory symptoms (lasting more than 8 weeks) and no evidence of active tuberculosis were recruited. Questionnaires were used to collect data on demographics, symptoms, diagnoses, and potential risk factors. Lung function was measured by spirometry. Allergic status was assessed through allergen skin prick testing with standard allergens.*
Results*: A total of 170 participants were recruited, with the majority being female (102, 60.0%). The mean age was 49 years (SD=16). The most common symptoms reported were wheezing in the last twelve months 156 (91.8%), cough 138 (81.2%) and severe exertional breathlessness 137 (80.6%). Thirty-nine (22.9%) participants were either active or passive smokers. Half of the patients (50.3%) were exposed daily to vapors, dust, gases, or fumes and 58 (34.3%) were exposed to biomass smoke. In total, 138 (81.2%) had a positive allergen skin prick test. Chronic bronchitis (49.1%) and asthma (36.1%) were the most common clinical diagnoses. Classification of lung function revealed 23 (15%) normal, 29 (19%) obstructive, 36(23.5%) restrictive and 61(39.9%) mixed obstructive/ restrictive patterns. Airflow obstruction (FEV1/FVC ratio) was independently associated with increasing age ($p<0.05$), exertional breathlessness ($p<0.001$), previous history of asthma ($p<0.05$), BMI ($p<0.05$), and doctor-diagnosed chronic obstructive pulmonary disease ($p<0.001$) and asthma ($p<0.05$).*
Conclusion*: This study demonstrated a high burden of abnormal lung function in patients attending clinics due to chronic respiratory symptoms. Increasing age, exertional breathlessness, prior diagnosis of asthma, BMI, and clinically diagnosed COPD and asthma were independently associated with obstructed lung function. These find-*

ings highlight the critical need for spirometry services to identify lung abnormalities in patients with chronic respiratory symptoms.

Epidemiology, and the findings should be factored into clinical decision making and program design for disease prevention, screening, and treatment. It also calls for further prospective research to learn more about the conditions in the context of additional relevant personal and clinical characteristics.

***Keywords**: Chronic respiratory diseases, Determinant, Pulmonary function, Asthma, COPD*
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Introduction

Chronic respiratory diseases (CRDs) are diseases of the respiratory airways and lung parenchyma. Asthma, chronic obstructive pulmonary disease (COPD), and occupational lung diseases are usually cited as the most frequent CRDs. Globally, CRDs are important contributors to the increasing burden of non-communicable diseases (NCDs) and are among the leading causes of morbidity and mortality, particularly in low- and middle-income countries. This growing burden is likely to reflect widespread exposure to noxious environmental pollutants, occupational allergens, and inhalation of substances such as tobacco (1-3). Despite their global impact, CRDs did not receive as much public attention or research funding as other non-communicable diseases (4, 5).

The 2017 Global Burden of Diseases study estimated that 545 million people in the world had CRDs, an increase of 39.8% from 1990. In 2017, CRDs were responsible for 3.9 million deaths/year (an 18.0% increase from 1990) and for 1470 disability-adjusted life-years (DALYs) per 100,000 people (a 13.3% increase on 1990). The most prevalent CRDs are COPD (3.9% global prevalence) and asthma (3.6%). Smoking is the leading cause of disability attributable to CRDs in men across all regions. However, the main risk factor for disability in women varies by region, with household air pollution from solid fuel use being the highest in sub-Saharan Africa (6). Surprisingly, when compared to other regions, sub-Saharan Africa had the lowest prevalence of CRDs and lowest mortality attributable to CRDs. This finding does not reflect the experiences of clinicians, suggesting the lower prevalence of CRDs might be due to under diagnosis in settings that lack or underutilize diagnostic capabilities (3, 7).

In Ethiopia, a community-based study reported that the prevalence of COPD was 17.8% and that factors such as age above 50 years, being a smoker, being exposed to biomass smoke, and poorly ventilated kitchens were significantly associated with COPD (8). In recent years, initiatives such as the Burden of Obstructive Lung Disease (BOLD) program have provided detailed information on the prevalence of normal, obstructive, and restrictive spirometry in many high-, medium- and low-income countries. However, there is limited knowledge about how the patterns of lung function deficit translate into clinical disease and impact healthcare services in low- and middle-income country (LMIC) settings such as sub-Saharan Africa (9). Therefore, the objective of this study was to determine the burden of chronic respiratory diseases, lung function, and their determinants among patients with chronic respiratory symptoms attending a clinic in a General Hospital in Ethiopia.

