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Original Research Paper

Pulmonology

"DIFFERENTIATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND ASTHMA USING SYMPTOM BASED QUESTIONNAIRE"

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ABSTRACT Obstructive airway diseases, both chronic obstructive pulmonary disease (COPD) and asthma are leading cause of mortality and morbidity worldwide. Both of the diseases are treatable. Early and correct diagnosis has better prognosis. They are often misdiagnosed or under diagnosed by primary health providers due to lack of proper training and non-availability of spirometry. Hence a symptom-based questionnaire was proposed and used to differentiate COPD and asthma. The patients were interviewed and spirometry was done to find the differentiating features.

Leading differentiating factors for COPD and asthma were: Sex, BMI, smoking index, chronic cough, chronic phlegm, MMRC dyspnoea scale, breathing related hospitalization, wheezing, past history of use of inhaled medications, h/o hay fever, eczema or skin allergy, nasal problems, family h/o allergy, h/o treatment for breathing difficulty.

KEYWORDS : Asthma, COPD, spirometry

Introduction

Asthma and COPD are prevalent respiratory conditions with overlapping disease characteristics and are still serious health problems with increased morbidity and mortality.[1] COPD is listed as the fourth leading cause of death worldwide.[2] India is one of the countries identified to have a significant increase in the burden of tobacco related mortality.[3]

Early symptoms of COPD, such as breathlessness, are often dismissed by primary care giver or at times considered as asthma or allergy in villages; such patients are wrongly labelled and carry on with the same diagnosis till they reach a respiratory specialist. As a consequence, identification of patients in the early stages of COPD is challenging. Such delay in diagnosis will delay adequate treatment and the possibility of preventing physical, emotional and socioeconomic consequences of the disease.[4,5,6]

Differentiation between asthma and COPD is important because several aspects of the guideline-recommended different management strategies for these conditions. There is now clear evidence that the pathogenesis and pathophysiology of asthma and COPD are not the same, and therefore, patients with these conditions should be treated accordingly.[7] There is much evidence indicating that anti-inflammatory and bronchodilator therapies do not have the same efficacy in patients of COPD as compared to asthma. Prognosis also differ in both the conditions, asthma is often fully remittent, especially in childhood and COPD seems to be more irreversible.[8]

In developing countries like India, monumental population resides in suburbs/villages where access to spirometry is unavailable and practioners may lack the skill of interpretation. Global Initiative for Chronic Obstructive Lung Diseases (GOLD) guidelines recommend that, when spirometry is unavailable, the diagnosis of COPD should be made using all available tools[9] such as symptom based questionnaire. This may enhance the rate and accuracy of diagnosis of obstructive airway diseases.

Material & Methods

Study Design (Fig-1)

Study was carried out as a single center prospective and observational study conducted at Lala Ram Sarup Institute of Tuberculosis and Respiratory Diseases, New Delhi; during the period from 1st June 2008 to 15th March 2010 (150 patients were selected).

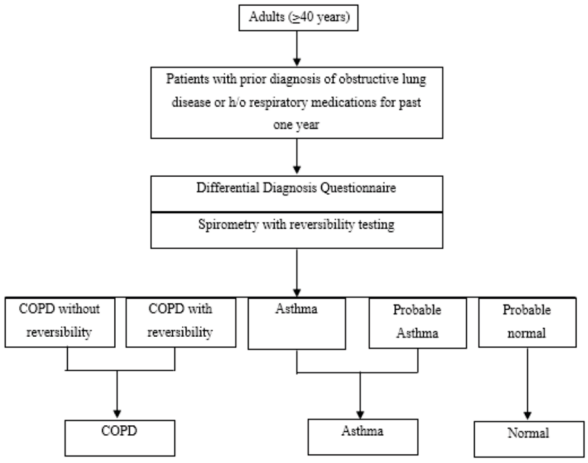


Figure 1. Algorithm depicting study design

Setting

Patients attending the chest clinic at LRS Institute of Tuberculosis and Respiratory Diseases

Subject Recruitment

Patients were recruited with age ≥40 years along with prior evidence of obstructive lung disease (e.g. COPD, asthma) on physician diagnosis or h/o respiratory medications within the past year, regardless of smoking status after informed consent. Patients with history of known preexisting or concomitant non-obstructive lung disease, active tuberculosis, unstable heart disease and with acute respiratory illness were excluded.

Study Tool

The patients were interviewed followed by spirometry with reversibility testing and were classified (Table- 1).

