



**ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE
GRAGUATE STUDY PROGRAM**

**MAGNTUDE OF RESTRICTVE LUNG DISEASE ANDT ITS
ASSOCIATED FACTORS AMONG PATIENTS ATTENDED CHEST
CLINC, SPHMMC, ADDIS ABABA, ETHIOPIA (2023/24)**

By: Gizealew Kebede

Addis Ababa, Ethiopia

JULY 2024



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**A Research Theses submitted to the Department of Intensive Care Medicine;
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Addis Ababa, Ethiopia

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Abstract

Introduction: This thesis aimed to investigate the magnitude of restrictive lung disease and its associated factors among patients seen at the Chest Clinic of St. Paul's Hospital Millennium Medical College (SPHMMC) in Addis Ababa, Ethiopia over a 5-year period from January 1, 2019 to December 31, 2023. Relying on a sample of 271 patient charts collected from the clinic, the researchers conducted both descriptive and analyses to examine the magnitude of restrictive lung disease and its related determinants.

Objective: This study aims to determine the magnitude of Restrictive Lung Disease and Its Associated Factors Among Patients Attended Chest Clinic, SPHMMC Addis Ababa Ethiopia (2023/24).

Methods: A five years retrospective study design was employed among 271 participants at SPHMMC from 1st January 2019 to 31st December 2023. Data from patient's medical chart reviews. The collected data was analyzed using statistical software Stata version 13. Simple descriptive, binary, and multivariable logistic regressions was used to examine the data. In multivariable logistic regression a statistically significant association in a predictor variable with a p-value < 0.05 was included. Finally, the analyzed data presented using the sentence, figure, and table.

Result: having history of chronic lung disease increases the magnitude restrictive lung disease from 25% goes up to 31%. (AOR=2.45; 95% CI: 1.13 to 5.34) higher for patients with history of chronic lung disease than patients with no history of chronic lung disease.

Age: The adjusted odds ratio (AOR) for age is 1.06 (95% CI: 1.04-1.09), with a p-value of 0.000. This suggests that there is a statistically significant positive association between age and restrictive lung disease.

Conclusion: one out of every four patients were found to have been diagnosed with restrictive lung disease. Furthermore, the study revealed a positive correlation between a history of chronic lung disease and age the likelihood of being diagnosed with restrictive lung disease.

Keywords: Restrictive Lung, Pulmonary Fibrosis, Interstitial Lung Diseases, Regression Analysis, chest clinic and magnitude

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Acronyms and Abbreviations

CVD: Cardiovascular Disease

CT: Compute Tomography

DCO: Decreased Diffusing Capacity

ERV: Expiratory Reserve Volume

FEV 1: Forced Expiratory Volume in 1 Second

FVC: Forced Vital Capacity Ratio

FRC: Functional Residual Capacity

GBS: Gilliam Bray Syndrome

HR: High-Resolution

ILD: Intestinal Lung Disease

MMFR: Maximal Mid Expiratory Flow Rate

NUT: National Taiwan University

PaCO₂: Partial Pressure of Arterial Carbonado Ide

PFT: Pulmonary Function Test

PTR: Pulmonary Tuberculosis

Rheumatoid Arthritis

SPHMMC: ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

SS: Systemic Sclerosis

6MWT: Six-Minute Walk Test

TLC: Total Lung Capacity

TYG: Triglyceride-Glucose Index

TNF: Tumor Necrosis Factor

VC: Vital Capacity

1. Introduction

1.1. Background

Magnitude of restrictive lung disease is reduced lung expansion, given as a lower total lung capacity. Restrictive lung disease underlying illnesses and disorders, including pleural effusions and chest disorders, diaphragmatic disorders, neuromuscular diseases, thoracic deformities, obesity, heart failure, pregnancy, may be reflected worldwide in more than 200 restrictive lung diseases. The cause of restrictive disease include sarcoidosis, multiple pneumoconiosis, and idiopathic pulmonary fibrosis(1). Restrictive lung diseases are a heterogeneous set of pulmonary disorders defined by restrictive patterns on spirometry(2). restrictive lung disorders in healthy subjects result in severe dyspnea when, because of decreased inspiratory capacity and inspiratory reserve volume(3).

The study done at European Respiratory Society reports magnitude of restrictive lung disease and its associated factors pulmonary fibrosis, connective tissue disease and collagen vascular disease. Magnitude of restrictive lung disease is diffuse parenchymal lung problems, or interstitial lung illnesses, are linked to significant morbidity and mortality. With a significant degree of restrictive lung disease clinical behavioral variability, idiopathic pulmonary fibrosis is the most fatal of the interstitial lung disorders (4).

The study done in U.S.A magnitude restrictive lung disease decrease in lung volumes is a component of the multifactorial clinical disease known as restrictive lung disease. Its estimated magnitude is up to 15% in the older population and 6% in the general adult population. Although lung volumes must be measured to diagnose restriction lung, the most common indicator for this disease is a decrease in forced ventilatory capacity with simple spirometry magnitude restrictive lung disease. According to several analytical techniques, the magnitude of restrictive ventilatory structure has been associated to mortality in the national health and nutrition examination survey(NHANES) population, with adjusted hazard ratios varying from 1.4 to 1.7(5).

Several studies have shown at Sylvanus Olympio were associated factors restrictive lung disease a typical extra-articular sign of rheumatoid arthritis 85.7%were female and 46.4% had respiratory symptoms were women. With CXR, the only pleuropulmonary lesion that was detected was

restrictive lung disease (17.8%).25% of individuals had abnormal spirometry, with associated restricted lung disease(6).

The study done Hospital-based Cross-Sectional Study from Bishoftu Hospital Ethiopia was shown restrictive lung disease. there are 39% shown mixed restrictive and obstructive lung disease. On the others hands 23.5 % shown magnitude of restrictive lung disease. Spirometry classification revealed 39.9%mixed obstructive & restrictive lung and 23.5% restrictive lung disease(7). In a chest clinic, magnitude of restrictive lung disease is the third most widespread diagnosis. The most prevalent type of idiopathic interstitial pneumonias is nonspecific restrictive lung disease pneumonia, or pneumonitis. This serves as a warning to properly address the management, diagnosis, and prevention of interstitial lung disease(8).

Magnitude of restrictive lung disease is wide and integrates a variety of disorders with several underlying causes. Diffuse parenchymal lung disorders, or restrictive lung diseases, are an umbrella terms that includes around 300 illnesses. The tissue that surrounds the lung's air sacs, or alveoli, and is encircled by the alveolar epithelium and capillary endothelium is referred to as interstitial. Patients who have inflammatory and/or fibrotic diseases typically experience shortness of breath, coughing, exhaustion, and weight loss as a result of the inflammation and/or fibrosis that causes a progressive reduction in lung function and impeded gas exchange. Exposure to environmental pollutants, viral infections, and autoimmune disorders are the most frequent causes of restrictive lung disease but many are idiopathic(9). Restrictive lung disease functional changes will differ based on the type and extent of restriction lung. People with extra lung disease restriction often have hypoventilation and a decrease in the chemical that stimulates breathing(10).

A reduction in lung volumes is an indicator of lung restriction, a multifactorial clinical condition that gets worse with age. Spirometry reveals a restrictive prevalence in about 12% of the general population. Restrictive disease have been associated factors to high mortality rates and a number of cardiovascular disease risk factors, such as obesity, diabetes mellitus, dyslipidemia, and systemic arterial hypertension (11).

Forced expiratory volume in one second and forced vital capacity reduced during spirometer (ratio is normal). Symptoms: dyspnea and a persistent dry cough. Interstitial lung disease cause inflammation or scarring of the lung tissue or result in filing of the air spaces with exudate and

debris pneumonitis. The interstitial becomes thickened and fibrotic due to increased release of elastic fibers and collagen from fibroblasts which will lead to stiff lung and results in decrease oxygen diffusion capacity. Extrinsic lung are associated factors related to the components of the respiratory pump not the lung tissue itself: chest wall, pleura, respiratory muscles and Guillain-Barré syndrome weakness of intercostal muscle). Abnormalities of the chest wall include bony abnormalities (kyphosis or kiphoscoliosis), massive pleural effusion, morbidity obesity and neuromuscular respiratory disease (12).

