

Sociodemographic Profile of Patients of COPD and Bronchial Asthma in Tertiary Care Centre of Uttarakhand.

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ABSTRACT

Background: Burden of chronic respiratory disease is alarming. International studies suggest that chronic respiratory disease are under surveyed & under diagnosed worldwide. The purpose of the study is to investigate the socio-demographic profile of patient with COPD and bronchial asthma patients presenting to tertiary care centre of Uttarakhand. **Objective:** To study the sociodemographic profile of patients with COPD and bronchial asthma attending the Sushila Tiwari hospital Haldwani, Uttarakhand. **Methods:** All patients with respiratory complaints meeting the inclusion criteria & willing to undergo spirometry were recruited from outpatient department and emergency department of government college Haldwani and associated Sushila Tiwari hospital Haldwani. **Results:** 154 patients (70 females and 84 males) were evaluated by spirometry. Male dominance was seen in COPD that is 47(59.5%), while female dominance was seen in bronchial asthma that is 17(54.8%). Bidi smoking was common in male, smoking and exposure to smoke from biofuel was responsible for COPD in female patients. Maximum number of patient presented in stage 2 COPD (moderate) 45(56.9%) followed by 23(29.11%) patient of severe COPD (stage 3). **Conclusion:** In our study tobacco product most frequently used was bidi both in man and women. Contrary to popular belief in developing countries, women exposed to tobacco smoke, whether active or passive, whether by bidi or hukka, like men are at increased risk for the development of COPD. Asthmatic subjects showed more reversibility than COPD subject. In evaluation of obstructive lung disease spirometry remained an investigative tool.

Keywords: Chronic obstructive pulmonary disease , Bronchial asthma , Spirometry.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) and bronchial asthma are the common conditions and their worldwide prevalence is expected to increase over the next twenty years^[1] Although the two diseases share many clinical features, there are important clinical and pathological differences influencing choice of medication and long term aims of management.^[2-4]

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COPD is defined as a disease state characterized by airflow limitation that is not fully reversible. The Global Burden of Disease Study has projected that COPD, which ranked sixth as the cause of death in 1990, will become the third leading cause of death worldwide by 2020.^[5,6] The prevalence & burden

of COPD are projected to increase in the coming decades due to continued exposure to COPD risk factors and the changing age structure of the world's population, with more people living longer and thus reaching the age at which COPD normally develops.^[7] Smoking cessation in early COPD is found to reduce rapid decline of ventilatory function in smokers,^[8,9] its early detection in asymptomatic smokers is also likely to motivate smokers to make an attempt to quit smoking thereby halting its progression to severe stage.^[10] According to Global Initiative for Chronic Obstructive Lung Disease (GOLD) COPD is defined as a disease state characterized by airflow limitation that is not fully reversible [Table 1].

Table 1: GOLD classification of COPD severity based on post bronchodilator FEV₁

Category	Severity	FEV ₁ (% Predicted)
GOLD 1	Mild	>80%
GOLD 2	Moderate	50% TO <80%
GOLD 3	Severe	30% TO 50%
GOLD 4	Very Severe	<30%

Bronchial asthma is a chronic inflammatory disorder of airways characterized by variable and recurring symptoms, airflow obstruction, bronchial hyper-responsiveness and underlying inflammation. The degree of reversibility following bronchodilator administration has played a pivotal role in the evaluation of obstructive lung disease, thereby influencing drug choice and patterns of care.^[11]

As per Global initiative for Asthma Guidelines (GINA), to establish the diagnosis of asthma, spirometry was the preferred method of measuring airflow limitation & its reversibility to establish the diagnosis of asthma. American Thoracic Society define positive bronchodilator response as an

increase in FEV₁ >12 % of baseline FEV₁ &/or FVC >200 ml after administration of a bronchodilator indicates reversible airflow limitation, consistent with feature bronchial asthma. Apart from the FEV₁ & FVC, Peak Expiratory flow (PEF) measurement is an important aid in both diagnosis & monitoring of asthma. An improvement of >20% of the pre-bronchodilator PEF, after inhalation of a bronchodilator, or diurnal variation in PEF, after inhalation of bronchodilator, or diurnal variation in PEF of more than 20% (with twice daily readings, more than 10% for more than one or two weeks) suggested a diagnosis of asthma [Table 2].