Methods and Materials

Study setting, study period, and study design

This was a cross-sectional study conducted at Bishoftu General Hospital in Oromia, Ethiopia as part of a three-center (Ethiopia, Kenya and Sudan) project on Lung Health Across Life course in Africa (LuLi). A detailed description of the methods used has been published elsewhere (10). Bishoftu General Hospital is located 45km away from the capital Addis Ababa. A total of 169,000 patients were treated at the outpatient unit of the hospital in 2019 (Hospital report) include reference). The study was conducted from June 2019 to March 2020 in the outpatient departments of the hospital. The study population comprised of consecutive adult patients aged 18 years and older with chronic respiratory symptoms (lasting more than 8 weeks), in whom TB had been excluded (negative sputum GeneXpert test), and who were willing to perform spirometry. Patients were excluded if they had acute infections such as pneumonia or active tuberculosis, were unable to perform spirometry, or did not wish to participate (10).

Data collection

Trained nurses administered a respiratory-focused questionnaire (based on the BOLD questionnaire with additional questions from LuLi questionnaires) to collect data on socio-demographics, co-morbidities, past medical history, and symptoms (10). The questionnaire also covered risk factors such as tobacco smoking, exposure to outdoor and indoor pollutants, occupation and known triggers (9, 11).

Spirometry

All participants underwent spirometry performed by trained and Pan African Thoracic Society (PATS) certified nurses for competence in foundational spirometry. Pre- and post-bronchodilator spirometry was performed and forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC) were recorded. Spirometry was performed in accordance with the standards of the PATS, the American Thoracic Society, and the European Respiratory Society (12). The EasyOne® Spirometer (ndd, Switzerland) with a daily 3L syringe calibration check was used for spirometric measurements. The procedure included at least 3 acceptable and repeatable forced vital capacity manoeuvers. All curves were reviewed by an external assessor and the best value was selected for analysis. The Global Lung Initiative 2012 (GLI2012) reference equations for "black" populations were used (12-16). The patient's lung function was categorized as normal FEV1/FVC, FEV1 and FVC>LLN; obstructed FEV1/FVC<LLN (post-bronchodilator); and restricted FVC<LLN. Bronchodilator responsiveness was defined as an improvement of FEV1 by ≥12% and 200ml after administration of 200ug salbutamol administered by a spacer device. As per GOLD guidelines, post-bronchodilator airflow obstruction (FEV1/FVC<0.7) was categorized into mild (FEV1≥80% predicted), moderate (80%>FEV1≥50% predicted), severe (50% >FEV1≥30% predicted), and very severe (FEV1<30% predicted) (11).

Six-minute walk and allergen skin prick testing

A six-minute walk test and skin prick testing were performed according to ATS and European Standards (12,13). Skin prick testing used the standard allergen solutions including grass, cat, dog, cockroach, dust mite (dermatophagoides pteronyssinus), with positive (10mg/ml histamine), and negative (0.9% saline) controls. The maximum wheal diameter was measured at 15 minutes. A wheal diameter ≥3 mm was considered positive, and a patient was considered atopic if they had one or more positive skin prick tests.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, v26.0 (IBM, Armonk, NY, USA). Descriptive analyses are presented as mean with standard deviation, frequency, and percentages with appropriate measures of variation. Simple comparisons used independent t-tests and ANOVA tests as appropriate. The association between variables and the change in FEV1/FVC ratio was determined using a multiple linear regression model that included variables that were significantly associated ($p < 0.05$) on univariate analysis. Linear regression assumptions (normality, linearity, outliers, homoscedasticity, and multicollinearity) were evaluated and found to be met. All tests were two-sided. P-values less than 0.05 were considered statistically significant.

Ethical considerations

Ethical approvals for the study were acquired from the Institutional Review Board of the College of Health Sciences, Addis Ababa University (062/18/IM) include reference number), and Liverpool School of Tropical Medicine Research Ethics Committee (18-048)include reference number). Informed written consent was obtained from each participant before enrollment.