1.2. Statement of the Problem

Restrictive lung diseases have a global influence, affecting individuals in various regions and population's worldwide. Restrictive lung disease is characterized by a decrease in lung volume, leading to reduced capacity for air exchange and inadequate ventilation. This condition can arise from intrinsic factors, affecting the lung parenchyma, or extrinsic factors, impacting the structures surrounding the lungs. Restrictive lung disease and its contributing factors are serious health issues that need to be addressed. Restrictive lung disease on spirometry, age, female sex, white race, lesser education, past and present smoking, comorbidities like diabetes, cardiovascular disease, and abdominal obesity were all positively correlated with restrictive lung disease (13).

Environmental Factors the development of restrictive lung disease may be facilitated by extended exposure to contaminants, such as chemicals, dust, and some industrial compounds. Among the considerable research conducted on environmental related factors. These studies have demonstrated how long-term exposure to air pollution affects changes in lung function over time (14).

The study done in Ethiopia, Kenya and Sudan: with low and middle-income nations suffer most of the chronic restrictive lung disease burden, with new population-based studies indicating significant levels of restrictive lung disease and decreased lung function (15). Occupational exposure to chemicals, gases, dust, and fumes at work has been related to a higher incidence of respiratory illnesses and lung function impairment (16).

Despite this fact, as to my observation and the exploration, I made, there is very limited research or recent information on the restrictive lung disease itself, especially in Ethiopia. Due to this

reason, we have very limited awareness and knowledge on this disease including health professionals. This lack of understanding, especially of health professionals, could contribute to delays in diagnoses, treatment and suboptimal management of the condition. Moreover, there are no sufficient trained professionals who specialized on restrictive lung disease. Thus, by considering the mentioned gaps the researcher is going to conduct this research. The cause for restrictive lung disease may be related to socio-demographic factors including age, gender, marital status, and occupation, extrinsic lung disease such as environmental factors, infections, allergic reactions, and autoimmune diseases and intrinsic lung disease like smoking, interstitial lung disease pneumonia, pulmonary fibrosis, and cystic fibrosis. Specific studies not magnitude of restrictive lung disease conducted at SPHMMC (Saint Paul's Hospital Millennium Medical College).

1.3. Significance of the Study

Magnitude of restricted lung disease is a major public health issue since it impacts a large number of people globally. This was be known the frequency, contributing variables, and consequences associated to magnitude of restricted lung disease can aid in the understanding of focused preventative plans, rapid identification, and efficient management of the restrictive lung disease.

The study was be significant for medical professionals as they can learn more about the burden magnitude of restricted lung disease, its effects on people, society, and how to create solutions to reduce that burden of restrictive lung disease. Determination of risk factors and examining the variables linked to restrictive lung disease may assist in defining the adaptable associated factors that influence the magnitude restrictive lung disease. Development of this knowledge, treatments and preventative measures can be put in place to lower the magnitude of restrictive lung disease. Clinical guidelines and policies can be developed locally, nationally, and internationally based on the results of restrictive lung disease research. In order to ensure consistent and evidence-based care for restrictive lung disease, this helps to standardize the diagnostic criteria, treatment procedures, and initiatives related to public health.

2. Literature Review

The restrictive lung disease global burden of there were 545 million cases of chronic respiratory disease in the world in 2017, which is an increase of 40% from 1990. The number of cases of chronic respiratory diseases varied greatly among Global burden disease super-regions, with high-income areas showing the highest prevalence for both males and females, and sub-Saharan Africa and south Asia showing the lowest prevalence (17).

Using NHANES values for White Americans, the magnitude of restrictive lung disease reduced FVC was 70.4% for men and 72.8% for women; utilizing NHANES equations for African Americans, the prevalence was 17.8% for men and 14.4% for women; and utilizing the Global Lung Function Initiative 2012 equations, the prevalence was 15.5% for men and 20.5% for women. By applying the formulas obtained from survey participants who did not smoke and did not have a respiratory diagnosis, it was found that less than 4% of men and women had reduced forced vital capacity(18).

Chronic respiratory failure could be brought on by restrictive lung disease, which is more common in individuals with neuromuscular disease (NMD) and ribcage deformity. This is a clear sign that home noninvasive ventilation (HNIV) should be started. On the other hand, individuals with normal daytime gas exchange may only exhibit daily symptoms, orthopnea, and sleep difficulties in the early stages of neuromuscular disease (19).

Prevalence of restrictive lung 0.4 and 10.3 for idiopathic pulmonary fibrosis (IPF), 6.6 and 71.7 for non-IPF F-ILDs, 0.3 and 1.5 for systemic sclerosis-associated interstitial lung disease (SSc-ILD), and 9.4 and 83.6 for interstitial lung diseases (ILDs) were the ranges of incidence per 100,000 person-years in 2018. For ILDs, the range of prevalence per 100,000 individuals was 33.6 to 247.4, for F-ILDs, 26.7 to 236.8, for IPF, 2.8 to 31.0, for non-IPF F-ILDs, 22.3 to 205.8, and for SSc-ILD, 1.4 to 10.1(20).

The magnitude of restrictive lung disease, study done in London, UK, shows that progressive fibrosis interstitial lung disease a relative decrease in forced vital capacity (FVC) of 10% or more over a 24-month period in spite of therapy. In 18–30% of cases, fibrotic lung diseases like IPF,

systemic sclerosis, or chronic hypersensitivity pneumonitis coexist with ILD, which is characterized by marked pleural and parenchymal involvement with upper lobe predominance (21).

Study done in Canada University of Calgary ILD clinic a mixed-methods study of interstitial Lung disease shows of the 50 patients, 27 (or 54%) needed additional oxygen therapy or had a peripheral oxygen saturation level on the six minute walk test that was less than 88%(22).

Study done in North American Lower airway inflammation brought on by chronic bronchitis includes neutrophil inflammation and signs of increased mucus production. By far the most frequent cause of chronic bronchitis in humans is exposure to tobacco smoke, obesity significantly impairing lung function, cough, and activity levels (23).

Another quantitative study done in America assessed Emphysema and lung function the baseline median percent of people with emphysema was 3%, and it rose by 0.58 percentage points on average every ten years(24).

The study done in New York Colombia University 194 subjects (8%) out of 2416 cigarette smokers who participated in the COPD Gene study had an interstitial lung abnormality. Age, tobacco exposure, and current smoking all raised the prevalence of an interstitial deviation(25).

Data from the National Health and Nutrition Examination Survey were analyzed for the study respiratory symptoms, chronic bronchitis, and magnitude of restrictive on spirometers were associated to triglyceride-glucose index (TyG). Increased TyG was linked to increased risk factors for cough, mucus production, exertion dyspnea, wheezing, chronic bronchitis diagnosis, and restrictive lung disease spirometer (26).

The study done in the University of California, San Francisco, USA cystic fibrosis After reaching a FEV1 < 30%, there is a 10% annual risk of death, and many patients pass away shortly after. In patients with severely compromised lung function, there are further risk factors for death, such as predicted FEV1 < 25%, FEV1 decline < 25%, PaCO2 > 50 mmHg, decreased functional status, and pulmonary hypertension(27).

The study done in the University of Manchester Division Smoking-related inflammation of the small airways precedes fibrosis and tissue loss. Age, tobacco exposure, and current smoking all increased the prevalence of an interstitial abnormality(28).