Table 2: Classification of Bronchial Asthma on the Basis of FEV₁, PEF, PEF Variability

Category	Lung Function	Daytime Symptoms	Nighttime Symptoms
Severe Persistent	FEV ₁ or PEF<60% Predicted PEF variability>30%	<ul style="list-style-type: none"> Continual symptoms Limited physical activity Frequent exacerbation 	Frequent
Moderate persistent	FEV ₁ or PEF>60% <80% Predicted PEF variability>30%	<ul style="list-style-type: none"> Daily symptoms Daily use of inhaled drugs Exacerbations>2 times /week , may last days 	>5 months
Mild persistent	FEV ₁ or PEF >80% Predicted PEF variability 20-30%	<ul style="list-style-type: none"> Symptoms 3-6 times/week Exacerbations may affect activity. 	3-4 times / month
Mild intermittent	FEV ₁ or PEF>80% Predicted PEF variability<20%	<ul style="list-style-type: none"> Symptoms <2 times /week Asymptomatic & normal PEF between exacerbations. 	<2 times /week

The present study comprises the socio-demographic profile of patients with COPD and bronchial asthma, and its association with various risk factors. Spirometry is a simple and accurate tool to assess airflow obstruction. In hilly state of Uttarakhand, there has been no such valid spirometry based study done previously.

Aim and Objective: To know socio-demographic profile of patient with COPD and bronchial asthma, in tertiary care centre of Uttarakhand.

MATERIALS AND METHODS

Type of Study-Prospective descriptive study

Duration of Study-November 2013 to October 2015(2 years)

Method of Data Collection-

154- Patients of age >15 years presenting with respiratory symptoms suggestive of COPD or bronchial asthma were selected from the Outpatient department and emergency of Dr Sushila Tiwari hospital, Government Medical College Haldwani, Nainital, Uttarakhand. A pre-designed questionnaire was used to obtain a data, which incorporated personal information (age, sex, address, and clinical profile), history of treatment and associated risk factors. A detailed clinical history and examination was performed and

findings recorded. After taking consent these patients were subjected to spirometry. All bronchodilators were withdrawn prior to spirometry. Spirometry was performed in accordance to American thoracic society guidelines. A baseline and post bronchodilator pulmonary function test (PFT) taken.

On the basis spirometric finding, these patients were classified as COPD, bronchial asthma, and normal group.

Inclusion criteria for COPD was smoking history >10 pack years associated with cough & sputum production, exposure to biomass fuel or pollution associated with cough, sputum production, breathlessness. Inclusion criteria for bronchial asthma were nonsmoker with history of atopy, rhinitis, eczema, seasonal variation of symptoms, recurrent episodes of wheezing, breathlessness, chest tightness, coughing particularly at night or in early morning.

Patients having present or past history of tuberculosis, poor LV function, cardiac disease, valvular heart disease, and interstitial lung disease were excluded from the study.

Data Analysis:

Results are presented as mean ± standard error of mean.

A p value of < 0.05 was considered significant.

Descriptive group data were compared using the unpaired student t-test. Differences among the groups were evaluated using independent student t-test.

RESULTS

Results:

1. Number of patients: Total 154 patients were selected for study, out of which 79(51.3%) COPD, 31(20.1%) Asthma patient were further evaluated. 44 (28.6%) patient were found to be normal [Table 3, Figure 1].

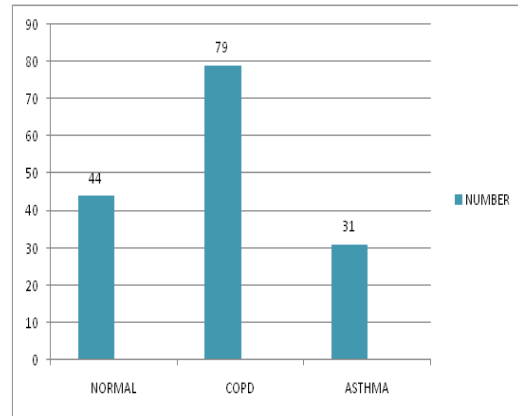


Figure 1: Number of normal, COPD and Asthma patients.

