



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

**THE PRACTICE OF SPIROMETRY USE FOR COPD PATIENTS
AT CHEST CLINIC OF ST. PAUL'S HOSPITAL MILLENNIUM
MEDICAL COLLEGE, ADDIS ABABA, ETHIOPIA. A 5 YEARS
CHART REVIEW**

By: Daniel Rebuma (MD, Internal Medicine Resident)

October 2021,

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Abstract

Background: Guidelines recommend the diagnosis of chronic obstructive pulmonary disease (COPD) to be confirmed by spirometry in all suspected patients. Despite this spirometry underuse has been reported in many surveys done in western countries. This can lead to misdiagnosis since the accuracy of diagnosing COPD without spirometry is not clearly known

In Africa little is known about the use of spirometry. This study aimed to assess the practice of spirometry use for COPD patients at chest clinic of St. Paul's hospital millennium medical college (SPHMMC).

Methods: A cross-sectional study based on data collected from charts of adult COPD patients having follow-up in chest clinic of SPHMMC. All charts of COPD patients from 2016- 2020 were reviewed by trained internal medicine residents using structured questionnaires. The data was cleaned and entered into computer using EPI DATA version 3.1 and then exported to Statistical Package of Social Sciences (SPSS) version 25 for analysis. Categorical data was analyzed as frequencies with percentages and continuous data was analyzed as means with standard deviations.

Result: 154 patients with clinical diagnosis of COPD were studied. 92 patients (59.7%) had diagnostic spirometry but no patient had follow-up spirometry. The diagnosis of 37 patients (40.2%) was rejected by spirometry.

Conclusion: Substandard use of spirometry was found. Relying on clinical diagnosis was found to lead to misdiagnosis in many patients.

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Acronyms and Abbreviations

BOLD: Burden of obstructive lung disease

COPD: Chronic Pulmonary Obstructive Disease

COVID-19: Coronavirus Disease 2019

CKD: Chronic kidney disease

CT scan: Computerized tomography scan

CXR: Chest x-ray

DC: Data Collectors

DM: Diabetes mellitus

FEV1: Forced Expiratory Volume in the first second

FVC: Forced Vital Capacity

GP: General practitioner

GOLD: The Global Initiative for Chronic Obstructive Lung Disease

HMIS: Health Management Information System

Hct: Hematocrit

ILD: Interstitial lung disease

PI: Principal Investigator

PTE: Pulmonary thromboembolism

SD: Standard Deviation

SNNRP: Southern Nations, Nationalities, and Peoples' Region

SPHMMC: St. Paul's Hospital Millennium Medical College

SPSS: Statistical Package for Social Sciences

WHO: World Health Organization

1. INTRODUCTION

1.1 Background

Chronic obstructive pulmonary disease (COPD) is a slowly progressive disease that results in airflow obstruction^[1]. It is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases and influenced by host factors including abnormal lung development^[2]. It is currently the fourth leading cause of death in the world^[3]. More than 3 million people died of COPD in 2012 accounting for 6% of all deaths globally. Globally, the COPD burden is projected to increase in coming decades because of continued exposure to COPD risk factors and aging of the population^[2].

The most common symptoms of COPD include dyspnea, chronic cough and/or sputum production. The main risk factor for COPD is tobacco smoking but other environmental exposures such as biomass fuel exposure and air pollution may contribute. Besides exposures, host factors predispose individuals to develop COPD. These include genetic abnormalities, abnormal lung development and accelerated aging^[2].

Diagnosing COPD in an early stage is important because early and appropriate management reduces the number and severity of exacerbations of COPD and improves quality of life of patients^{[4]–[6]}. Spirometry is required to make the diagnosis. Spirometry is a noninvasive test that measures the volume of air forcibly exhaled from the point of maximal inspiration (forced vital capacity, FVC) and the volume of air exhaled during the first second of this maneuver (forced expiratory volume in one second, FEV1). The ratio of these two measurements (FEV1/FVC) should be calculated. A forced expiratory volume in 1 second to forced vital capacity (FEV1 /FVC) ratio of less than 0.70 is diagnostic of airflow obstruction; the presence of a post-bronchodilator

FEV1/FVC < 0.70 confirms the presence of persistent airflow obstruction and thus of COPD^[2].

In addition to diagnosis, spirometry should also be used for assessment of severity of airflow obstruction (for prognosis) and for follow-up monitoring ^[2]. GOLD classifies the severity of COPD based on the degree of airflow obstruction. Mild COPD is when the value of FEV1 is $\geq 80\%$ predicted. Moderate COPD is when FEV1 is $\geq 50\%$ but < 80% predicted. Severe COPD is when FEV1 is $\geq 30\%$ but <50% predicted. Very severe COPD is when FEV1 is <30% predicted.

Utilizing spirometry for COPD has many documented benefits. Some of these benefits include assistance in avoiding misdiagnosing COPD, cost saving approaches, and reducing the considerable burden COPD has on the healthcare system^[7]. It also helps prevent COPD re-admissions and improve the patient's quality of life/outcomes^[8].

1.2 Statement of the problem

The 2021 Global Initiative for Chronic Obstructive Lung Disease (GOLD) guideline recommend spirometry to be done in all patients suspected with COPD and patients should also be followed with at least once a year spirometry to identify patients who are declining quickly ^[2]. Despite the guideline and many other quality literatures, spirometry is still widely underutilized in diagnosis and follow-up of COPD. This can result in patients being misdiagnosed with COPD ^[7].

The reasons for underuse of spirometry include scarcity of resources, lack of adequate training in use, problems in the interpretation of spirometry patterns and belief that spirometry is not necessary for diagnosis^{[9], [10]}. To tackle these problems, few solutions had been tried in the past which include training general practitioners and nurses on how to use and interpret spirometry and making spirometry easily accessible ^[10].

In Africa clinical utilization of spirometry is even more limited because of obvious scarcity of resources & access to spirometry. For this reason patients are usually started on treatment by using only demographic and clinical data^{[11]–[16]}. But what is not known is utilization of spirometry in centers where access to spirometry is available and the accuracy of clinical diagnosis.

The aim of this study was to assess the practice of spirometry use for COPD diagnosis and follow-up at chest clinic of St. Paul hospital's millennium medical college (SPHMMC). The concordance between clinical diagnosis and spirometry diagnosis was also assessed.

1.3 Significance of the study

This study gives baseline information on the subject since there is, as yet, no published research done on the topic in our hospital and in our country. The results will help improve the care given to COPD patients since it showed the proportion of COPD patients who get spirometry when they are followed in a center where spirometry is available.

It also assessed the accuracy of clinical diagnosis done without spirometry. This is particularly important because spirometry is not available in many Ethiopian health facilities. And knowing the accuracy of clinical diagnosis can help hospital administrators and policy makers to decide on the need of spirometry in our practice.