Study done associated factor magnitude of restrictive lung disease in the United States and northern Europe, rheumatoid arthritis (RA) is a systemic inflammatory disease that affects approximately 1% of the population. Lung involvement is the most prevalent extra-articular manifestation of RA, affecting up to 60% of patients during the course of the disease. Clinically, RA can affect any compartment of the lung including the parenchyma, where it can cause rheumatoid nodules or interstitial lung disease (ILD); the pleura, where it can cause effusions and/or inflammation; the small and large airways, where it can cause bronchiectasis, constrictive or follicular bronchiolitis, cricoarytenoid and the pulmonary vasculature, which can cause vacuities and pulmonary hypertension. Significant morbidity and death are linked to lung involvement, especially RA-ILD(29).

A study done in USA, South Carolina, one of the most prevalent and dangerous side effects of systemic sclerosis intestinal lung disease (SS-ILD) affects a sizable fraction of those who have the illness. It is characterized by lung interstitial inflammation and fibrosis, which causes lung tissue to stiffen and scar. Restrictive lung disease is the outcome, which is characterized by decreased lung compliance and compromised lung function. While a mortality rate of up to 40% after ten years and a prevalence of up to 30%. While dyspnea, cough, and a non-specific interstitial pneumonia prevalence on CT scan are the most common symptoms of systemic sclerosis-associated interstitial lung disease, a small percentage of cases also meet the criteria for typical interstitial pneumonia. Up to 80% of SS patients have interstitial abnormalities visible on high-resolution CT (HRCT) of the chest, and up to 90% of patients have interstitial abnormalities visible at autopsy. However, only 30–40% of patients will experience clinically significant ILD, with a mortality rate of up to 40% after 10 years(30).

The study done in USA Lung function and cardiovascular disease: In the general population, magnitude estimates for restrictive ventilator prevalence vary from 3 to 12%. Obesity and the metabolic syndrome are independently factoring to the existence of a restrictive ventilator magnitude 10%, hypertension 12%and dyslipidemia11%. Individuals with a restrictive lung disease ventilator showed a higher magnitude of cardiovascular disease (CVD) than those with

normal spirometer, regardless of common CV risk factors. Similar associations with increased CVD risk were seen when using pletismographic total lung capacity, the gold standard method for diagnosing a restrictive lung disease, compared to using FVC criteria alone. Restrictive ventilatory have also been demonstrated to be predictive of cardiovascular and all-cause mortality with heart disease accounting for 39% of deaths and respiratory and lung cancer accounting for less than 10% of fatal events(31).

The primary cause of persistent restrictive lung disease and the need for home oxygen therapy was increasing kyphoscoliosis. Coffin-Lowry syndrome manifests in males as skeletal anomalies, severe developmental impairment, and deformities of the face. About 80 percent of cases have a connection to as demonstrated in this example; kyphoscoliosis can be extremely severe, leading to paraplegia and restrictive lung disease(32).

Patients with restrictive diseases exhibited reduced lung area change rate and diaphragmatic motion. The lung area in/height's area under the curve (AUC), sensitivity, and specificity were 0.88, 0.77, and 0.88, respectively, with the restrictive diseases serving as benchmarks(33).

Pulmonary dysfunction and type 2 diabetes (T2D) have been linked in recent research. There are still gaps in our understanding of the prevalence and risk factors for particular pulmonary functional deficits in a number of populations, including sub-Saharan Africans (SSA). In SSA with T2D, we evaluated the prevalence and determinants of particular restrictive lung disease impairment(34).

Descriptive statistics were used to examine the patterns of pulmonary function impairment between the exposed and control groups. Of the cleaners, almost 17 (24.3%) acquired obstructive lung disease, whereas 16 (22.9%) developed restrictive lung illness(16).

2.2 Conceptual Framework

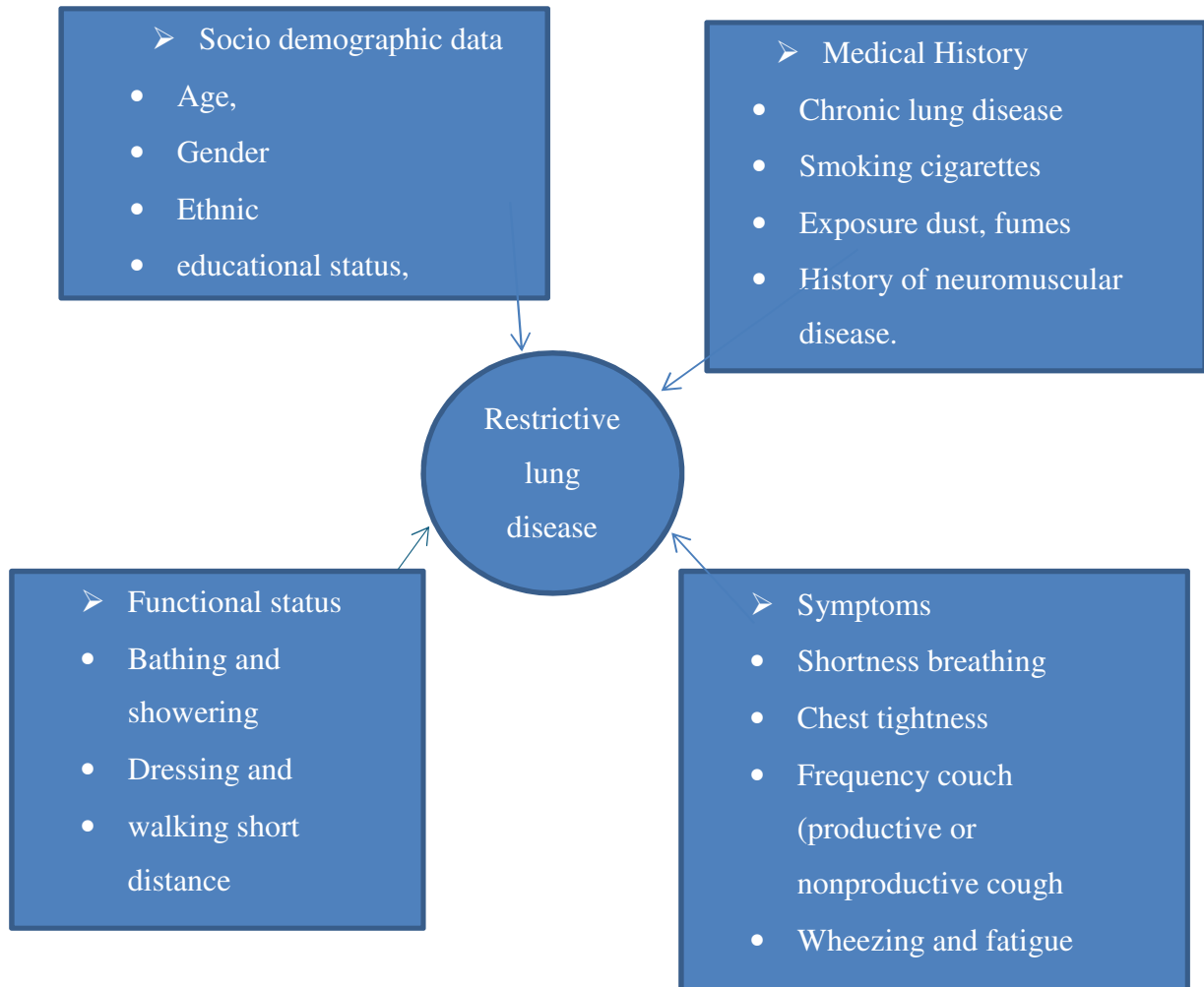


Figure 1:conceptual framework, SPHMMC, 2019-2023.

conceptual framework of restrictive lung disease (35)

3. Objective

3.1. General Objective

- ❖ To assess the magnitude of restrictive lung disease and its associated factors among patients attended Chest Clinic, SPHMMC Addis Ababa Ethiopia from 1st January 2019 to 31st December 2023.

3.2. Specific Objectives

- ❖ To assess the magnitude of restrictive lung disease on patients who attended the chest clinic at SPHMMC.
- ❖ To identify factors associated with restrictive lung disease on patients who attended the chest clinic at SPHMMC.