Table 3: Number of patients (n)

Number of patients	Diagnosis			Total
	Normal	COPD	Bronchial Asthma	
N	44	79	31	154
%	28.6	51.3	20.1	100.0

2. Sex Distribution: There was a male preponderance with 47(59.50%) patients being male and 32(40.50%) females in COPD group. While in Asthma group a female preponderance was observed with 17(54.80%) being female and 14(45.20%) male. In Normal group, male preponderance with 23(52.30%) patient being male and 21(47.7%) female [Table 4, Figure 2].

3. Age: Patients were divided into 4 age groups according to their age. In COPD group the youngest patient was of 35 year and the oldest was 81 year. In Bronchial asthma group youngest was of 16 year and the oldest was 70 year. Maximum number of patients was seen in 41-60 years age group having 58(73.4%) patients in COPD group. The mean age in COPD group was 56.13(±8.76). In asthma group the mean age was 37.88(±11.57). In Normal group the mean age of patient was 43.96(±17.35) [Table 5, Figure 3].

Table 4: Sex distribution.

Sex	Number %	Diagnosis			Total
		Normal	COPD	Bronchial Asthma	
Female	n(%)	21(47.7%)	32(40.5%)	17(54.8%)	70(47.66%)
Male	n(%)	23(52.3%)	47(59.5%)	14(45.2%)	84(54.5%)
Total	n(%)	44(100.0)	79(100.0)	31(100.0)	154(100.0)

Table 5: Distribution of age.

Age Group	Diagnosis			Total
	Normal	COPD	Asthma	
< 20 Year	0(0%)	0(0%)	3(9.7%)	3(1.9%)
20-39 Year	31(70.5%)	1(1.2%)	13(41.9%)	45(29.3%)
40-59 Year	11(25.0%)	58(73.4%)	10(32.3%)	79(51.3%)
>60 Year	2(4.5%)	20(25.4%)	5(16.1%)	27(17.5%)
Total	44(100.0%)	79(100.0%)	31(100.0%)	154(100.0%)

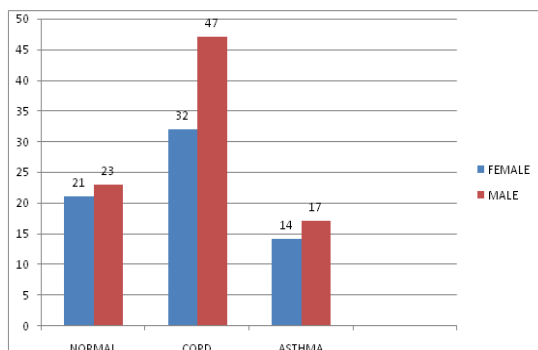


Figure 2: Gender wise distribution.

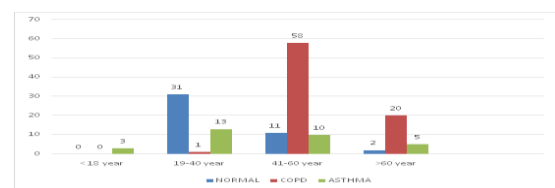


Figure 3: Age wise distribution.

4. Weight, Height and Body Mass Index (BMI):

The mean height and weight in COPD group was 159.03 cm (± 8.45) and 55.81 kg (± 13.70) respectively. Mean BMI in COPD group was 21.97 kg/m² (± 4.7). In Asthma group mean height, weight and BMI was 157.67 cm (± 11.66), 59.35 kg (± 13.89) and 23.98 kg/m² (± 5.7) respectively. In Normal group mean height, weight and BMI was 160.65 cm (± 9.97), 63.52 kg (± 11.54) and 24.69 kg/m² (± 4.4) respectively [Table 6].

Weight (kg)	59.35 (± 13.89)	55.81 (± 13.70)	63.52 (± 11.54)
BMI (kg/m ²)	23.98 (± 5.7)	21.97 (± 4.7)	24.69 (± 4.4)

Table 6: Height, Weight and BMI of COPD and Asthma patients.