Results

As outlined in figure 1, a total of 220 patients were approached; of whom, 170 were recruited. Among the 170 participants, the mean age was 49 (SD=16). The majority of the patients were aged 26-35 years (37, 21.8%) and 46-55 years (36, 21.2%) followed by the age group 56-65 years (34, 20.0%). A majority of 102 (60.0%) of the participants were female. The most common occupation was "housewife" (51, 30.0%). Most of the study participants were literate (123, 72.4%). A majority of participants (104, 61.2%) reported comorbidities: 30 (17.6%) reported gastro-esophageal reflux disease, 26 (15.3%) reported allergic rhinitis, 20 (11.8%) were hypertensive, 16 (9.4%) had nasal polyps, 9 (5.3%) were diabetic and 8 (4.7%) had rhinosinusitis. Less frequently reported were obesity, chronic heart failure, eczema, and HIV/AIDS. 33(19.4%) had more than one comorbidity. (Table 1)

A majority of patients reported previous history of lung disease 156 (91.8%); of which asthma and chronic bronchitis being the most common diagnoses reported by patients. The clinician reviewing the patient reported what their leading diagnosis was following the encounter: 83(48.8%) chronic bronchitis, 61(35.9%) asthma, 23(13.5%) COPD, 5(2.9%) post TB chronic lung disease, 4(2.4%) rhinosinusitis, and 3 (1.8%) interstitial lung diseases, OSA and bronchiectasis each. (Table 1). There was poor agreement between physician and patient-reported diagnoses for different CRDs: asthma (kappa for= asthma 0.083), for COPD (kappa = 0.271, and for chronic bronchitis (kappa = 0.009).

Table 1 Baseline characteristics

Variables	**n (%)**
Age	
18-25	11 (6.5)
26-35	37 (21.8)
36-45	26 (15.3)
46-55	36 (21.2)
56-65	34 (20.0)
>65	26 (15.3)
Female Sex	102 (60.0)
Occupation	
Housewife	51 (30.0)
Employed worker	21 (12.4)
Construction, mining, factory laborer	19 (11.2)
Farmer	5 (2.9)
Merchant	4 (2.4)
Other	70 (41.2)
Educational status	
Literate	123 (72.4)
Comorbidities	104 (61.2)
Gastro-esophageal reflux	30 (17.6)
Allergic rhinitis	26 (15.3)
Hypertension	20 (11.8)
Nasal polyps	16 (9.4)
Diabetes mellitus	9 (5.3)
Rhinosinusitis	8 (4.7)
Obesity	5 (2.9)
Chronic Heart Failure	4 (2.4)
Eczema	2 (1.2)
HIV positive	1 (0.6)
Patient report of known lung disease or treated illness	
Any	156 (91.8)
Asthma	110 (64.7)
Chronic bronchitis	44 (25.9)
Tuberculosis	24 (14.1)
COPD	6 (3.5)
Measles	4 (2.4)
Whooping cough	2 (1.2)
Clinician diagnosis	
Chronic Bronchitis	83(48.8)
Asthma	61(35.9)
COPD	23(13.5)
Post TB chronic lung diseases	5(2.9)
Rhinosinusitis	4(2.4)
ILD	3(1.8)
OSA	3(1.8)
Bronchiectasis	3(1.8)

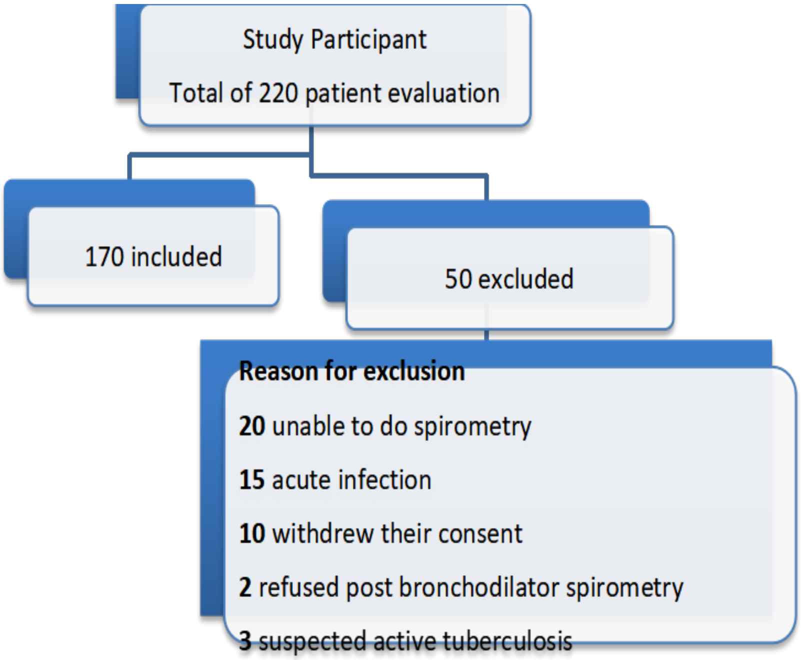

Figure 1: Selection of study participants Study flow diagram illustrating participant selection and consent type