Table-1: Criteria establishing the Study Diagnosis

Study diagnosis	Criteria
COPD without reversible component	Post bronchodilator FEV1/FVC <0.70 Reversibility <200 ml or <12% of baseline FEV1
COPD with reversible component	Post bronchodilator FEV1/FVC <0.70 Reversibility ≥200 ml and ≥12% of baseline FEV1

Asthma	Post bronchodilator FEV1/FVC ≥0.70 Reversibility ≥200 ml and ≥12% of baseline FEV1
Probable asthma	Post bronchodilator FEV1/FVC ≥0.70 Reversibility <200 ml or <12% of baseline FEV1 and Prior diagnosis of asthma or subject is taking corticosteroids on a chronic basis
Probable normal	Post bronchodilator FEV1/FVC ≥0.70 Reversibility <200 ml or <12% of baseline FEV1 and Does not fulfill criteria for probable asthma

Questionnaire included 59 questions covering sociodemographic data, symptoms and relevant history. Questions were translated in Hindi language according to standard protocols for better understanding and ease of answering. These observations were compared to each group to obtain relevant results. Inter-observer variability or bias was eliminated by keeping single investigator.

The Study of Patients

Each patient was analysed in the following variables (sociodemographic data, symptoms and relevant history)

1. Name
2. Age and Sex
3. BMI
4. Address and Contact No.
5. Smoking
6. Dyspnoea
7. Phlegm
8. Wheeze
9. History (family, inhaler, allergy, nasal features)
10. Others (nasal symptoms, smoke, wheeze, fumes)
11. Cough
12. PFT (Spirometry with reversibility)

Data was analysed using univariate analysis for non-numerical values and ANOVA for numerical values. $p<0.05$ was considered statistically significant.

Observations

One hundred and fifty patients with Obstructive Lung Disease fulfilling the inclusion criteria were enrolled for this study. The following observations were made:

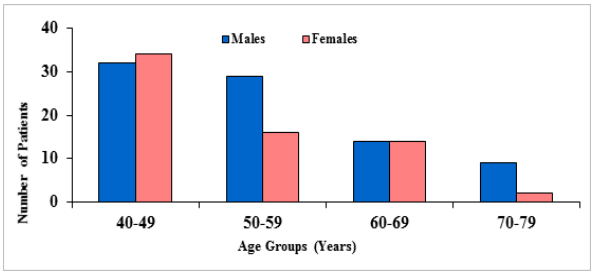
Gender Distribution

Among the total of 150 patients 84 (56%) were males and 66 (44%) were females.

Relationship Between Patients Age and Sex

It was observed that out of 150, maximum number of patients, 66 (44%) were found in age group 40-49 years consisting of 32 males and 34 females, age group 50-59 had 45 (30%) patients of which 29 males and 16 females, age group 60-69 had 28 (18.7%) patients of which 14 males and 14 females, minimum patients were in age group 70-79 had 11 (7.3%) patients of which 9 males and 2 females. The mean age of total patients was found to be 50.06±9.81 (51.75±4.64 male, 50.73±9.61 female). (Graph-1)

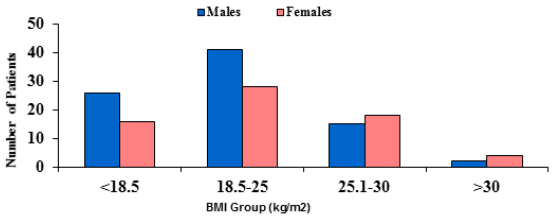
Graph-1: Relationship between age and sex



Relationships Between Patients' Body Mass Index (BMI) and Sex

It was observed that out of 150, maximum number of patients, 69 (46%) had normal BMI ranging between 18.5-25 kg/m^2, out of which 41 were males and 28 were females. Minimum numbers of patients, 6 (4%) were found obese with BMI >30 kg/m^2, out of which 2 were males and 4 were females. Mean BMI of 150 patients was 21.7 kg/m^2. Males had a mean BMI of 21.3 kg/m^2 while females had a mean BMI of 22.1 kg/m^2. (Graph-2)

Graph-2: Relationship between BMI and sex



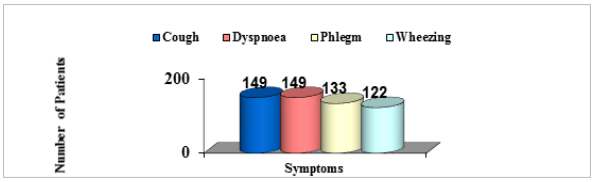
Smoking Status

It was observed that among 150 patients, 90 (60%) were active smokers, 44 (29.3%) were passive smokers and 16 (10.7%) were non-smokers.