Measurements	Bronchial Asthma	COPD	Normal
Height (cm)	157.67 (± 11.66)	159.03 (± 8.45)	160.65 (± 9.97)

5. Symptoms: Shortness of breath was the most common symptom seen in 100% cases. Second most common symptom observed was cough, seen in 66(83.54%), 26(83.87%), 29(65.90%) patients of COPD, Asthma and Normal group respectively. 22(27.84%), 3(3.79%) and 3(3.79%) patients had fever, pain abdomen and chest tightness respectively in COPD group. 8(25.8%), 9(29.03%) patients has fever and chest-tightness respectively in Asthma group [Table 7, Figure 5].

Table 7: Number of patients with symptoms of Bronchial Asthma, COPD.

Symptoms	Number (%)	Bronchial asthma	COPD	Normal
Shortness of breath	n (%)	31(100%)	79(100%)	44(100%)
Fever	n (%)	8(25.8%)	22(27.84%)	11(25%)
Cough	n (%)	26(83.87%)	66(83.54%)	29(65.90%)
Pain abdomen	n (%)	0(0)	3(3.79%)	0(0)
Chest tightness	n (%)	9(29.03%)	3(3.79%)	0(0)

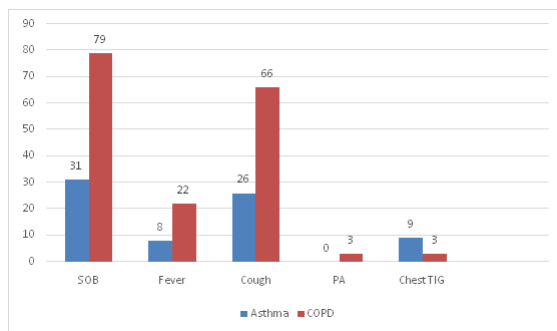


Figure 5: Symptoms of Asthmatic and COPD patients.

6. Signs : Rhonchi was most common sign observed, being 45(56.96%)male and 31(39.24%)female in COPD group and 15(48.38%) female and 11(35.48%) male in Asthma group. Crackles were present in 7(8.8%) and 01(3.22%) patient both male and female in COPD and Asthma group respectively. 8(10.12%) male patients in COPD group had clubbing (1.2%) patient had hepatomegaly and 1(1.2%) patient had edema in COPD group respectively [Table 8, Figure 6].

Table 8: Signs of Asthmatic and COPD patients.

Sign	Bronchial Asthma		COPD	
	F	M	F	M
Rhonchi	15(48.38%)	11(35.48%)	31(39.24%)	45(56.96%)
Crackles	01(3.22%)	01(3.22%)	7(8.8%)	7(8.8%)
Hepatomegaly	0	0	0	1(1.2%)
Clubbing	0	0	0	8(10.12%)
Edema	0	0	0	1(1.2%)

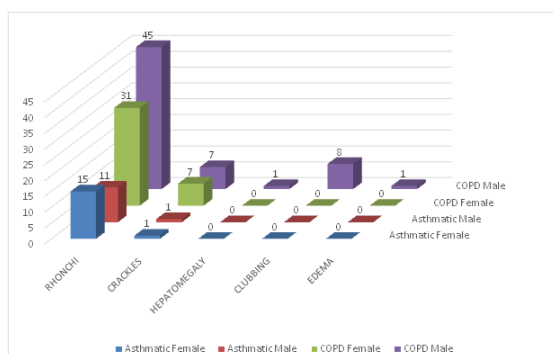


Figure 6: Signs of Asthmatic and COPD patients.

7. Radiological Features: Hyperinflation was most common radiological finding observed in 31(39.24%) male and 15(18.98%) female in COPD group, 4(12.90%) female and 5 male (16.12%) in Asthma group. Prominent bronchovascular marking was seen in 11(13.92%) female and 6(7.95%) male in COPD group, 6(19.35%) female and 2(6.45%) male in Asthma group. In 73 patients, chest radiograph was normal [Table 9].

8. Smoking pattern: Overall, 57(72.15%) patients in COPD group and 6(13.63%) patients in normal group were smoker. Among COPD patient, 42(89.36%) male patients and

15(46.89%) female patients were smoker. Bidi smoking was most common pattern observed being 36(76.59%) male COPD and 13(46.62%) female COPD group. Cigarette smoking was observed in 6(12.76%) male COPD, and none in female COPD group, while hukka smoking was observed in 2(6.25%) female COPD patient and none in male COPD group. 5 (10.6%) male COPD and in 17 (53.12%) female COPD patients were nonsmoker [Table 10].