4. Methods and Materials

4.1. Study Area Setting

The study was conducted in St. Paul's Hospital Millennium Medical College. SPHMMC is located in Gulele Sub-City in Addis Ababa, Ethiopia. The late Emperor Haile Selassie founded the hospital in 1968, and the medical school opened its doors in 2007. However, the council of ministers issued a decree in 2010 that established St. Paul's Millennium Medical College. A board under the Federal Ministry of Health is in charge of it. For its undergraduate medical education, the college launched Ethiopia's first integrated modular and hybrid problem-based curriculum, and it expanded its postgraduate program offerings. Patients from all over the nation are referred to the college's more than 2,800 clinical, academic, administrative, and support staff members, who offer medical specialty services. While the inpatient capacity is more than 700 beds, The College sees an average of 1,200 emergency and outpatient clients daily.

4.2. Study Period

The study was conducted from 1st of April 2024 to May 30th, 2024.

4.3. Study Design

Institutional based retrospective chart review study was be conducted.

4.4. Source Population

All patients that are registered and attended the Chest Clinic at SPHMMC from 1st January 2019 to 31st December, 2023.

4.5. Study Population

Patients who attended the Chest Clinic at SPHMMC from 1st January 2019 to 31st December 2023 and met the inclusion criteria for being included in the study.

4.6. Inclusion Criteria

- All patients 'at SPHMMC Chest Clinic on patients who attended from 1st January 2019 to 31st December 2023.
- Participants should be aged greater than 14 years old.

4.7. Exclusion Criteria

- Children (Age <14).
- Patients who had incomplete medical record, death, information have no primary record chest clinic excluded from the actual study population.
- Previous Lung Surgery or Lung Transplant not eligible.

4.8. Sample size and sampling procedure

Sample size

Sample size was be calculated by using a single population proportion formula.

$$\text{Formula: } n_i = \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2}$$

$$n_i = \frac{(1.96)^2 \times 0.2(1-0.2)}{(0.05)^2}$$

Hence: 245.86~ 246

Where n_i = Initial estimated sample size

Z = Confidence level (alpha, α)

P = Magnitude of restrictive lung disease (20.%) from the previous (36).

d = Desired precision

N.B: Then, by adding 10% of non-respondent rate, final desired sample size is 246+ 10%.

➤ Then, the final sample size is 271.

Sampling procedure

A systematic random sampling method was used to select the sample from the registered charts among patients attended Chest Clinic, SPHMMC from 1st January 2019 to 1st December 30th, 2023.

According to the charts registration, it was determined that the sampling fraction (k) value was equal to $24,540/271 = 91$ starting point between 1 and the sampling interval 91 in this case. It makes a starting point of 12.

Every $91 + 12 = 103$ patients in the study was chosen.

4.9. Measurement

4.9.1. Study variables dependent and independent variable

Dependent Variable

- Restrictive Lung Disease

Independent variable:

- Age, Gender, Ethnic and educational status,
- Chronic lung disease
- Smoking cigarettes
- Exposure dust, fumes
- History of neuromuscular disease.
- Shortness breathing
- Rapid shallow breathing
 - Difficult lying flat
 - Chest tightness
 - Frequency cough (productive or nonproductive cough
 - Wheezing and fatigue
 - Bathing and showering
 - Dressing and walking short distance

- Climbing stairs
- Performing household
- Engaging in social activities

4.9.2. Data instruments

Data from patient medical chart reviews was collected using a checklist created after thorough evaluation of relevant research and subsequent literature review. The checklist was composed 27 questions, categorized into Part I: Socio-demographic data, Part II: Medical history, Part III, Symptom, Part IV Functional status, Part V Restrictive lung disease and Part, VI Additional information. The principal investigator was conducting a one-day training session for four BSc nurses on the study instrument and data collection procedures. These trained nurses were then be recruited and involved in the data collection process. The certified BSC nurse were complete the checklist and measure it from the patient's medical file.

4.9.3. Data collection procedures

The data collection methods for this study involve a structured questionnaire to gather relevant information from patients attending the Chest Clinic at SPHMMC. The secondary method involves reviewing patient medical charts to extract pertinent data. To ensure the accuracy and reliability of data collection, a training session was be conducted for four BSc nurses. The training was covering the study protocol, data collection procedures, and the proper use of the checklist. This was standardizing data collection techniques among the nurses involved in the study. Once trained, these nurses where be recruited to participate in the data collection process.

During data collection, the lead investigator was overseeing the process, ensuring that all documents are complete and adhering to the study protocol. Any incomplete documents where be cleaned up and quality-checked before being entered into stat software for analysis. Overall, the data collection methods aim to systematically gather comprehensive information from patient medical charts, utilizing standardized checklist and trained personnel to maintain data accuracy and reliability.

The presence or absence of various medical conditions was recorded, including: interstitial lung disease asthma, bronchitis, pneumonia and pulmonary fibrosis. The participant does exhibit the participant experiences dyspnea during physical exertion; decrease in exercise tolerance compared to previous levels, frequently experiences chest tightness, and the participant reports a persistent cough. The participant has a documented history of hypoxemia, dry cough and productive cough.

To collect the data, BSc a trained healthcare professional experience more than three years who works at SPHMMC Chest Clinic. Those who have been registered with restrictive lung disease SPHMMC is located in Gulele Sub-City in Addis Ababa and had complete medical record, information a research team was administer.

4.9.4. Operational definitions

Restrictive lung disease: Interstitial lung diseases, pulmonary fibrosis and Mixed obstructive lung disease.

Confirmed restrictive lung disease Normal forced vital capacity (FVC) >80%, mild 61-80%, moderate 50-60% and severe<50%. Restriction and Total lung capacity (TLC) < 80% = Restrictive disease, 70-80 % mild restrictive disease, 60-70% moderate restrictive disease, 50-60% moderately severe restrictive disease and < 50% severe restrictive disease (34).

Interstitial lung disease: The parenchyma of the lungs is affected by interstitial lung disorders.(37)

pulmonary fibrosis: Pulmonary fibrosis is a chronic and progressive tissue healing response, which results to permanent damage and remodeling of the lung(38).

Mixed obstructive lung disease: In mixed lung disease, the combination of these obstructive and restrictive mechanisms can lead to a complicated clinical picture(39)

4.9.5. Data quality control and management

Quality control measures was implemented throughout the study to ensure data accuracy and reliability. These include pretest was employed in 5% of the sample size, thorough training of data collectors, development of a carefully designed checklist, data cleaning and quality checking

before entry into Stata version 13, possible employment of double data entry, consistency checks, and detailed documentation of procedures. These measures aim to maintain high standards of data integrity and validity in the study.

The lead investigator was thoroughly review gathered information, ensuring completeness and quality. Incomplete documents were corrected before entering data into Stata for analysis. Descriptive analysis was utilized tables, bar graph, and pie charts, employing basic frequencies and proportions. A binary logistic regression model was assessing the relationship between independent and outcome variables. Potentially significant independent variables were undergone screening before inclusion in the multivariable binary logistic regression model. Significance testing was utilized odds ratio, p-values, and 95% confidence intervals, with a p-value < 0.05 indicating statistical significance in relation to the outcome variable

4.9.6. Data analysis procedure

The data processing and analysis phase involves steps to extract meaningful insights from the collected data. Initially, all information obtained from patient medical charts was undergo careful data entry into digital formats, ensuring accuracy and completeness. Subsequently, a comprehensive data cleaning process was implemented to correct errors, inconsistencies, and missing values, thereby maintaining data integrity. Descriptive statistics, including measures like mean, median, and standard deviation, was computed to summarize the dataset's characteristics. Visual representations such as tables, bar graphs, and pie charts was facilitating the presentation of these descriptive findings, aiding in the identification of trends and designs. Moving beyond descriptive analysis, inferential statistical techniques like regression analysis was utilized to explore relationships between variables. This includes employing binary logistic regression to investigate associations between independent variables (e.g., demographic factors, medical history) and the magnitude restrictive lung disease. Before conducting multivariable regression, a screening process was identified potentially significant independent variables, optimizing the model's predictive power. Significance testing was then determined the statistical relevance of observed relationships, with a p-value < 0.05 indicating significance. Ultimately, the results were interpreted in the context of the research objectives and relevant literature, culminating in a

comprehensive report outlining findings, methods, and implications for clinical practice or further research activities.