Distribution of Symptoms

It was observed that among 150 patients, cough and dyspnoea were the most common symptom found in 149 (99.3%), followed by phlegm present in 133 (88.7%) while wheezing was the least common symptom found in 122 (81.3%) patients. (Graph-3)

Graph-3: Distribution of symptoms



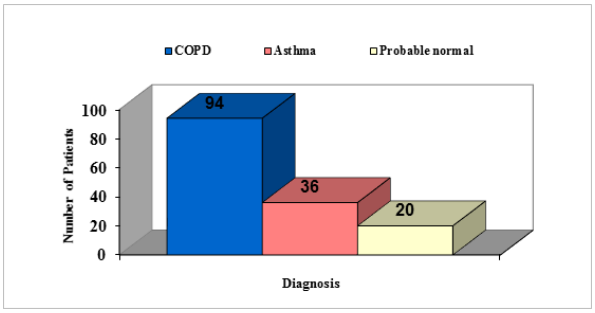
Symptoms on the Basis of History

It was observed that out of 150, family h/o allergy was present in 45 (30%). Personal h/o allergy was present in 15 (10%). History of nasal problems was present in 42 (28%), while past h/o treatment for breathing difficulty was present in 110 (73.3%) patients.

Diagnosis on the Basis of Spirometry

It was observed that out of 150, maximum number of patients, 94 (62.7%) had diagnosis of COPD, 36 patients (24%) had diagnosis of asthma while diagnosis of probable normal was made in 20 (13.3%) patients. (Graph-4)

Graph-4: Diagnosis



Results

Results of variables in comparison to disease pattern based on spirometry are as follows (Table-2)

Table-2: Results of variables

Variables		COPD (n=94)	Asthma (n=36)	Probable normal (n=20)	Total (n=150)	P value
Age	Mean	51.79±9.33	53.19±10.74	51.30±10.60	52.06±9.81	0.717 (NS)
Sex	Male	61 (64.9%)	19 (52.8%)	4 (20%)	84 (56%)	0.001 (S)
	Female	33 (35.1%)	17 (47.2%)	16 (80%)	66 (44%)	
BMI	<18.5	33 (35.1%)	6 (16.7%)	2 (10%)	41 (27.3%)	0.012 (S)
	>18.5	61(64.9%)	30(83.3%)	18(90%)	109(73.7%)	0.438 (NS)
Smoking index	Mean	259.79 ±331.98	87.78 ±151.12	86 ±118.15	195.33 ±288.02	0.002 (S)
COUGH	3 month/year	54 (57.4%)	12 (33.3%)	5 (25%)	71 (47.3%)	0.005 (S)
	Cough >2 yr	65 (69.1%)	21 (58.3%)	7 (35%)	93 (62%)	0.015 (S)
	Chronic cough	45 (47.9%)	9 (25%)	4 (20%)	58 (38.7%)	0.01 (S)
MMRC dyspnoea scale	Grade1	6 (6.4%)	2 (5.6%)	7 (35%)	15 (10%)	0.015 (S)
	Grade2	66 (70.2%)	30 (83.3%)	11 (55%)	107 (71.3%)	
	Grade3	18 (19.1%)	4 (11.1%)	1 (5%)	23 (15.3%)	
	Grade4	2 (2.1%)	0 (0%)	1 (5%)	3 (2%)	
	Grade5	2 (2.1%)	0 (0%)	0 (0%)	2 (1.3%)	
Phlegm	Present	85 (90.4%)	32 (88.9%)	16 (80%)	133 (88.7%)	0.355 (NS)
	3 month/year	47 (50%)	8 (22.2%)	4 (20%)	59 (39.3%)	0.002 (S)
	Chronic phlegm	42 (44.7%)	10 (27.8%)	4 (20%)	56 (37.3%)	0.046 (S)
Wheezing	Present	81 (86.2%)	29 (80.6%)	12 (60%)	122 (81.3%)	0.024 (S)
	Started in recent years	63 (67%)	17 (47.2%)	9 (45%)	89 (59.3%)	0.045 (S)
	Wake with wheezing	36 (38.3%)	13 (36.1%)	5 (25%)	54 (36%)	0.531 (NS)
Inhalers	Helped a lot	28 (29.8%)	13 (36.1%)	0 (0%)	41 (27.3%)	0 (S)
	Did not help	12 (12.8%)	10 (27.8%)	0 (0%)	22 (14.7%)	
	Never tried	54 (57.4%)	13 (36.1%)	20 (100%)	87 (58%)	
Family H/O any allergy	Yes	13 (13.8%)	13 (36.1%)	0 (0%)	26 (17.3%)	0.001 (S)
H/O hay fever, eczema or Skin allergy	Yes	5 (5.3%)	7 (19.4%)	0 (0%)	12 (8%)	0.017 (S)
H/O treatment for breathing difficulty	Yes	74 (78.7%)	32 (88.9%)	4 (20%)	110 (73.3%)	0 (S)
H/O nose problems in past years	Yes	10 (10.6%)	13 (36.1%)	2 (10%)	25 (16.7%)	0.002 (S)
Nose problem without a cold	Yes	6 (6.4%)	9 (25%)	2 (10%)	17 (11.3%)	0.013 (S)