2. LITERATURE REVIEW

2.1 Rate of spirometry use for diagnosis and follow-up of COPD

Spirometry is often underutilized even in developed countries. A community based population study in Canada which examined the correlation of patient and physician factors when ordering spirometry to confirm the diagnosis of COPD reported underutilization of spirometry among COPD patients^[17]. This population study examined 491,754 patients in Ontario, Canada. It was concluded that only 35.9% of these patients who were newly diagnosed with COPD ever received a spirometry test.

Another study in university affiliated hospital in Michigan examined the frequency of COPD over diagnosis, but specifically analyzed patients in the hospital setting^[18]. The purpose of the study was to examine the percentage of hospital COPD patients that received confirmatory testing with spirometry and to examine the accuracy of the diagnosis. They examined 6,018 patients with COPD in the hospital, of which 504 (8.4%) had completed spirometry during their hospital stay. One strength of this study was that it was conducted at a teaching hospital, which reflects real-life scenarios with COPD. This study highlights the necessity to diagnose COPD patients with spirometry in the primary care office setting before they become admitted and treated inaccurately due to a lack of objective COPD confirmation ^[18].

Another cross sectional study in Germany which studied 2568 patients also found underutilization of spirometry. In this study patients aged 40 years and older with a diagnosis of COPD were identified through electronic health records. The proportion of patients who ever had a spirometry documented was 46%. It also showed that spirometry had been performed in 29% of patients with COPD within the preceding year^[19].

A prospective study in Italy which evaluated the frequency of spirometry use, found that among the 203 patients with a doctor-diagnosis of COPD, 56.2% of those with doctor-diagnosed COPD ever had performed a spirometry in their life with an average time since the last spirometry evaluation of about four years^[16].

A multicenter study in Sweden which included 56 primary care centers and 14 hospital outpatient clinics studied 1114 patients with clinical diagnosis of COPD. They analyzed spirometry data at diagnosis and it showed the diagnosis of COPD was confirmed by spirometry in 59% of patients. Spirometry data with post-bronchodilator FEV1/ VC ratios were available in 45% of patients^[20].

A cohort study among 40,969 Danish patients studied use of spirometry among patients initiation medications targeting COPD and found that spirometry testing had been performed in 49.5% of the patients and half of the total patients had still not undergone spirometry after a year^[21].

Another retrospective study using electronic medical record in the department of internal medicine of Cooper University Health care assessed physicians' adherence to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guideline of 158 patients who were having outpatient follow-up in the center. Of the 158 patients in this study, 56.3% of patients had spirometry confirmation of the diagnosis^[22].

When coming to our continent, only few studies are found about the practice of spirometry use in COPD patients in Africa. A cross-sectional survey among 321 doctors working in different Nigerian hospitals (one district hospital, one privately owned hospitals and one university teaching hospital)^[14] reported that Eighty-one (25.2%) doctors claim to have access to spirometer in their hospitals but despite having access to a spirometer only 40.7% used it for aiding the

diagnosis of COPD. From doctors who don't have access to spirometry 27.5% used it for diagnosis of COPD^[14].

Another African study was a retrospective study of spirometry utilization of hospitalized patients with clinical findings of COPD at University of Ilorin Teaching Hospital in Nigeria ^[23]. They found that the rate of utilization of spirometry in the hospitalized patients (228) with clinical findings of COPD was 8.3%^[23]. In this study, 73.7% of the patients had reversibility test or post-bronchodilator test, while 26.3% had only baseline spirometry^[23].

2.2Concordance between clinical and spirometry diagnosis for COPD

A multicenter multinational study named Burden of obstructive lung disease (BOLD)^[24] whose main aim was to estimate the prevalence of COPD at 23 sites located in 20 different countries assessed the concordance between clinical diagnosis of COPD and spirometry diagnosis of COPD. In this study the “doctor’s diagnosis of COPD” was based on self-reported, physician-diagnosed COPD, chronic bronchitis, emphysema, or any combination of them. In this study 919 patients had a previous medical diagnosis of COPD but when post-bronchodilator spirometry was done, 569 patients (61.9%) have no obstruction (false positive COPD). In a subgroup analysis excluding participants who reported a diagnosis of “chronic bronchitis” or “emphysema” (n = 220), 37.7% had no airflow limitation. The site-specific prevalence of false positive COPD varied greatly, from 1.9% in low- to middle-income countries to 4.9% in high-income countries^[24].

Another study utilized a cross-sectional investigation to examine 341 patients in Australia who had a COPD diagnosis or were prescribed tiotropium with a general practitioner recognition^[7]. Of the 341 patients who were given spirometry, it was found that 31% (107) had been misclassified with COPD ^[7]. This study recognized the importance of using spirometry to diagnose COPD and also

highlighted the unreliable nature of diagnosing a patient with COPD based on reported symptoms alone ^[7].

Another study examined the frequency of COPD over-diagnosis among underserved patients with a government qualified organization ^[25]. This descriptive retrospective cohort study included 80 patients who were either previously diagnosed with COPD or receiving anticholinergic inhalers without a COPD diagnosis. These patients were given spirometry testing and concluded that about 42.5% of these patients had no obstruction and 22.5% had a reversible form of obstruction ^[25]. Therefore, a high percentage of these underserved patients who were either treated for COPD or diagnosed as COPD did not objectively have COPD based on spirometry ^[25].

The study which analyzed 6,018 patients with COPD in the hospital setting ^[18] found that from the 504 subjects who had spirometry confirmation of their diagnosis, COPD was confirmed only in 69.2% ^[18].

The study in Italy which evaluated the frequency of spirometry use and the concordance between doctor-diagnosed COPD and spirometry patterns, found that only 13.3% patients with respectively doctor-diagnosed COPD had concordant spirometry patterns with their known diseases ^[16]

In the Latin America study which examined COPD medication prescription patterns over half of patients use drugs of COPD without having obstructive lung disease ^[26].