9. Geographical distribution: Patient in present study were from both hilly and plain terrain of the state. Fifty one (64.55%) patients were from plain region and 28(35.44%) patients were from hilly region in COPD group. In Asthma, group 19(61.29%) patients were from plain regions and 12(38.70%) patients were from hilly region.

Table 9: Radiological features of Asthmatic and COPD patients.

Features	Bronchial asthma		COPD		Normal	
	F	M	F	M	F	M
Hyperinflation	4(12.90)	5(16.12)	15(18.98)	31(39.24)	0(0)	0(0)
BVM Prominent	6(19.35)	2(6.45%)	11(13.92)	6(7.59%)	1(2.27%)	2(4.54%)
Normal	7(22.52%)	7(22.58%)	6(7.59%)	10(12.65%)	20(45.72%)	21(47.72%)

Table 10: Smoking pattern.

Smoking pattern	COPD group (n= 79) Smokers 57 (72.15%), Non-smokers 22 (27.85%)		Normal group(n= 44) Smokers 6 (13.63%) Nonsmokers 38 (86.37%)	
	Male(n=47) Smokers 42(89.36%) Nonsmokers 5(10.6%)	Female(n=32) Smokers 15(46.89%) Nonsmokers 17(53.12%)	Male(n=23) Smokers 5(21.73%) Nonsmokers 18(78.26%)	Female(n=21) Smokers 1(4.76%) Nonsmokers 20(95.23%)
Cigarette	6(12.76)	0(0%)	1 (4.34%)	0 (0.0%)
Bidi	36(76.59%)	13(46.62%)	4(17.39%)	1 (4.76%)
Hukka	0(0%)	2(6.25%)	0(0.0%)	0 (0.0%)
None	5(10.6%)	17(53.12%)	18(78.26%)	20(95.23%)

In COPD group 64.86% patient were from plain region, 35.14% patients were from hilly region. In asthma group 64.29% were from plain region, 35.71% were from hilly region [Table 11].

Table 11: Distribution of geographical condition.

Diagnosis	Hilly	Plain
Normal (n=44)	23(52.27%)	21(47.72%)
COPD (n=79)	28 (35.44%)	51(64.55%)
Bronchial Asthma(n=31)	12(38.70%)	19(61.29%)

10. Classification of COPD severity based on GOLD

Criteria: As per GOLD criteria of severity of COPD based on post bronchodilator FEV1 (%), maximum number of patient being 45(56.96%) belonged to moderate COPD. Twenty three (29.11%), 4(5.06%), 3(3.79%) patients had severe, mild and very severe COPD [Table 12, Figure 7].

Table 12: Distribution of patients as per severity of disease as per GOLD criteria.

Gold	Severity	Post bronchodilator FEV1 (%)	Number of patient
Gold 1	Mild	>80	4(5.06%)
Gold 2	Moderate	50 to 80	45(56.96%)
Gold 3	Severe	30 to 50	23(29.11%)
Gold 4	Very Severe	< 30	3(3.79%)

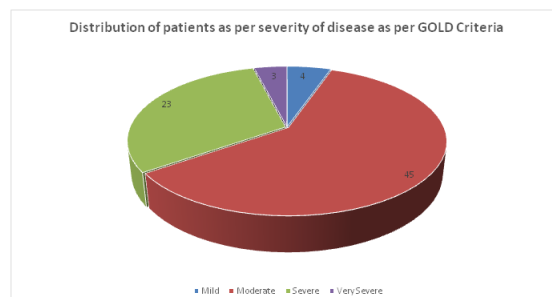


Figure 7: Distribution of patients as per severity of disease as per GOLD criteria.