4.9.7. Ethical considerations

Prior to beginning data collection for this study, the institutional review board (IRB) of St. Paul's Hospital Millennium Medical College was provide ethical clearance. Names was not used when gathering data from medical files; instead, the medical record number was be utilized. Only the principal investigator was having access to the information gathered, and confidentiality was upheld at all times during the project.

4.9.8. Dissemination of results

Following completion, the study will be sent to St Paul's hospital millennium medical college it will be shared, if feasible, through conferences, publications, and presentations at scientific meetings.

5.Results

5.1. Demographic description response Rate

A 271 patients included in the study. In this study the response rate was 100%. The average age of patients that were captured by this study is 51.2, while the minimum is 16 and the maximum is 85. In addition, the median age is 49. In terms of gender, 57% of the study group are female while close to two-third of the population (62%) reside in rural areas. In terms of ethnicity, more than half of the study group are 50 Oromo, while 30% are Gurage, and 12% are Amhara.

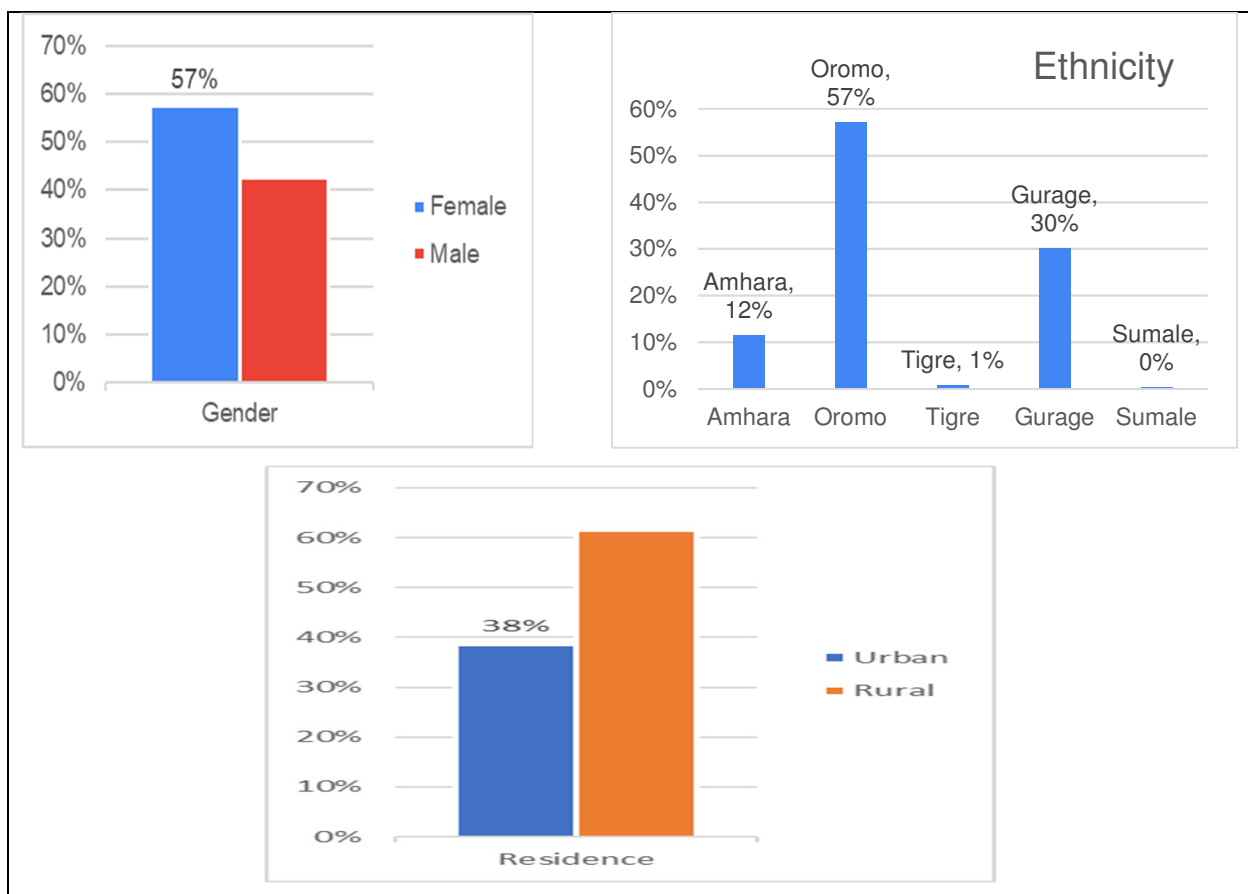


Figure 2: Demographic respondents, SPHMMC, 2019-2023

In terms of height and weight, only data on 42 of the 271 patients was documented in the clinic. The average BMI of the 42 patients is 23.3, while the median is 24 and the mode is 21. This indicates that the patients didn't have any weight related issues. That is, the average patient is normal weight. The study conducted two types of analysis – descriptive and bivariate/multivariate logistic regression analyses.

The descriptive part starts with understanding the several study variables in this thesis. It starts with describing magnitude of chronic lung disease and specific types. Then, it goes on to describing and seeing the characteristics of restrictive lung disease, and the different associated factors. The variables that was be analyzed (descriptively) related to restrictive lung disease can be categorized into three: socio-demographic data, type of chronic lung disease followed by Asthma (28%), and Pulmonary Fibrosis (12%). At fourth place, Bronchitis (9%) and ILD (7%) are the third and fourth types of chronic lung disease found on such patients. It can be referred that more than three-fourth (77%) of patients diagnosed with chronic lung disease were diagnosed with either COPD, Asthma, or Pulmonary Fibrosis.

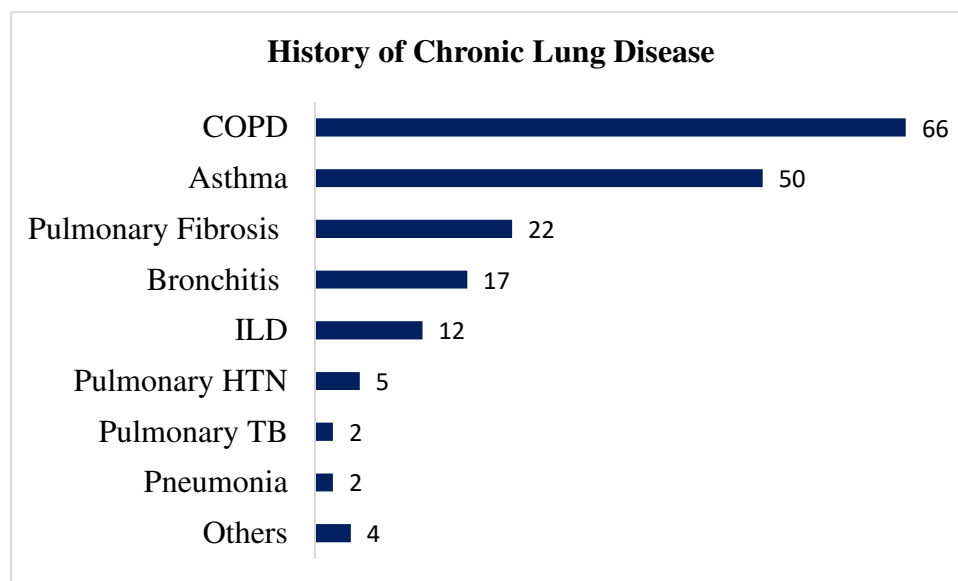


Figure 3: History of chronic lung disease, SPHMMC, 2019-2023

Besides history of chronic lung disease, other medical history variables include smoking, exposure to occupational dust or fumes, neuromuscular disorders, and any other symptoms. In term of

smoking, only 21 (8%) used to smoke. The average years of smoking of these 21 patients, however, was 12 years, with a minimum of 5 years and maximum of 30 years. Almost all (97%) of all the patients have no exposure to occupational dust or fumes and all patients have no history of neuromuscular disorder. However, in terms of the types of historical symptoms, frequent coughing was seen in 73% of all the patients. Chest tightness (58%), Wheezing (50%), and Fatigue (35%) are also the major symptoms with RLD. Other historical symptoms include difficulty lying flat (26%), shortness of breath with minimal exertion (24%), rapid, shallow breathing (8.3%), and shortness of breath at rest (10%).