There are also other studies that evaluated the predicted value of symptoms for airflow obstruction. A study done in England found out that the predictive value of respiratory symptoms (cough, wheeze, sputum, breathlessness) was 35.8% ^[27]. Another study done in Canada which evaluated the accuracy of history on diagnosis of COPD found that only 2 elements of clinical examination were

significantly associated with the diagnosis of COPD on multivariate analysis: self-reported history of COPD (adjusted likelihood ratio (LR) 4.4) and wheezing (adjusted LR 2.9^[28] A study in Belgium which evaluated diagnostic accuracy of different methods showed that spirometry added significantly more to the diagnostic certainty than questionnaires, history and clinical examination.^[29]

3. OBJECTIVES

3.1 General Objective

- To assess the practice of spirometry use for COPD patients at chest clinic of St. Paul's Hospital millennium medical college's chest clinic

3.2 Specific Objectives

- To determine the rate of spirometry use for confirmation of COPD diagnosis
- To assess the use of spirometry in follow-up of COPD patients
- To examine the concordance between clinical diagnosis & Spirometry diagnosis

4. METHODS

4.1 Study area and period

This study was conducted in SPHMMC; SPHMMC is one of the few centers in Ethiopia where access to spirometry is available. It is located in Addis Ababa, Ethiopia. It was established through a decree of the Council of Ministers in 2010. Although the medical school opened in 2007, the hospital was established in 1968 by the late Emperor Haile Selassie. It is governed by a board under the Federal Ministry of Health. The college has more than 2800 clinical, academic and administrative and support staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, the College sees an average of 1200 emergency and outpatient clients daily^[32]. The pulmonology unit which provides spirometry service is found under Internal medicine department and has four pulmonologists. Second year internal medicine residents and nurses also work in the unit. This study was conducted from March 2020 to September 2021 in the pulmonology unit's chest clinic of SPHMMC.

4.2 Study design

A cross-sectional study was conducted on patients having follow-up in adult chest clinic of the hospital

4.3 Population

4.3.1 Source population

All COPD patients on follow-up in adult chest clinic of SPHMMC

4.3.2 Study population

All COPD patients on follow-up in adult chest clinic of SPHMMC from January 1, 2016- December 31, 2020 who fulfill the inclusion criteria,

4.3.2.1 Inclusion criteria

- COPD patients who are above the age of 40 years
- Had at least 1 evaluation of pulmonologist during the follow-up

4.3.2.2 Exclusion criteria

- Those with non-conclusive spirometry result
- Those with conflicting spirometry results
- Those with not acceptable spirometry
- Those with non-reproducible spirometry

4.4 Sample size determination and sampling technique

All charts of COPD patients having follow-up from January 1, 2016- December 31, 2020 was reviewed. 194 patients were found having follow-up. From these patients, 5 patients haven't been evaluated by pulmonologist yet. 23 patients have non-conclusive spirometry result & 12 patients have conflicting spirometry result. These patients were excluded from the study. So the final sample size of this study was 154, giving a response rate of 79.38%

4.5 Study variables

4.5.1 Dependent variables

- Use of spirometry for diagnosis of COPD
- Use of spirometry for follow-up of COPD

4.5.2 Independent variables

- Age
- Sex
- Occupation
- Educational status
- Monthly income
- Marital status
- Religion
- Smoking status
- Secondhand smoke
- Working with chemicals, dust and fumes
- Chronic cough
- Sputum
- Wheeze
- Dyspnea
- Comorbidity (DM, HTN, Heart disease)
- Concurrent diagnosis of Asthma

- Barrel chest
- Duration of follow-up
- Spirometry findings

4.6 Data collection procedure

The patients' charts were retrieved from the hospital's card room by using HMIS documentation as a guide to identify patients who have COPD as one of their diagnoses. After finding the charts, data about patients' demographic, clinical and spirometry result was collected by using structured questionnaire. The data was collected inside the hospital's card room during the study period

Internal medical residents were involved in data collection. Prior to data collection, the residents were trained on how to fill the questionnaire. They were then followed closely for completeness and validity of the data by the investigator. Incompletely filled questionnaires' will be refilled by the responsible residents.

4.7 Data processing and analysis

After the completeness of all information on the questioners was checked, it was cleaned, coded and entered using EPI DATA version 3.1. It was then exported to Statistical Package of Social Sciences (SPSS) for windows version 25 for analysis. Categorical data were analyzed as frequencies with percentages and continuous data were analyzed as means with standard deviations.

4.8 Operational definitions

- ✓ **COPD patients:** Physician diagnosis of COPD based on clinical evaluation (history, physical examination, laboratory values and imaging) without the use of spirometry
- ✓ **Confirmed COPD:** patients with confirmed irreversible spirometry result of FEV1/FVC of <0.7
- ✓ **Non-conclusive spirometry:** Spirometry results with no clear single diagnosis & results in which the operator recommends repeating the procedure
- ✓ **Follow-up spirometry:** Spirometry which is repeated for purpose of identifying patients who are rapidly deteriorating. This doesn't included spirometry which was repeated for diagnostic uncertainty
- ✓ **Severe polycythemia:** Hematocrit level ≥ 60
- ✓ **Moderate polycythemia:** Hematocrit level of 55-59.9
- ✓ **Mild Polycythemia:** Hematocrit level of 50-54.9

4.9 Ethical consideration

Ethical clearance was obtained from Institutional Review Board of SPHMMC. After obtaining the permission the data collection was commenced. All information that was obtained from the individual record was treated confidential. Information obtained was used only for the study purpose.

4.10 Dissemination of results

The results of this study will first be presented to the staffs of Internal medicine and Public health departments during the research defense presentation. After that attempts will be made to publish the results the results in institutional, national and international journals after being peer reviewed.

5. Results

5.1 Characteristics of the study sample

5.1.1 Socio-demographic characteristics of the study sample

In the 154 patients that were studied, COPD was more common in male than females. Males constituted 63% and females constituted 37% of the studied patients.

Mean age was 61.42 ($\pm$ 12.324). The youngest patient was aged 40 & the oldest patient was 92. Around one third of the patients were aged between 60 and 69. Only 7.1% of the patients were aged above 80.

The region of residence of the patients was from 5 different regions. More than half of the patients (53.7%) were from Addis Ababa followed by Oromia (32.7%). There was only 1 patient from Harrari region (Table 1).

Table 1: Socio-demographic characteristics of COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia

Variable	Category	Frequency	Percent
Age (N=154)	40-49	31	20.1
	50-59	31	20.1
	60-69	48	31.2
	70-79	33	21.4
	>80	11	7.1
Sex (N=154)	Male	97	63.0
	Female	57	37.0
Region (N=147)	Amhara	14	9.5
	Oromia	48	32.7
	SNNRP	5	3.4
	Harrari	1	0.7
	Addis Ababa	79	53.7

5.1.2 Duration of follow-up & admission history of the study sample

The number of patients having follow-up in the clinic is increasing every year. Majority of the patients (39.6%) are new patients with duration of follow-up less than 1 year. This number has increased by more than fourfold when compared to patients who were having follow-up for the last 5 years (9.1%) (Figure1). 19 patients (12.3%) have at least one admission history for reasons either related to COPD or not related to COPD (Figure 2).