11. Bronchodilator Reversibility Testing to distinguish between COPD and bronchial asthma

a) Prebronchodilator Spirometric characteristics:

154 subjects with respiratory complaint were evaluated consecutively. 79 COPD and asthma patients with baseline FEV1 of 49.86%±16.64%, and 47.08%±13.98% predicted respectively met the inclusion criteria and were included for further analyses. Subject pre-bronchodilator spirometric characteristics are outlined in [Table 13a]. The COPD and asthma groups had comparable baseline

prebronchodilator pulmonary function tests [Table 13b].

b) Postbronchodilator Spirometric characteristics:

After salbutamol inhalation there was a statistically significant increase of all flow volume curve parameters in both groups. The mean responses were significantly greater for

asthma group for all the FEV1 criteria. The absolute change in FEV1 after bronchodilator administration was significantly greater in asthma subjects in comparison to the COPD group. The pre- and post- bronchodilator FEV1/FVC ratio remained almost the same in the COPD group, whereas in comparison the ratio increased significantly (p = 0.01) in the asthma group.

Table 13a: Spirometric criteria of COPD and Asthmatic patients.

Spirometric criteria	COPD	Asthma	p-value*
FVC(L)	1.79(±0.66)	1.81(±0.74)	0.87
% pred	55.61(±16.70)	56.21(±16.05)	0.86
FEV1(L)	1.32(±0.52)	1.26(±0.51)	0.59
% pred	49.86(±16.64)	47.08(±13.98)	0.41
FEV1/FVC	73.78(±10.32)	70.45(±10.17)	0.13

* Independent sample T test

* p < 0.05, significant differences between groups.

Notes: Data are presented as mean ± SD. Spirometric comparisons between groups were made only between % pred normal values.

Table 13b: Spirometric criteria of COPD and Asthmatic patients.

Spirometric criteria	COPD	Asthma	p-value
FVC(L)	1.91(±0.66)	2.10(±0.81)	0.20
% pred	59.31(±16.54)	65.29(±17.50)	0.09
FEV1(L)	1.44(±0.53)	1.58(±0.63)	0.25
% pred	54.36(±16.91)	58.84(±17.19)	0.21
FEV1% Delta init	10.29(±9.55)	25.63(±9.45)	0.01
FEV1 abs Delta L	119.87(±93.32)	316.77(±158.50)	0.01
FEV1% Delta pred	4.52(±3.43)	11.69(±5.33)	0.01
FEV1/FVC	75.00(±10.25)	75.38(±9.33)	0.85

Note: Data are presented as mean ± SD

*p < 0.05, significant difference in COPD versus asthma groups.

DISCUSSION

COPD and Bronchial Asthma are common conditions leading to hospital admission in adults and children in India. Demonstration of airflow obstruction is essential to make definitive diagnosis of COPD

In our study, there was a male preponderance with 47 (59.50%) male and 32 (40.50%) female in COPD group with male female ratio of 1.4:1. Possible explanation of more number of male could be smoking habits and more exposure to smoke and dust as compared to females. Similar pattern was seen in study by Jan Zielinski et al, which consisted 57.3% men and 42.7% women. Georgios Stratelis et al reported 43% males and 57% females.

In bronchial asthma group female preponderance was seen with 17 (54.80%) being female and 14 (45.2%) being male with male-female ratio of 0.82:1. Interestingly this is in contrast to the other studies, which suggest male preponderance and narrowing of male: female ratio with advancing age.^[12]

COPD primarily involves adults and prevalence increases with greater years of exposure to smoke. The mean age in our study for COPD was 56.13 ± 8.76 years. Similar pattern was seen in studies by Jan Zielinski et al (51.8 ± 12.5 years); Daphne C Richter et al (52.2 ± 1.15 years) and Georgios

Stratelis et al (48 years). In contrast to COPD, asthmatics presents early in their life but in our study mean age for asthma patients was 37.88±11.57 in our study. A higher proportion of adult onset asthma could be reason for higher mean age.

In our study, the mean BMI in COPD group was 21.97 kg/m² ± 4.7. In bronchial asthma group, mean BMI was 23.98 kg/m² ± 5.7. Pattern similar to our study was observed in study done by Seema et al. Daphne C Richter et al reported mean BMI 25.6 kg/m² ± 1.25 in COPD group and 28.1 kg/m² ± 0.94 in bronchial asthma group. Differences could be attributed to ethnic variation as mean height; weight in Asian population was less than Caucasians.