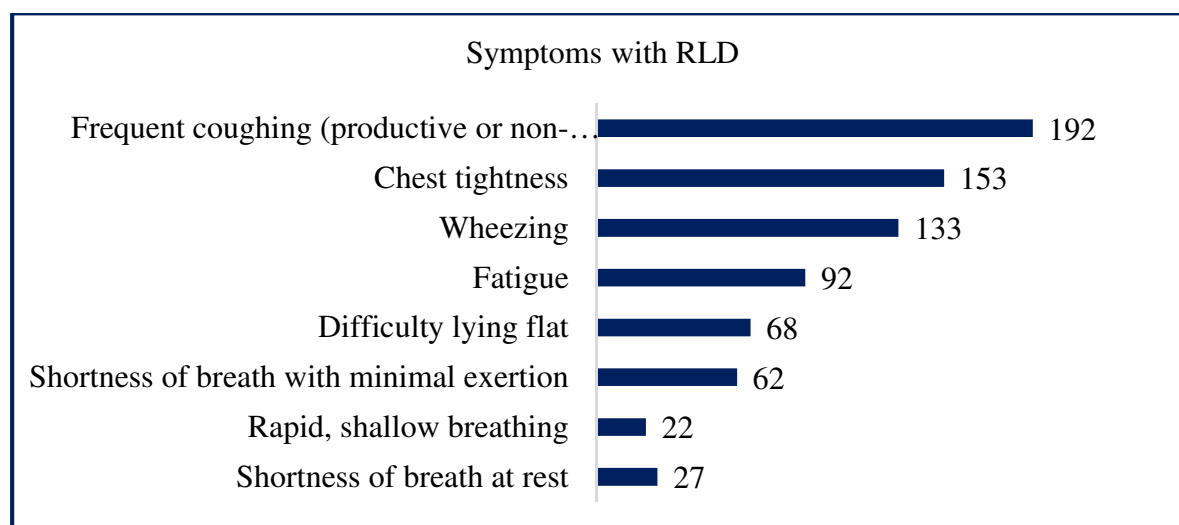


Figure 4: Symptoms with RLD, SPHMMC, 2019-2023

The study also assessed the functional status of patients in terms of having difficulty while doing some activities. As such, the study found out that majority of the patients didn't face difficulties when performing several activities. The most challenging activity for 26% of the patients was walking short distances followed by climbing stairs (24%). Other activities such as engaging in social activities, performing household chorus, dressing, and taking a bath were not considered difficult activities for the patients.

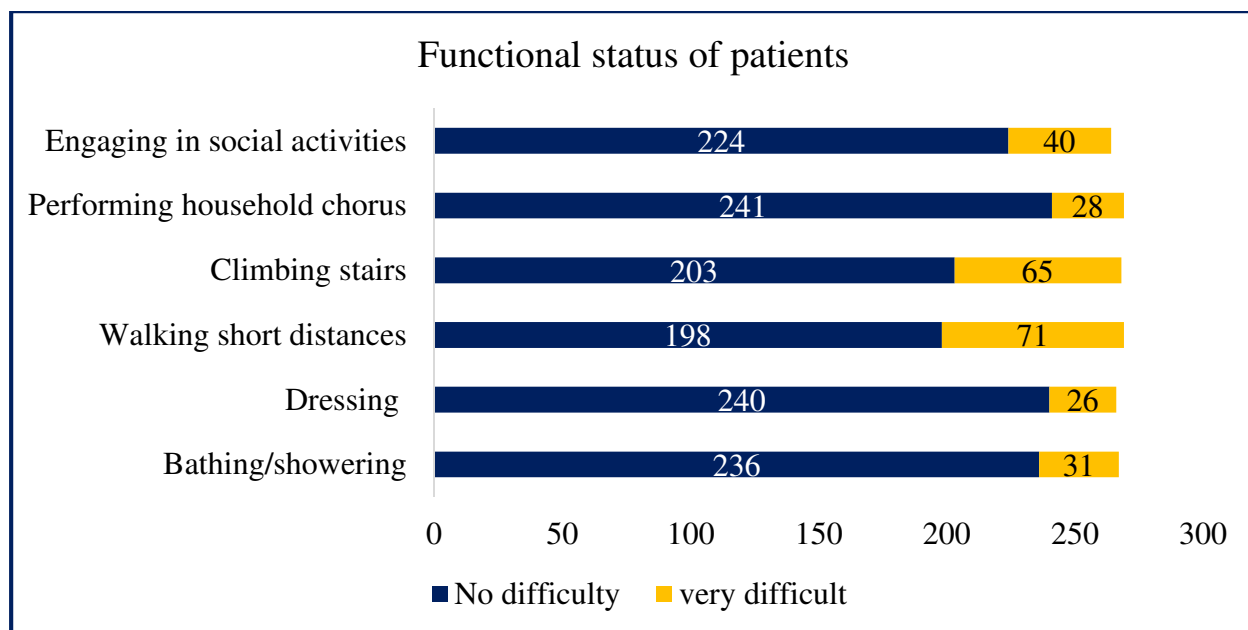


Figure 5: Functional status of the patient, SPHMMC, 2019-2023

Another descriptive was conducted on the patients' medical representation (symptoms related with restrictive lung disease). These are Hypoxemia, decreasing breathing sound, Wheeze Inspiratory, and Wheeze Expiratory. 57% of the respondents have shown hypoxemia and wheeze expiratory, 51% of them had wheeze inspiratory and the rest 46% had decreasing breathing sound.

Symptoms Related with RLD



Figure 6: Symptoms related with restrictive lung disease (RLD), SPHMMC, 2019-2023

The above chart shows that half of the patients have symptoms related to restrictive lung disease. When applying filters for only those patients diagnosed with previous chronic lung disease, the percentage of patients with symptoms related with RLD increases to 62%.

5.2. Magnitude of Restrictive Lung Disease

Of all the patients that have attended St. Paul's Hospital Chest Clinic, one-fourth of them (25%) have been diagnosed with restrictive lung disease.