The common presenting symptoms at presentation were wheezing in the last twelve months 156 (91.8), cough 138 (81.2%), severe limiting breathlessness 137 (80.6%), phlegm production 115 (67.6%), weight loss 103 (60.6%), and night sweats 102 (60.0%) (Figure2).

Data on possible risk factors for CRDs were collected: 144 (84.7%) lived in towns or cities, and 39 (22.9%) were either active or passive smokers (Active smokers 13: passive smokers 26 patients). Patients were asked to estimate the distance of their home to a major road, 65 (38.2%) lived less than 100 meters, 59 (34.7%) lived 100 to 500 meters and 46 (27.1%) lived more than 500 meters. More than half of the patients, 50.6% , were exposed daily to vapors, dust, gases, or fumes. Fifty-eight (34.1%) were exposed to smoke from biomass burning. Of the total, only 17 (10.0%) cultivated crops. Most of the participants 96 (56.5%) had contact with animals. BMI was used to categorize weight, 92 (54.1%) were normal weight, 33 (19.4%) overweight, 27 (15.9%) underweight, and 18 (10.6%) obese. (Table 2)

Skin prick testing (SPT) showed that, overall, 138 (81.2%) had one or more positive skin prick tests. Fifty -eight (34.1%) for cat, 75 (44.1%) for dog, 74 (43.5%) for cockroach and 123 (72.4%) were positive for dust-mite skin prick testing. The majority of patients, 158 (92.9%) of study participants, completed 6- minute walk test, whereas, 11(6.5%) paused or stopped. The mean distance walked was 414.5 meters (95% CI (396.7-431.8) and 123 (72.4%) had normal 6MWT (≥400m). (Table 2)

Lung function status of the study population

Classification of spirometry showed that 23 (15%) of patients had normal spirometry, 29 (19%) obstructive, 36(23.5%) restrictive and 61(39.9%) mixed obstructive & restrictive patterns. Mean FEV1 (% predicted) 54% (SD=26), mean FVC (% predicted) 65% (SD=26), and mean FEV1/FVC ratio of 0.64 (SD=0.14).

Table 2: Potential risk factors, Skin prick test (SPT), and 6MWT in study participants.

Variables	No (%)
Active or passive smoker	39 (22.9)
Place of residence	
Town or city	144 (84.7)
Suburban	11 (6.5)
Rural	15 (8.8)
The distance of your home from a major road	
Less than 100 meters	65 (38.2)
100 to 500 meters	59 (34.7)
More than 500	46 (27.1)
Daily breathe in vapor, dust, gases, or fumes	86 (50.6)
Exposure to smoke from burning	58(34.1)
Use of aerosols or spray at home	59 (34.7)
Burn incense at home	39 (22.9)
Fire bricks	7 (4.1)
Cultivate crops	17 (10.0)
Contact with animals	96 (56.5)
BMI	
Underweight	27 (15.9)
Normal weight	92 (54.1)
Overweight	33 (19.4)
Obesity	18 (10.6)
Allergy for SPT	
Positive	138 (81.2)
Negative	32 (18.8)
More than one positive SPT	100 (58.8)
Cat Positive	58(34.1)
Dog Positive	75(44.1)
Cockroach positive	74(43.5)
Dust Mite Positive	123(72.4)
Six –minute walking test	
Normal ≥400m	123(72.4)
Reduced<400m	46(27.1)
Not done	1(0.6)

Educational status, the patient-reported physician-diagnosed asthma and chronic bronchitis, breathlessness, and clinician diagnosed chronic bronchitis, asthma and COPD, showed a significant difference in pulmonary function (FEV1/FVC). No significant difference in pulmonary function testing was seen for environmental and domestic exposures.