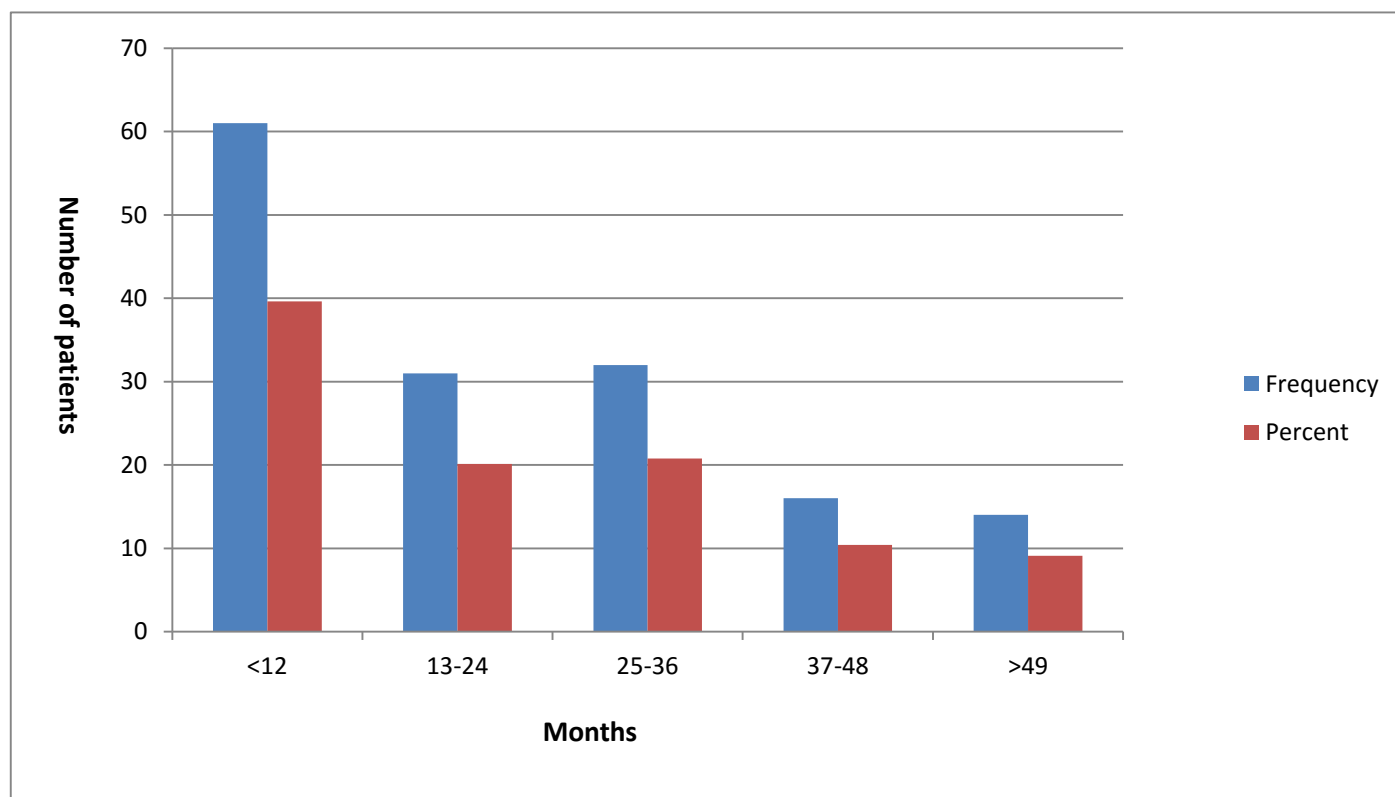


Figure 1: Duration of follow-up of patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

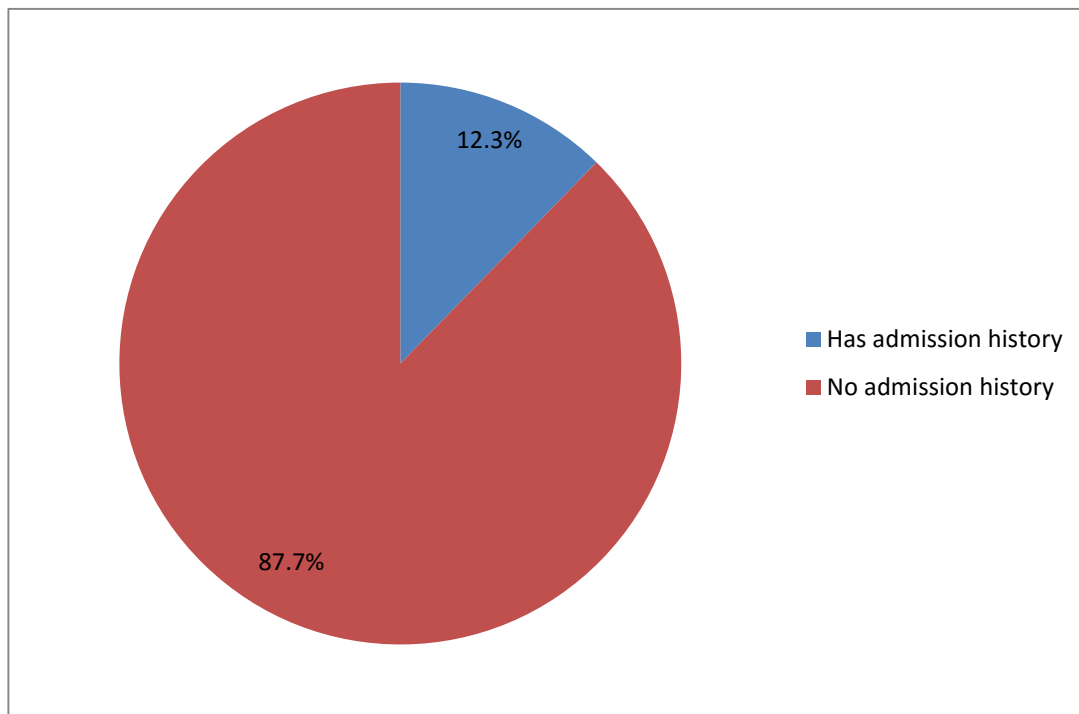


Figure 2: Admission history of patients at SPHMMC chest clinic in percentage, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

5.2 Risk factors associated with COPD

Smoking history, second hand smoke exposure and biomass fuel exposure were the only risk factors that were documented in patient charts. Nearly 70% of our patients (66.9%) have never smoked and active smokers accounted only for 9.2%. Presence or absence of second hand smoking history was documented only in 17 patients. Biomass fuel exposure was documented only in 14 patients (Table 2).