Men with low values of BMI are at increased risk for the development of COPD,^[13] malnutrition and weight loss can reduce respiratory muscle mass and the strength of the remaining muscle fibers.^[14] On the contrary, obesity represents a risk factor for asthma development.^[15] There is evidence that smoking induces loss of body weight, whereas smoking cessation provokes weight gain. A lower value of BMI is associated with increased risk of death in patients with COPD.^[16] Overweight asthma patients are more difficult to achieve control.^[17]

Shortness of breath was commonest symptom seen in our study. All COPD and bronchial asthma

patients reported shortness of breath. Study by Hana Millerova et al and Nanshan Zhong et al reported similar finding .

Rhonchi was most common sign observed in 76(96.20%) patients of COPD, 26(83.3%) patient of bronchial asthma followed by crackles seen in 14 patient(17.7%)COPD and 2(6.4%) asthma patients. Nanshan Zhang et al reported rhonchi in 75% patients of COPD. Episodic and reversible nature of obstruction may be responsible for less prevalence of these sign in asthmatics patients.

In our study, most common radiological finding was hyperinflation. It was seen in 46(58.2%) COPD and 9 (29.03%) bronchial asthma patients. NL Muller et al reported sign of hyperinflation present in 29(97%) of 30 necropsy proven and symptomatic cases of COPD.

In our study, overall 57 (72.15%) patients were smoker in COPD group. Smoking was more prevalent in male, 42(89.36%) male were smoker, while only 15(46.89%) female were smoker. Exposure to smoke of biofuel, passive smoking, or other may be responsible for development of COPD in nonsmokers, more so in female who is mainly involved in cooking at home. Tobacco product most frequently used was bidi both in men and women. Vivek et al in his study found 99.1% male and 20.6% female who were bidi smoker 18.8% were cigarette smoker male.

In our study COPD group had 51(64.86%) patient from plain region and 28 (35.14%) from hilly region .While in bronchial asthma group 19 (64.29%) patient were from plain and 12(35.71%) were from hilly areas. Possible explanation of this finding was that patients from hilly region seek medical facility late due to ignorance, difficulty in reaching the hospital at appropriate time due to poor road communication and adverse environmental factors such as heavy rainfall, landslides, difficult terrain, snowfall and seasonal climatic variations.

As per GOLD classification, in our study maximum number of patients that was 45(56.96%) had moderate COPD (stage 2) followed by 23 patients (29.11%) of severe COPD (stage 3). 4 (5.06%) and 3(3.79%) patients had mild and very severe COPD. Georgios Stratelis et al found 95(67.3%) patients with mild COPD followed by 52(36.8%) and 3(2.1%) patients of moderate and severe COPD respectively.

Although it was commonly believed that patient with COPD have largely irreversible airflow obstruction evidence now suggests that considerable proportion of patients exhibit clinically significant bronchodilator reversibility. In our study out of 79 patients of COPD 22(27.8%) showed significant bronchodilator reversibility.

CONCLUSION

1. In our study a dominance of males was seen in COPD that is 47(59.5%), while female dominance was seen in bronchial asthma that is 17(54.8%). Maximum number of patients in COPD were seen in age group 41-60 years that is 58(73.4%), while in bronchial asthma maximum patients belonged to age group 19-40 years that is 13(42%).
2. Mean age in our study for COPD was 56.13 ± 8.76 year with mean smoking history being 10.24 ± 14.31 pack per year.
3. In our study tobacco product most frequently used was bidi in both men and women.
4. No significant difference in clinical features on basis of the study geographical distribution of patients could be established in our study.
5. Maximum number of patient presented in stage 2 COPD (moderate)45(56.9%)followed by 23(29.11%) patient of severe COPD(stage 3).
6. It could be concluded from our study that asthmatic subjects showed more reversibility than COPD subjects. Adding bronchodilator test in the diagnosis of COPD (GOLD guidelines) helped to reduce the misclassification of asthmatics with COPD.

Limitations:

1. Small sample size (n = 154) was one of the major limitation of our study.
2. Patients were selected on the basis of history of classical history of bronchial asthma or COPD or other respiratory complaints. Asthmatic smokers, patients with combined disease or patient with COPD in absence of a strong smoking history, which thus created groups with relatively large differences in bronchodilator response.

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