In the univariate analysis, a decreasing in the FEV1/FVC ratio (i.e. indicating obstruction) was found to be significantly associated with increasing age, lower educational status (illiteracy), being severely breathlessness during exertion and a diagnosis of asthma or COPD. On the other hand, whereas a diagnosis of chronic bronchitis was associated with an increasing FEV1/FVC ratio (indicating i.e. less obstruction). In the multivariate analysis, decreasing FEV1/FVC ratio (indicating i.e. obstruction) was found to be significantly associated with increasing age, decreasing BMI, being severely breathlessness during exertion and a diagnosis of asthma or COPD. However, it was not associated with rural/urban residence or a diagnosis of chronic bronchitis.

Table 3: Comparison of FEV1/FVC ratio between groups.

Variable	No	Mean FEV1/ FVC	SD	P-value
Age				0.145
18-25	11	0.66	0.13	
26-35	37	0.70	0.14	
36-45	26	0.66	0.17	
46-55	36	0.64	0.12	
56-65	34	0.62	0.15	
>65	26	0.62	0.14	
Educational status				0.034
Literate	123	0.66	0.14	
illiterate	47	0.61	0.14	
Place of residence				0.098
Town or city	144	0.66	0.14	
Suburban	11	0.58	0.15	
Rural	15	0.61	0.14	
BMI				0.063
Underweight	27	0.64	0.16	
Normal weight	92	0.63	0.15	
Overweight	33	0.69	0.12	
Obesity	18	0.71	0.09	
Patient report of known lung disease or treated illness				
Asthma				<0.001
Yes	110	0.61	0.13	
No	60	0.71	0.14	
Chronic bronchitis				0.005
Yes	44	0.70	0.12	
No	126	0.63	0.14	
Common symptoms at presentation				
Breathlessness				<0.001
Yes	137	0.63	0.13	
No	33	0.75	0.13	
Clinician diagnosis				
Chronic bronchitis				0.002
Yes	83	0.68	0.14	
No	87	0.62	0.14	
Asthma				0.020
Yes	61	0.61	0.13	
No	109	0.67	0.14	
COPD				<0.001
Yes	23	0.54	0.10	
No	147	0.66	0.14	

Table 4. A associated factors with the FEV1/FVC ratio using multivariable linear regression analysis

Variable	Multivariable	
	Unstandardized coefficient β (95% CI)	P-value
Age	-0.001 (-0.003, 0.000)	0.017*
Educational status (illiterate Vs literate)	-0.001 (-0.45, 0.44)	0.97
Breathlessness	-0.106 (-0.154, -0.058)	<0.001*
The patient reported doctor-diagnosed		
Asthma	-0.043 (-0.085, 0.000)	0.049*
Chronic bronchitis	0.026 (-0.019, 0.070)	0.256
Place of Residence (Town Vs rural)	0.036 (-0.015, 0.008)	0.163
BMI	0.004 (0.000, 0.008)	0.034*
Clinician diagnosed		
Chronic bronchitis	0.017 (-0.083, 0.050)	0.623
Asthma	-0.074 (-0.142, -0.005)	0.035*
COPD	-0.139 (-0.219, -0.059)	0.001*