Table 2: Documented risk factors of COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

		Frequency	Percent
Smoking history (N=109)	Never smoked	73	66.9
	Previous smoker	26	23.9
	Current smoker	10	9.2
Second hand smoke exposure (N=17)	Yes	3	17.6
	No	14	82.3
Bio-mass fuel exposure (N=14)	Yes	1	7.1
	No	13	92.8

5.3 Clinical characteristics of COPD patients

5.3.1 Symptoms & Physical findings

Most patients reported respiratory symptoms. The most predominant presenting symptoms were chronic cough (92.2%) and sputum production (71.4%). The most common physical finding was wheeze (Figure 3).

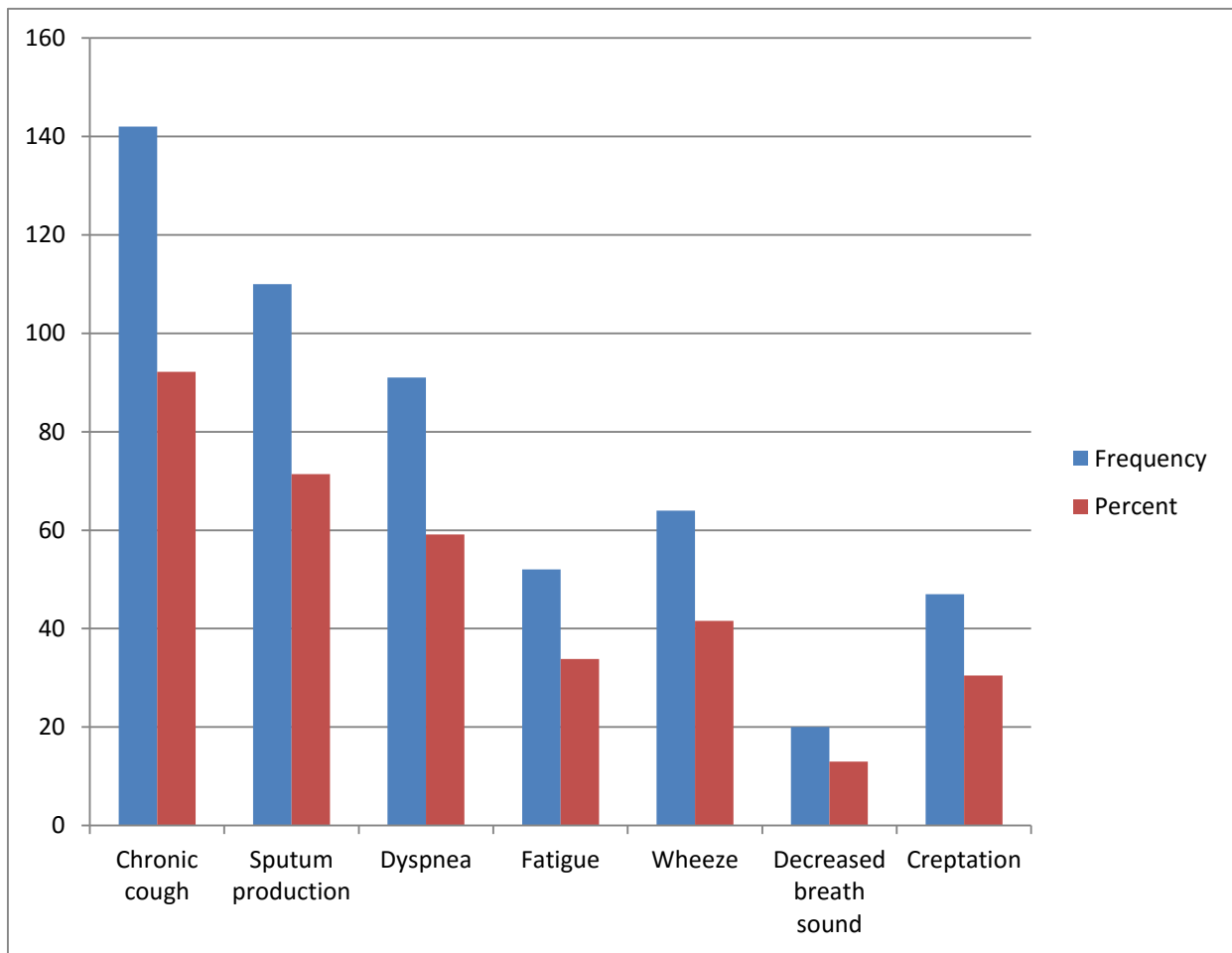


Figure 3: Clinical Presentation of COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

5.3.2 Comorbidities

Nearly a third of the patients (33.11%) have hypertension which makes it the commonest comorbidity among the patients. The second commonest comorbidity was Asthma (25.3%) and HIV was the least common comorbidity (3.2%) (Figure 4).

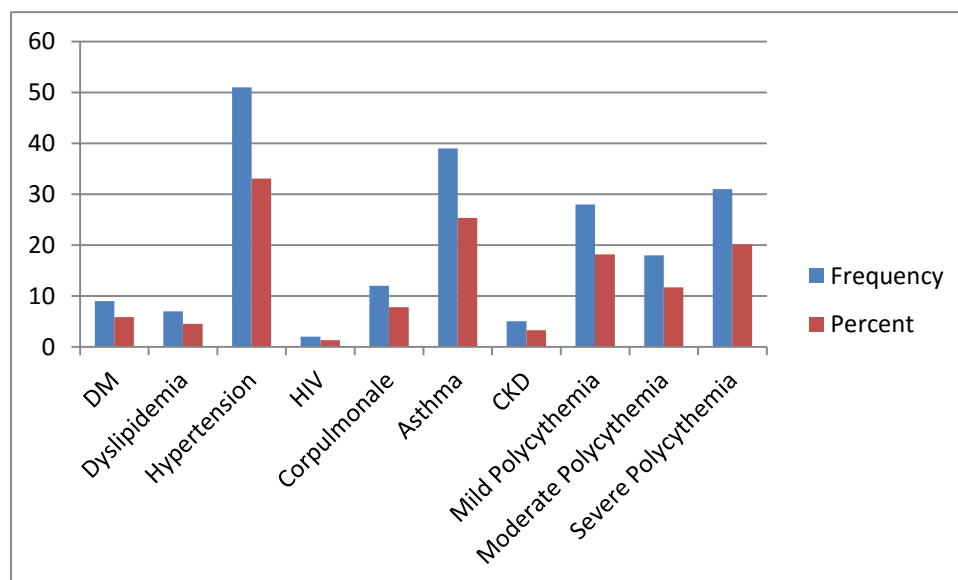


Figure 4: Comorbidities among COPD Patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

5.3.3 Chest X-ray (CXR) findings

Almost all patients (92.9%) had Chest X-ray. Despite clinical diagnosis of COPD, 43 patients from the 143 have normal chest x-ray. The commonest abnormality that was found was hyper inflated lung followed by presumed pneumonic shadowing and cardiac abnormalities. Only 1 patient had bullae on chest x-ray (Figure 5).