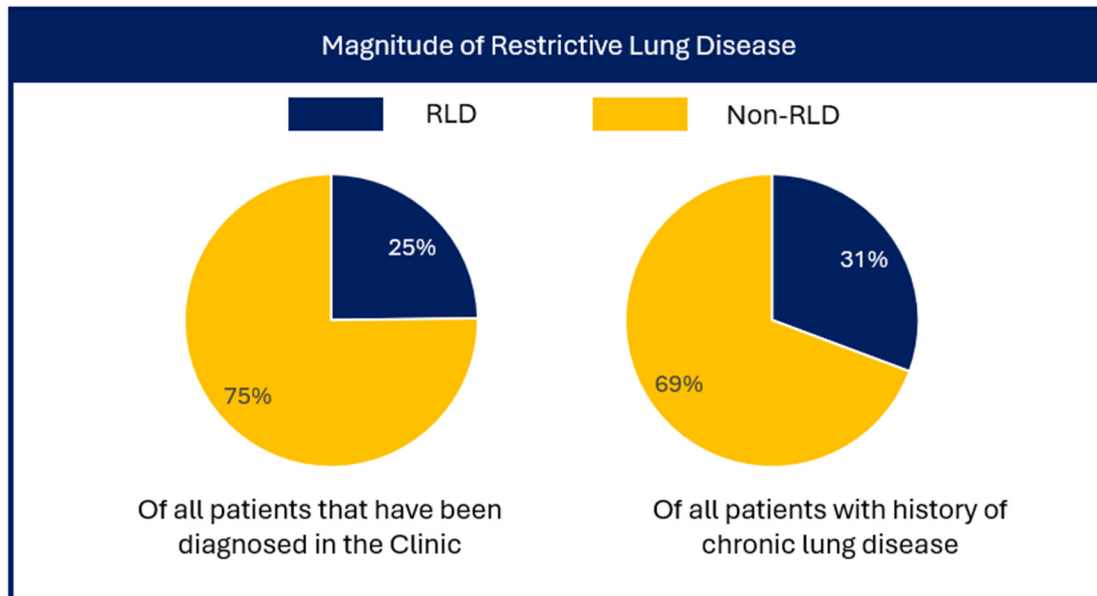


Figure 7: Magnitude of restrictive lung disease, SPHMMC, 2019-2023

Of the 66 patients diagnosed with restrictive lung disease, 57 of them have been diagnosed with other major diseases as can be inferred from the chart below. Of all the additional diagnostics information, the major one was Type 2 Diabetic Mellites (DM) (36%), followed by hypertension (HTN) (27%), and rheumatoid arteritis (RA) (20%).

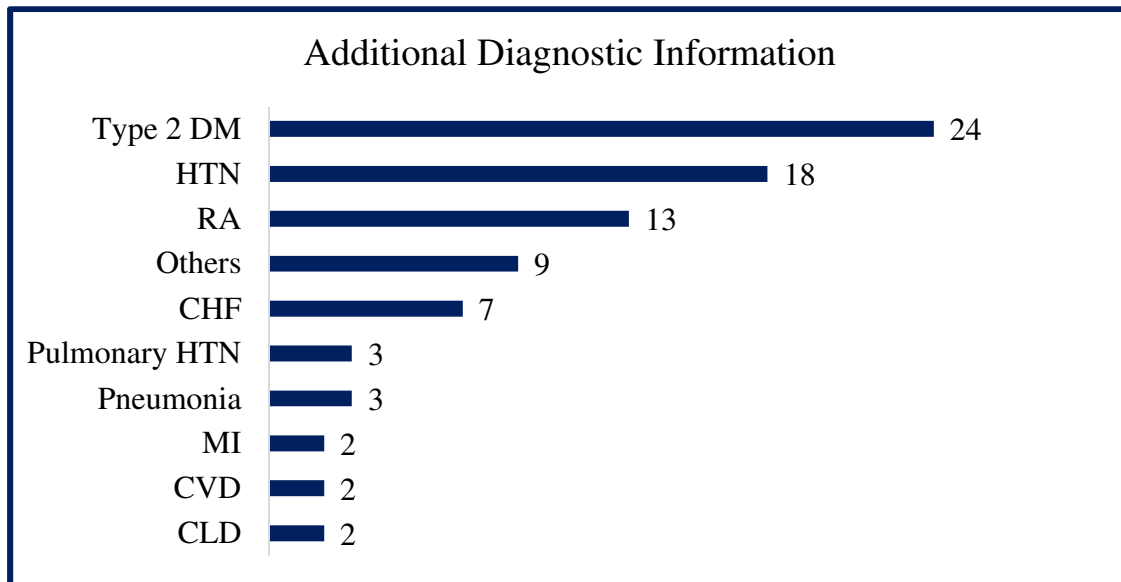


Figure 8: Additional diagnostic information, SPHMMC, 2019-2023

This means, 36% of the patients with restrictive lung disease have been diagnosed with Type 2 DM. In addition, 27% of patients have additional information of HTN. This indicates that patients with Type 2 DM and HTN are more likely to be exposed to restrictive lung disease. Other types of diagnosis include RA, congestive heart failure (CHF), pulmonary HTN, and others. All this diagnosis has direct relationship with restrictive lung disease. The overall inference is that assessing additional diagnostic information contributes to identifying whether a person is exposed to restrictive lung disease or not.

5.3. Factor associated with restrictive lung disease

History of chronic lung disease: The adjusted odds ratio (AOR) for those with history of chronic lung disease is 2.45 (95% CI: 1.13-5.34), with a p-value of 0.023. This indicates a statistically significant positive association between history of chronic lung disease and restrictive lung disease. Individuals with history of chronic lung disease have a significantly higher likelihood of developing restrictive lung disease compared to those without history of chronic lung disease.

Age: The adjusted odds ratio (AOR) for age is 1.06 (95% CI: 1.04-1.09), with a p-value of 0.000. This suggests that there is a statistically significant positive association between age and restrictive

lung disease. In other words, as age increases, the odds of having restrictive lung disease also increase.

Table 1: BIVARIATE AND MULTIVARIABLE ANALYSIS OF factors associated with restrictive lung disease on patients who attended the chest clinic at SPHMMC

Variable	Category	COR	(95% CI)		p-value	AOR	(95% CI)		P-value
			lower	upper			lower	upper	
Age in years	Continuous	1.07	1.04	1.09	0.000	1.06	1.04	1.09	0.000
Chronic lung disease	Yes	2.78	1.40	5.55	0.004	2.45	1.13	5.34	0.023
	No								
Gender	Male	0.61	0.34	1.07	0.089	0.69	0.36	1.31	0.265
	Female								
Ethnicity	Amhara	0.83	0.63	1.10	0.211	0.94	0.68	1.29	0.703
	Oromo								
	Tigre								
	Gurage								
	Somali								
	Afar								

Abbreviations: *COR, crude odds ratio significant at p-value < 0.25, AOR**, adjusted odds ratio significance at p< 0.05

6. Discussion on results

In the present study the magnitude of restrictive lung disease was 25%. A study conducted in governmental hospitals in Addis Ababa, Ethiopia; descriptive statistics were used to examine the patterns of pulmonary function impairment between the exposed and control groups. Of the cleaners, almost 17 (24.3%) acquired obstructive lung disease, whereas 16 (22.9%) developed restrictive lung illness(16). Similarity both studies found a significant magnitude of restrictive lung disease among the patient populations examined. The possible justification might be similarity in study subjects and sample size.

Another study in USA lung function and cardiovascular disease estimated the magnitude of restrictive lung disease vary from 3 to 12 %(29) . The findings of this thesis show a high rate of magnitude compared to the study in USA. Many reasons including genealogy, nutrition, educational status, time, place and development stage of the two countries can be some of the reasons to explain this big difference.

Another major finding of this thesis is the positive relationship between the history of chronic lung disease and restrictive lung disease. Not just history of chronic lung disease, but specific types of CLD such as pulmonary fibrosis, ILD, and COPD are directly related to the chance of being diagnosed with restrictive lung disease. Another related Additional diagnostic information shows that patients with Type 2 DM, HTN, and RA are more likely to be exposed to restrictive lung disease. conducted a study in USA, South Carolina that indicated the same findings. The findings of the study indicated that pulmonary fibrosis and ILD affect a sizable fraction of those who have been diagnosed with restrictive lung disease. The lung tissues will stiffen, and scar is created which results in restrictive lung disease. The study also indicated that magnitude of restrictive lung disease goes up to 30% - which is aligned with the findings if this thesis. In addition, the study indicated that a restrictive pulmonary pattern, typically defined as a reduction in lung volumes and total lung capacity without signs of airway obstruction, is with an increased magnitude of CVD. While obstructive pulmonary disorders primarily include COPD and asthma, restrictive ventilatory patterns may be due to a wide list of etiologies, intrinsic and extrinsic to respiratory system(31). This is also a similar finding with the thesis.

conducted a study in USA on lung function and cardiovascular disease which also has similar findings in areas of additional diagnostic information on Type 2 DM, HTN, and RA. The study

found out that 12% of the patients diagnosed with restrictive lung disease were also diagnosed with hypertension (HTN) at the same time(29). In addition, it showed that type 2 DM is also linked with restrictive lung disease. This thesis not only proof this link but also found the extent relationship between the two diseases. 36% of the patients with restrictive lung disease were also diagnosed with type 2 DM. This indicates that type 2 DM is highly correlated with restrictive lung disease.