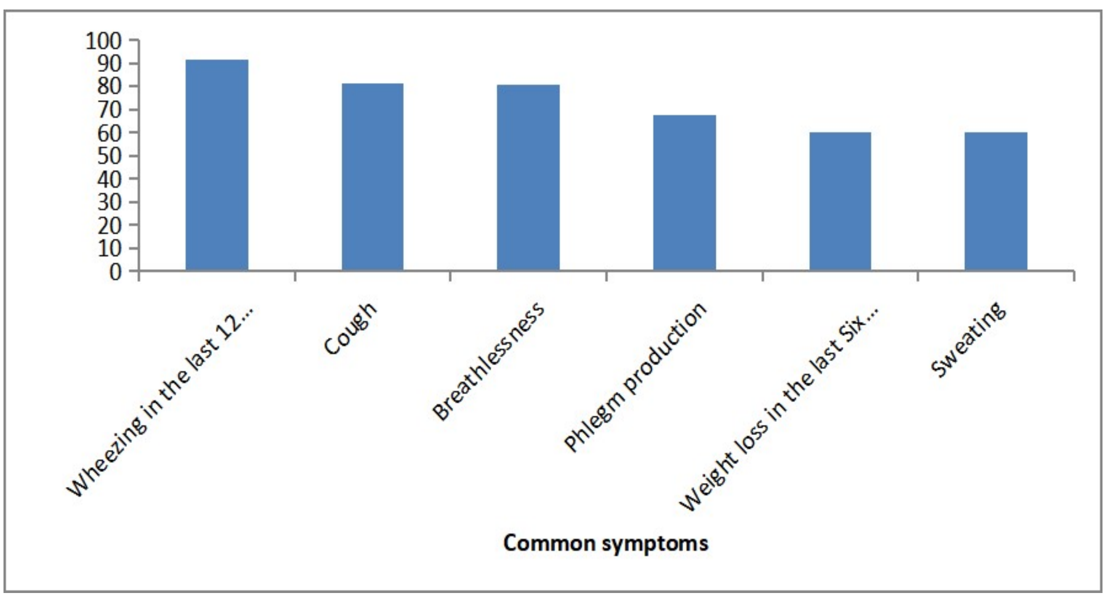

Figure 2: Common symptoms of study participants in Bishoftu general hospital, Ethiopia

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Age, breathlessness, patient-reported doctor-diagnosed asthma, BMI, clinician diagnosed asthma, and COPD remained independently associated factors in multiple linear regression after selecting variables significantly associated with FEV1/FVC in bivariate analysis (simple linear regression).

Our multivariate model explained 35.6 % of the variance in the FEV1/FVC ratio in a multiple regression study (R2 = 0.356, p <0.001). Keeping other variables constant, each one-year increase in age decreased the FEV1/FVC ratio by 0.001 (P = 0.017). Patients with the presenting symptom of breathlessness had a lower FEV1/FVC ratio by 0.1 (p <0.001) compared to patients without the breathlessness symptom. Patients who reported doctor-diagnosed asthma had a 0.043 (p = 0.049) lower FEV1/FVC ratio than those who did not. For each unit, an increase in the BMI index results in an increase of 0.004 (p =0.034) in the FEV1/FVC ratio. Furthermore, the lung function test (FEV1/FVC) of patients diagnosed with asthma and COPD was decreased compared to their counterparts by 0.074 (p = 0.035) and 0.139 (p 0.01), respectively. (Table 4)

Discussion

This study characterized the common non-communicable respiratory diseases seen at an outpatient department of general hospital in a low-income countries. This study demonstrated that there was a significant discrepancy between physician and patient reported diagnosis and a high burden of abnormal lung function tests. The patterns with mean FEV1 and FVC were 54% and 65% of the predicted values, respectively, while the mean FVC 65% predicted and mean FEV1/FVC ratio of was 0.64. In this Spirometric evidence of airflow obstruction was associated with increasing age, decreasing BMI, limiting exertional breathlessness on exertion, and previous diagnosis of bronchial ed asthma or COPD, but not with urban/rural residence of or diagnosis of chronic bronchitis.

In the current study of 170 patients presenting with chronic respiratory symptoms to an out-patient clinic in Ethiopia, 19% had purely obstructed spirometry with median FEV1/FVC of 67%. In comparison, a study of patients with treated/cured pulmonary TB with chronic respiratory symptoms in Benin had a median FEV1/FVC ratio of 81%, and a study of textile workers in Kano, Nigeria reported that 10% had obstructive spirometry (14-16). These differences are likely to be the consequence due to the difference in study populations, general respiratory patients, post TB patients, and textile workers.

In our study, we found a low prevalence of smoking and high exposure to biomass and daily exposure to vapors, gases, dusts, and fumes, which contrast with previous studies from developed nations: Sweden, Norway, and Spain reporting high prevalence of smoking and low exposure from biomass or daily exposure to vapors, gases, dusts, and fumes (17-19). Although there was high exposure to vapors, gases, dusts, fumes and biomass. These substances in our study; itthis was not associated with high rates of symptoms and abnormal lung function, most probably reflecting due to the small sample size of 170.

In the current study, The prevalence of allergic sensitization as quantified by skin prick testing was 81.2% in our study. This is higher than the positive SPT rate of 67.3% reported by Africa Severe Asthma projects in Uganda, Kenya, and Ethiopia, despite these studies involved being studies of asthmatic patients investigated with, and an extended panel of twelve allergens. Our rate of positive skin prick tests is higher than the rate of 56.6% reported in Hungary (20, 21). Even though there was high rate of SPT positivity, the associations of SPT positivity with Asthma diagnosis was not significant. The differences in these findings between our study and others are most likely due to reflect differences in study populations, geography, and genetic susceptibility.