Discussion

The present study was conducted with the prospective analysis of the utility of symptom based questionnaire to differentiate between COPD and asthma with spirometry and reversibility testing.

Age

In our study mean age of COPD patients was 51.8 years compared with 53.2 years in asthmatics. Thus in our study, age was not statistically significantly associated with differential diagnosis of COPD and asthma probably because our study included subjects ≥40 yrs. The studies done by Zeilinski et al[10], Tinkelman et al[11] and Miedinger et al[12], found that patients of COPD were more likely to be older (mean age of 51.8, 58.7 and 54 years respectively) when subjects ≥40 years were studied which is comparable with our study. Beeh et al[13] found increased likelihood of COPD with increasing age (mean age 54 years) and early onset of symptoms (age <20 years) with increased likelihood of asthma.

Sex

In our study we found that COPD was more common in males (64.9%) than females (35.1%). Comparable trends were seen by Zielinski et al[10], Beeh et al[13] and Miedenger et al[12] with prevalence of males in COPD as 57.3%, 57% and 60% respectively. This could be explained with fact that active smoking is more common in males as compared to females and smoking is an important causative factor for COPD. In asthma not much of gender difference was found and results were comparable with Beeh et al[13]. Thus gender is an important factor in differentiating COPD from asthma.[11,13,14]

BMI

In our study BMI <18.5 kg/m^2 (underweight) was more common in COPD patients as compared to asthma (35.1% Vs 16.7%) reflecting the extra-pulmonary components of COPD (skeletal muscle wasting and nutritional abnormalities leading to cachexia and weight loss).

BMI is included in BODE index and has been recognized as a prognostic factor in COPD and is an independent risk factor of death[15]. It was also found in our study that asthma was more common as compared to COPD in higher BMI (83.3% Vs 64.9). In other studies,[16,17] it was observed that obese patients had higher risk of developing asthma as compared to non-obese patients. Thus BMI was found to be significant for differential diagnosis of COPD and asthma when our results were compared with other studies.

Smoking

In our study overall subjects with diagnosis of COPD had a higher smoking exposure (mean smoking index of 259.8) than patients with asthma (mean smoking index of 87.8). Similar trends were found in other studies[10,11,18] where smoking index were higher in COPD patients as compared to asthma.

Tobacco smoke from various forms viz bidis; cigarette, hukka, and Environmental tobacco smoke (ETS) can cause COPD as well as asthma.[19] Smoking intensity differentiates COPD from asthma with higher smoking exposure correlating with diagnosis of COPD.

Symptoms

Symptoms of cough, sputum production and dyspnoea were distributed fairly evenly across our study population independent of the presence of airflow limitation. These are non-specific symptoms and patients may over and under report these symptoms. The prevalence of symptoms is high among smokers with airway obstruction but they are not sensitive, specific or predictive of airway obstruction.[20]

Cough

In our study we found that almost all COPD patients (98.9%) and all asthmatics (100%) reported cough as their presenting symptom, similar trends were seen by other investigators Calverly et al[21], Martinez et al[22], Ohar et al[20] and Yawn et al[23]. Hence cough alone did not differentiate COPD and asthma. However it was found that certain characteristics of cough in COPD patients like presence of cough for 3 months in a year (57.4%) and presence of cough for more than 2 years (69%) and chronic cough (48%) were found to be significant for differentiating it from asthma. Similarly, Gingter et al[24] found that chronic cough was present in 43% COPD patients which is comparable with our study.

Dyspnoea

Dyspnoea is a subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity.[25] In our study we found that out of 150 patients, 149 had dyspnoea. All the COPD and asthmatic patients reported dyspnoea as their presenting symptom. Tinkelman et al[11], Freeman et al[26] also found dyspnoea as the most frequent symptom. Hence dyspnoea alone cannot differentiate COPD and asthma.