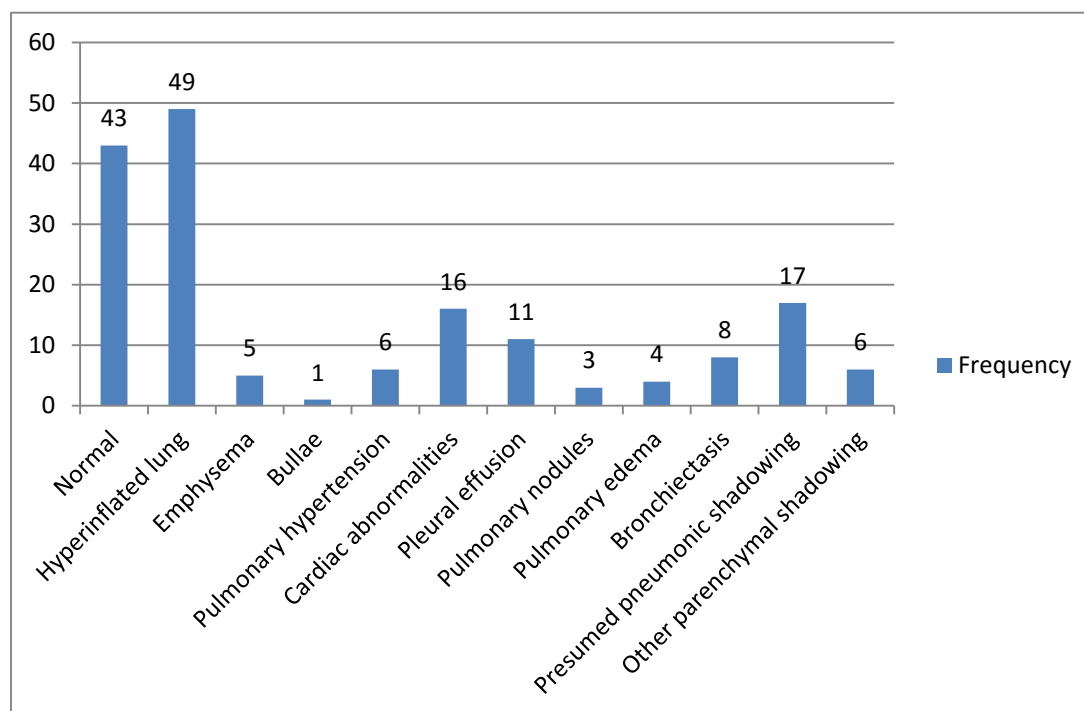


Figure 5: CXR Findings COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=143)

5.3.4 Chest CT scans findings

A substantial number of the patients (63.6 %) of patients had CT scan. By far the most commonly reported chest CT scan result was emphysematous changes which was reported in 54 patients. The second commonest abnormality (pulmonary hypertension) was reported in a much less number (only 13 patients). The least common abnormalities were pulmonary thromboembolism and non-pneumonic parenchymal shadowing. Both were reported in 2 patients. Despite the clinical diagnosis of COPD 15 patients have normal CT scan (Figure 6).

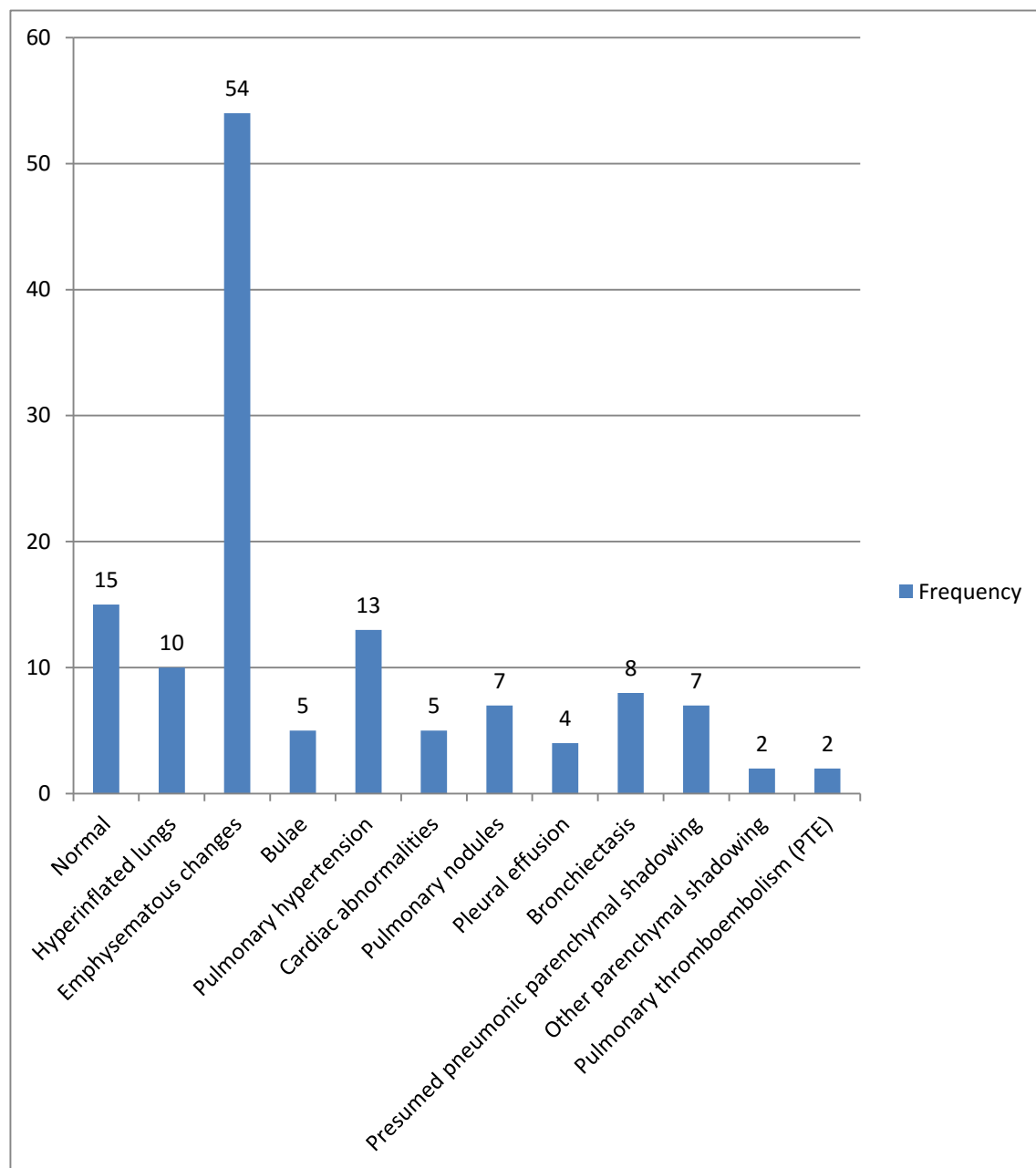


Figure 6: Chest CT scan findings COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=98)

5.4 Rate of spirometry use for diagnosis and follow-up of COPD

92 patients had diagnostic spirometry done. This gives a percentage of slightly less than 60 percent (59.7%) (Figure 7). From patients who have follow-up for more than 1 year, there were no patients who had a repeat spirometry for follow-up purpose. 61 patients have not reached the one-year follow-up duration which is needed to assess the practice of repeat spirometry.