A previous study conducted in Ethiopia by Bayisa TTola et. al in Ethiopia reported that 26% of 144 clinically diagnosed patients with obstructive airway disease had a history of prior tuberculosis treatment and almost 17% had ever smoked cigarettes, which was entirely among men. Asthma was the major diagnosis in 86% of patients; the rest being diagnosed with COPD with 55.8% of asthmatic and 63.6 % of COPD patients having obstructed defect. , However, only 56% of their patients had spirometry performed, in contrast to the 100% in our study. Among COPD patients, 40% were females and 40% were ever smokers. When compared with our study, Bayisa T et al this study reported a much higher prevalence of obstructive lung disease, most probably reflecting the focus of the previous study on those patients diagnosed with obstructed lung diseases in a tertiary hospital chest clinic that is a referral center for all patients with a pulmonary problem in the country (22). In contrast, our study included was of all patients with chronic respiratory symptoms, irrespective of their diagnosis attending a general non-tertiary hospital.

In our study, smoking status was not associated with significant difference in lung function, which is consistent with reports from Benin and Taiwan (23, 24). However, it contrasts with studies conducted in Latin America and the USA (25-29). This might reflect our small sample size and the widespread exposure to other inhaled noxious agents in our patients.

Several cross-sectional comparative longitudinal, and cohort studies have reported that as people become age, their FEV1/FVC ratio declines (15,23, 28-31). The current study is in line with these reports. The findings are current study is also consistent with other studies that patient-reported doctor-diagnosed asthma is significantly associated with reduced FEV1/FVC ratio (32).

Our study results suggested a significant association between decreasing BMI and decreasing FEV1/FVC ratio analogous to findings from a study of the Caribbean population.

Finally, our study showed that most of the study patients who were all symptomatic and attending an outpatient clinic had abnormal lung function and that lung function were significantly decreased particularly in those with a diagnosis of COPD. A similar association was observed in studies across different regions (33-35). Although COPD as an obstructive lung disease is defined by a decrease in the FEV1/FVC ratio, its diagnosis in most African countries is often clinical due to limited access for in Africa because spirometry is rarely available, a diagnosis of COPD is usually a clinical one, not based on spirometry. Similarly, the present study reveals that clinically un- diagnosed asthma was independently associated with a decrease in the FEV1/FVC ratio. This suggesting that some patients who are clinically diagnosed with bronchial with a clinical diagnosis of asthma may actually have , not supported by spirometry should in fact be diagnosed with COPD.

Limitations of the study

The study's limitations include its single-center, institution-based design and small sample size, which may limit its generalizability. Despite these limitations, the study provides useful insight into risk factors and lung function status among patients with chronic respiratory symptoms in Ethiopia.

Conclusion

In conclusion, this study indicates a high burden of lung function abnormality patterns with a low mean FEV1/FVC ratio. All patients experienced were symptomatic primarily with such as wheezing, cough, breathlessness, and phlegm production. Chronic bronchitis and asthma were the most common CRDs diagnosed by treating physician-diagnosed respiratory diseases. Older age at presentation, breathlessness, patient-reported doctor-diagnosed asthma, low BMI, clinically un-diagnosed asthma, and COPD are significantly associated with reduced pulmonary function. Given The high prevalence of abnormal lung function tests patterns among patients clinically diagnosed with CRDs, spirometry services should be made readily available for routine evaluation of such patients in Ethiopia. should prompt spirometry services to widely be available to determine the exact patterns of lung abnormality. This study serves will help as a baseline for future large-scale community studies in Ethiopia using more advanced diagnostic tools in order to understand the diseases burden and risk factors more accurately. to design larger sample size and more confirmatory institution and community-based studies to understand the burden of chronic lung disease, and determine what the major risk factors are for CRDs and determinants of pulmonary function in Ethiopia. Additionally, this information can be used toIt also helps in designing preventive measures based on the identified risk factors for CRDs.

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Declaration of competing interest:

The authors declare that they have no known competing financial interests or personal relationships that could potentially influence the work reported in this paper

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