MMRC Dyspnoea Scale

Modified Medical Research Council dyspnoea scale (MMRC) is simple to administer and correlates with other dyspnoea scales and with scores of health status[27, 28]. In the BODE index, the score on the MMRC dyspnoea scale was a better predictor of the risk of death than FEV_1[29,15]

In our study, MMRC dyspnoea scale questionnaire found that maximum number of COPD patients (70.2%) and asthmatics (83.3%) had MMRC grade 2 dyspnoea at presentation. Exertional dyspnoea was more severe and significant in COPD patients with grade 3 present in 19%, grade 4 in 2% and grade 5 in 2% of patients as compared to 11.1%, 0% and 0% in asthmatics. Celli et al[15], Freeman et al[5126], Tinkelman et al[11], Martinez et al[22] and Miedniger et al[12] found that exertional dyspnoea on MMRC scale is more severe in COPD patients and helps in differentiating it from asthma.

Phlegm

It was observed that out of 150 patients, 90.4% of COPD and 88.9% asthmatic patients had history of sputum production, thus sputum production did not differentiate between the two. In certain western studies[13, 23, 24] sputum production was found to be low as compared to our study.

This could be due to the fact that in our study pre diagnosed obstructive lung disease patients were enrolled compared to general population in other studies. When characteristics of phlegm were studied it was found that phlegm for 3 months in a year (50%) and chronic phlegm (44.7%) were found to be significant for differentiating COPD from asthma (22.2% and 27.8% respectively), comparable observations were made by Tinkelman et al[11].

Wheeze

It was observed that out of 150 patients, 86% COPD and 81% asthmatics had wheeze as compared to 60% in probable normal group, hence wheeze statistically differentiates patients with obstructive airway disease from others. When duration of wheeze was compared, it was found that wheeze in recent years was more in COPD (67%) as compared to asthmatics (47%). Similar trends were seen in another American study[11]. This can be explained due to earlier onset of wheezing in asthmatics than COPD.

History

H/O Inhaled Medications

It was observed that none of probable normal had ever used inhalers while 57% and 36% COPD and asthma patients had never used inhaled medication. Among the group of patients who had used inhalers, the beneficial effect was more in asthmatics (36%) as compared to COPD (29%), which when compared was found to be significant in differentiating them. No such correlation was found in white race[11]. This can be explained due to differences in population characteristics.

H/O Allergy

It was observed, family history of allergy, history of eczema or skin allergy was found significantly more in asthmatics (56%) as compared to COPD (19%). Comparable observations were made by Beeh et al[13], Frank et al[30].

H/O Treatment of Breathing Difficulty

It was observed that 79% COPD, 89% asthmatics and 20% in probable normal group, had past history of some sort of treatment. Though there was no significant difference between COPD and asthma groups but significant difference was found when compared to probable normal group.

H/O Nasal Symptoms

In our study it was observed that asthmatics had significantly more history of nasal problems (36%), nasal problem without cold (25%) as compared to COPD patients (10% and 6.4% respectively).

Spirometry and Diagnosis

In our study, the spirometry with reversibility was the basis of differentiation of COPD and asthma and further dividing COPD patients into reversible and irreversible components and asthma into confirmed asthma and probable asthma. Patients with normal spirometry and no history of medications in past were considered probable normal.

In the total population of our study, COPD (reversible + irreversible component) was 62.6% whereas asthma (confirmed asthma + probable asthma) was 24% and 13.3% were probable normal. Our results did not match with other studies[10,18,26]. This may be due to difference in sample size, inclusion-exclusion criteria's and difference in race.

Conclusion

Concluding this study, it emphasizes that spirometry with reversibility testing is gold standard case finding strategy to differentiate and diagnose COPD and asthma, but it cannot be used in large populations, as majority of primary care givers do not have accessibility to spirometers and lack skill of interpretation. Hence simple questioners based on symptoms and history should be researched/prepared as to determine differences between COPD and asthma along with ruling out probable normal subjects who do not need further work up.

The study advocates that use of questionnaires is not intended to replace the need for spirometer. We believe that they can be very useful to facilitate the diagnosis especially in settings where spirometry is not readily available, or where it is under-utilized. Thus symptom based questionnaire in conjunction with spirometry helps in differentiating COPD from asthma.

Limitation of the Study

The size of the study population is small. We need large scale multicentric studies with a bigger sample size. The setting of this study does not fully preclude the possibility of selection or referral bias

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