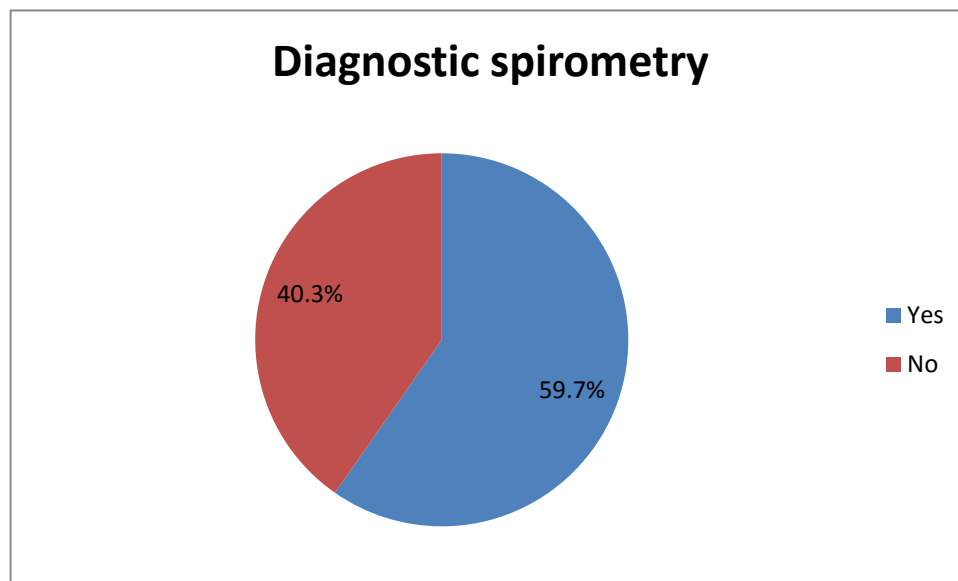


Figure 7: Rate of spirometry use for diagnosis of COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=154)

5.5 Concordance between clinical and spirometry diagnosis for COPD

From 92 patients who had diagnostic spirometry for clinical diagnosis, the diagnosis was rejected by spirometry in 37 patients, giving rejection rate of 40.2 %. In these patients the spirometry results were normal in 16.3% of the patients & other abnormalities other than COPD were detected in 23.9% of the patients

Table 3 shows the concordance between clinical and spirometry diagnosis. It also shows the severity of COPD among those who have their clinical diagnosis confirmed by spirometry. (See also figure 8)

Table 3: Spirometry results in COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=92)

	Frequency	Percent
Normal	15	16.3
Abnormal but not COPD	22	23.9
Mild COPD	20	21.7
Moderate COPD	4	4.3
Severe COPD	22	23.9
Very severe COPD	9	9.8

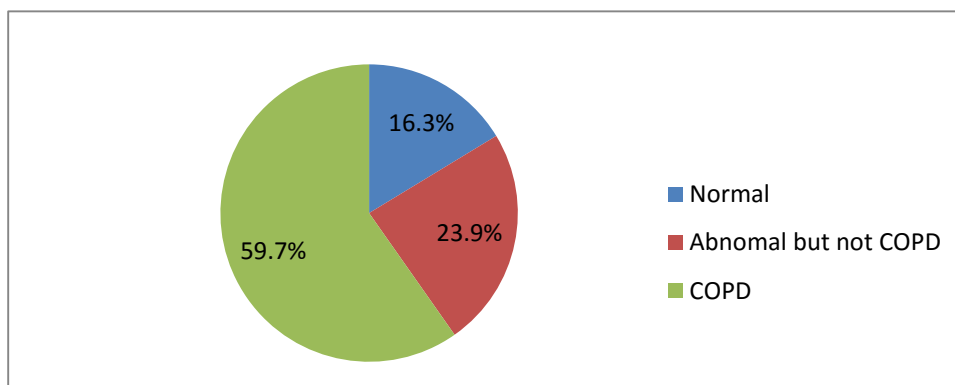


Figure 8: Spirometry results in COPD patients at SPHMMC chest clinic, January 2016-December 2020, Addis Ababa, Ethiopia (N=92)

6. Discussion

The aim of this study was to assess the practice of spirometry use in the diagnosis and follow-up of COPD patients. The results show that only about 60% patients with clinical diagnosis of COPD get their diagnosis confirmed by spirometry. And the use of spirometry for the purpose of follow-up was non-existent in all patients who has follow-up of at least 1 year duration as we didn't find even a single patient who gets spirometry for follow-up purpose.

Despite guidelines recommendation about the need to objectively confirm clinical diagnosis spirometry^[2], clinical data was relied for diagnosis in significant number of patients. Sub-optimal use of spirometry in COPD patients seems to be common also in other countries including the developed western countries. A prospective study of 203 patients in Italy done by E. Heffler et al. found that only 56.2% patients had clinical diagnosis confirmed by their spirometry^[16]. In a retrospective study in Cooper university's department of internal medicine which studied 158 patients, B. Chinai et al. found the rate of spirometry use to be 56.3%^[22]. In a multicenter study in Sweden which studied 1114 patients, M. Arne et al. found a rate of 59%^[20]. The result of all these studies is comparable to this study and we believe the reason for sub-standard use of spirometry in our setting could be due to scarcity of the resources needed for spirometry including adequate trained human resources.

Surprisingly the rate of spirometry use in our study was higher when compared to some other studies in developed countries. A similar retrospective study in a university affiliated teaching hospital in Michigan studied 6018 patients and found a much lower practice of spirometry (8.4%)^[18]. The difference can be explained by the characteristics of study participants. They studied hospitalized patients who usually are not fit for spirometry because of their unstable conditions. But we studied stable outpatient patients.