Another factor associated with restrictive lung disease is ageing. This thesis indicted that the probability of getting diagnosed with restrictive lung disease increases as age increases. That is, when age increases by one year, the probability of being diagnosed with restrictive lung disease increases by 1.06%, or 1.1%. Conducted a study in U.S. evaluated the age-standardized prevalence of and risk variables associated with a restricted-on spirometer. Put another way, the likelihood of receiving a restrictive lung disease diagnosis rises by 1.11 for every year that an individual gets older(13). Both studies indicate a positive association between advancing age and the likelihood of developing restrictive lung disease. The numerical values for the age-related increase are slightly different between the two studies (1.06 vs. 1.11), though both indicate a similar magnitude of effect.

When comparing the two sites, the magnitude of restrictive lung disease is similar at St. Paul's Hospital Chest Clinic (25%) compared to Bishoftu Hospital, Ethiopia 23.5% (15). The reason might be similarity in, geographical, environmental factors and diagnostic criteria.

6.1. strength and limitation of the study:

Strength of the Study

1.Comprehensive Scope:

- The study covered a 5-year period from 2019 to 2023, providing retrospective.
- It examined a sizable sample of 271 patient charts from the clinic.
- Both descriptive and analyses were conducted to gain a thorough understanding of the research questions.

2. Focus on Magnitude and Associated Factors:

- The study aimed to investigate the magnitude of restrictive lung disease among the chest clinic's patients.
- It also examined the various associated factors and determinants of restrictive lung disease, including chronic lung conditions, comorbidities, and clinical presentations.

3. Detailed Findings:

- The study was able to quantify the high magnitude of restrictive lung disease, with one in four patients being diagnosed.
- It identified specific chronic lung conditions and comorbidities that increase the risk of restrictive lung disease.

Limitations of the Study--- end of the thesis

- At the time of data collection, several factors were considered, and data was collected as such. However, data on most of the variables (such as marital status, educational status, body mass index, smoking) was not documented by the clinic.
- Despite heavy literature on smoking and history of occupational hazards, the thesis couldn't make analysis and discussion on the relationship between these factors and restrictive lung disease in patients visiting the Chest Clinic in St. Paul's Hospital

6.2. Conclusion

The key findings indicate that magnitude of restrictive lung disease is highly common among individuals who have attended the SPHMMC Chest Clinic in the past five years is 25%. The adjusted odds ratio (AOR) for those with history of chronic lung disease is 2.45 (95% CI: 1.13-5.34), with a p-value of 0.023. This indicates a statistically significant positive association between history of chronic lung disease and restrictive lung disease. The adjusted odds ratio (AOR) for age is 1.06 (95% CI: 1.04-1.09), with a p-value of 0.000. This suggests that there is a statistically significant positive association between age and restrictive lung disease. Another related

Additional diagnostic information had shown that patients with Type 2 DM, HTN, and RA are more likely to be exposed to restrictive lung disease.

6.2. Recommendations

The following organizations are accountable and suggested as listed below.

for policy makers: Policies should focus on early detection and prevention, especially for those with chronic lung conditions and risk factors like age, diabetes, hypertension, and rheumatoid arthritis.

for the health professionals: Provide comprehensive care and education to patients on managing restrictive lung disease and its underlying causes. Collaborate with researchers to better understand the risk factors and improve diagnostic and treatment approaches.

For hospitals: The department head of the chest clinic ensure adequate staffing, equipment, and resources to diagnose and treat the high magnitude of restrictive lung disease. Implement streamlined referral systems and care coordination between primary, specialty, and respiratory care providers.

For the researchers: Further investigate the magnitude of restrictive lung disease development. Explore novel diagnostic tools and therapeutic interventions to better manage restrictive lung disease. Conduct large-scale epidemiological studies to validate the findings and generalize the insights.

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8. Assurance of principal investigator

As a signer to this agreement, I undertake full responsibility for the research project's ethical and scientific conduct. I promise to submit my advisor with a timely progress report and to ask for their permission and guidance as needed while conducting the research. All parties involved in the study, including any funding source, will be promptly informed to my advisors.

Name of the student: Gizealew Kebede

Signature: _____

Date: _____

Approval of the primary advisor

Name of the primary advisor: Dr. Zelalem Getahun (ECCM, FELOW) _____

Signature: _____

Date: _____

Approval of co-advisor

Name of the co advisor: Selomon Yimer _____

Signature: _____

Date: _____

Approval of examiner

Name of examiner-----

Signature: -----

Date: -----

9. Appendix

Annex I: English Informed consent

I am_Gizealew kebede_____, Post graduate student at SPHMMC, School of Medicine, department of Intensive care Medicine in respiratory therapy track. I am currently conducting my thesis using secondary data from April 1st, 2024 to April 30th, 2024, on the prevalence of restrictive lung and associated factors at SPHMMC chest clinic among public hospitals, Addis Ababa, Ethiopia. Finding the prevalence of restrictive lung disease and related factors at the SPHMMC chest clinic is the study's goal. By safeguarding the medical records that might reveal study participants' identities, I maintain confidentiality. Individual identifiers will be eliminated and will not be presented in any way. Privacy and confidentiality regulations are adhered to throughout the data collection process and are maintained in the finding's presentation.

I agree to allow the data collection process and guarantee with my signature below on behalf of the hospital's chest clinic department, as the purpose of the study has been explained to me in a language I can understand, in order to protect the registration book and patient data.

Name Qualification

Date..... Signature.....

With regards,

Gizealew Kebede

Annex II: English version Questionnaire

Section 1. Socio demographic data		
1.1.	Age in years	
1.2	Gender	a. Male b. female
1.3	Ethnic	a. Amhara b. Oromo c. Tigre d. Gurage e. Somali f. Afar
1.4	Residency	a. Urban b Rural
1.5	Marital status	a. Single b. Married c. Divorced d. Not documented
1.6	Educational status	a. No formal education b. Primary c. Secondary

		d. College and above e. Not documented
1.7	Weight in (KG)	-----
1.8	Height in (CM)	-----
1.9	Body Mass Index (BMI) in numbers	
Section 2. Medical History		
2.1	Do you have a diagnosis of any chronic lung disease?	a. Yes b. No
2.2	Have you ever smoked cigarettes?	a. Yes b. No
2.3	Do you have a history of exposure to occupational dust or fumes?	a. Yes b. No
2.4	Do you have a history of neuromuscular disorders (e.g., muscular dystrophy, myasthenia gravis)?	a. Yes b. No
2.5	In the past month, have you experienced any of the following symptoms? (Please select all that apply)	a. Shortness of breath at rest b. Shortness of breath with minimal exertion c. Rapid, shallow breathing d. Difficulty lying flat e. Chest tightness f. Frequent coughing (productive or non-productive) g. wheezing f. fatigue

Section 3. Functional status:		
3.1.	Dyspnea How much difficulty do you have with the following activities due to breathing problems? (Please select one option for each)	
A.	Bathing/ showering	a. Very difficult b. No difficulty
B.	Dressing	
C.	Walking short distances	a. Very difficult b. No difficulty
D.	Climbing stairs	a. Very difficult b. No difficulty
E.	Performing household chorus	a. Very difficult b. No difficulty
F.	Engaging in social activities	a. Very difficult b. No difficulty
Suction 4. Functional status		
4.1	Hypoxemia	a. Yes b. No C. Not documented

4.2	Decrease breathing sound	a. Yes b. No c. Not documented
4.3	Wheeze inspiratory	a. Yes b. No c. Not documented
4.4	Wheeze expiratory	a. Yes b. No c. Not documented
Section 5. Restrictive lung disease:		
5.	Restrictive lung disease	a. Yes b. No
Section 6. Additional information:		