When compared to other African studies, the practice in SPHMMC seems to be better. The result was mainly much better than the Nigerian study which studied the rate of spirometry use retrospectively in 228 patients with clinical diagnosis of COPD. The rate of spirometry use in that study was 8.3%^[23]. Their study has similar study design, comparable study center, and equal number of pulmonologists when compared to our study. We believe the difference for the results could be due to the time gap between their study and our study. There was a gap of 11 years between these two studies. The fact that they studied hospitalized patients can also explain the difference. We couldn't find other reasons that can explain the difference. Our result was also better of when compared to another cross sectional survey done in Nigerian Hospitals among 321 doctors working in different hospitals. In their study, from doctors who have access to spirometry,

40.7% of them claim to use it. They included district hospitals in addition to University teaching hospitals and this can explain the difference from our study

The practice of spirometry for follow-up purpose was found to be totally non-existent in SPHMMC. This is despite the guidelines recommendation to repeat spirometry at least once a year to identify those patents that are progressing rapidly^[2]. Rapidly deteriorating patient can be given therapeutic options such as lung transplant and other therapeutics. The reason for not performing follow-up spirometry even in a single patient could be due to absence of the such therapeutic options when rapidly declining lung functions are found.

This study also showed relying on clinical diagnosis results in misdiagnosis. It was found that there is discordance between clinical diagnosis and spirometry diagnosis as 40.2% of the patients have their diagnosis rejected by spirometry. This result clearly shows the unreliability of clinical diagnosis in many patients. Similar results were shown in other studies. The percentage of rejected diagnosis was 61.9% in the BOLD study^[24], 65% in the Australian retrospective cohort study^[25], 86.3% in the Italian study^[16], 78.4% in the Latin American study^[26]. Even though the studies found different percentages, all studies including this one show that clinical diagnosis is unreliable.

7. Limitations of the study

Despite studying patients over five years period, our sample size was small when compared to some other similar studies^[18]. This can impact the generalizability of the result.

We relied on documentation on the patients' chart to assess the risk factors. Because of poor documentation some of the possible risk factors that would have affected the use of spirometry such as occupational and environmental exposures were not studied.

After COVID-19 was reported in the country on March13, 2020, spirometry service was stopped in the hospital. This has affected the results of the study.

The study was focused only on the use of spirometry for COPD patients and it didn't study the practice of spirometry in the other conditions that need spirometry such as Asthma.

We relied on pulmonologist interpretation of the spirometry results and those spirometry results that were not commented by pulmonologists were discarded since our data collectors has no training on interpretation of spirometry results.

8. Strengths of the study

- It was conducted in one of the biggest hospitals in the country with a big catchment area
- Patients over a long period of time was studied, so it is a good representative of the practice in the Hospital
- A strict exclusion criteria was used so as to exclude spirometry findings that would have affected the interpretation of concordance between clinical and spirometry diagnosis

9. Conclusion

The practice of diagnostic spirometry in COPD patients in SPHMMC was found to be better than the other African reports and it was comparable to the practice in many western countries. But still it is way below what is recommended by the guidelines.

There was no practice of spirometry for follow-up purpose in all patients who fulfill the duration needed for repeat spirometry.

Clinical diagnosis of COPD was found to be inaccurate in many patients. This emphasizes the need of spirometry for every patient suspected to have COPD

10. Recommendations

Since clinical diagnosis is inaccurate spirometry, every effort should be made to use of spirometry for confirming clinical diagnosis. The hospital administrators should increase the capability of the center by increasing the availability of the devices needed for spirometry. The pulmonology unit of SPHMMC should also focus on training internal medicine residents, general practitioner doctors and nurses on how to perform and interpret spirometry

Policy makers should also work to increase the availability of this practice in other centers of the country.

Further studies could be conducted to assess the following

- The practice of spirometry in other conditions such as Asthma and interstitial lung disease
- The effect of clinical misdiagnosis of COPD on the treatment options and on the outcome of patients
- The reasons for underutilizing spirometry in diagnosis of COPD

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11. Annexes

11.1 Annex I: Information Sheet

RESEARCH TITLE: THE PRACTICE OF SPIROMETRY USE FOR COPD PATIENTS AMONG PHYSICIANS AT ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE, ADDIS ABABA, ETHIOPIA. A 5 YEARS CHART REVIEW.

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Advisors Mr. Andamlak Gizaw (MPH, Asst. prof of public health)

Dr. Tekleweyn Solomon (Internist, Asst. Prof of Pulmonology & critical care)

Sponsor St. Paul's Hospital Millennium Medical College

11.2 Questionnaire

St. Paul's Hospital Millennium Medical College

Questionnaire for survey of practice of spirometry use for COPD patients in SPHMMC

Instruction

i. Make circle (O) or write phrases or words where necessary

ii. To be used only for intended purpose.

1) Name MRN.....

2) Age Sex..... Address

3) Occupation

4) Religion

5) Income -----

6) Relationship status

7) Educational status

8) Smoking status a) never smoked b) previous smoker c) current smoker

9) If current or previous smoker, what was the pack year

10) Is there anyone who smokes in your house?

11) Exposure to biofuel combustion?

12) What respiratory symptoms were documented?

A) chronic cough

B) Sputum production

C) Shortness of breath

D) Exercise intolerance

13) Physical examination

A) BMI

B) Wheeze

C) Barrel chest

D) Decreased breath sound

E) Signs of respiratory distress

F) Cyanosis

G) Clubbing

H) Body swelling

14) Any comorbidity? If yes, mention it

15) Hematocrit

16) Chest x-ray

17) Chest CT

18) Qualification of the physician who diagnosed COPD clinically.....

19) When did the patient first come to the follow-up clinic?

20) Total duration of follow-up in the clinic

21) Was the patient previously admitted to hospital?

22) If yes to the above question, how long was the duration of stay in hospital?

23) Was diagnostic spirometry done?

24) Did the spirometry confirm or reject the clinical diagnosis?

- 25) Time from first symptom to spirometry use
- 26) Time from clinical diagnosis to spirometry use
- 27) Spirometry finding
- a) Pre bronchodilator FEV1/FVC ratio
 - b) Post bronchodilator FEV1/FVC ratio
 - c) Conclusion
- 28) Was follow-up spirometry was done?
- 29) How often was follow-up spirometry done?
- 30) 21) Result of follow-up spirometry
- a) Pre bronchodilator EV1/FVC ratio
 - b) Post-bronchodilator FEV1/FVC ratio
 - c) Conclusion

11.3 Annex III: Assurance of Investigator

I the undersigned resident agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisors and seek the necessary advice and approval from my advisors in the course of the research. I will also communicate timely to my advisors and all stakeholders involved in the study.

Name of the Resident: _____

Signature: _____

Date: _____

Approval of Advisors

Name of Public Health Advisor: _____

Signature: _____

Date: _____

Name of Clinical Advisor: _____

Signature: _____

Date: _____