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To Estimate The Prevalence Of Bronchiectasis In COPD Patients

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Abstract: ***Background****- Bronchiectasis can present at any age but increases with age and the highest prevalence is in older females.* ***Objective****- The aim 0f this study was to evaluate the prevalence of bronchiectasis in COPD patients.* ***Material and Methods****-We evaluated, 64 clinically diagnosed patients of COPD according to the criteria laid down by NHLBI/WHO-GOLD 2014 as having FEV_1/FVC <70% as confirmed by spirometery, reaching GOLD stages I, II, III, and IV****. Results****-Out of 64 patients, 41 (64.06%) cases were male and remaining 23 (35.94%) patients were female. In 41 males, only 10 (15.63%) cases with bronchiectasis having prevalence 2.53 where as in out of 23 females, 9 (14.06%) with bronchiectasis showing the prevalence 6.62. It is observed COPD patients with bronchiectasis the prevalence is higher in female. Total 64 patients of COPD only 19 patients are with bronchiectasis, prevalence of bronchiectasis in our study was 29.69%.****Conclusion****- In COPD patients due to frequent exacerbations, recurrent infections, smoke, toxic fumes and previous history of tuberculosis, leads to increased dilation of bronchus and this develop bronchiectasis.*

Keywords*: Bronchiectasis, Chronic obstructive pulmonary disease (COPD), High resolution computed tomography (HRCT),*

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I. Introduction

Bronchiectasis described as irreversible, permanent dilatation, destruction and thickening of the airways characterised by chronic cough, excessive sputum production, bacterial colonisation, and recurrent acute infections.[1] It is classified into the following three forms morphologically.[2] Cylindrical, Varicose and Saccular or cystic. Bronchiectasis can present at any age but increases with age and the highest prevalence is in older women[3]. Upto 70% of cases may be in women[1,4]. Approx 42% of cases develop post-infection. However, there is no identifiable underlying cause in about 50% of adults and 25% of children[5]. Cough is the commonest symptom relating to bronchiectasis in >90% of patients. It may progress to respiratory failure and Cor-pulmonale.[6]The gold standard investigation for diagnosis of bronchiectasis is HRCT scan of the chest.[8] HRCT has a very high sensitivity and specificity for diagnosis [9]. COPD is currently the third leading cause of death in the world[10]. According to the 12-site Burden of Obstructive Lung Disease (BOLD) study, the average prevalence of COPD is 10.1%[11] . In India, the magnitude of this problem is not uncommon as prevalence rate is 3.67%, about 4.46% in male and 2.86% in female[12]. In India, COPD causes about 500,000 deaths per year [13] .COPD is diagnosed as the presence of a post - bronchodilator forced expiratory volume in 1 second/ forced vital capacity (FEV1/FVC) < 70% in patients with a long smoking history, according to the criteria published by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) [14]. An exacerbation of COPD is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and that leads to a change in medication[14-18] COPD is a established cause of bronchiectasis and early detection of bronchiectasis in COPD patients will lead to better treatment of COPD patients, and lead to significant decrease in morbidity and mortality[19-21].

II. Material And Methods

We evaluated, 64 clinically diagnosed patients of COPD according to the criteria laid down by NHLBI/WHO-GOLD 2014 as having FEV_1/FVC <70% as confirmed by spirometery, reaching GOLD stages I, II, III, and IV, those who were stable and fit into inclusion criteria, irrespective of present "smoking status". For confirming the diagnosis appropriate investigations were carried out accordingly, like Spirometry, chest X-Ray, Sputum for gram staining and culture, and HRCT-scan of all patients.

III. Study Period

The study was carried out from MARCH 2014 to OCTOBER 2015.

IV. Statistical Analysis

Data for variables including patient ID, demographics (gender,age), date of sputum examination, physicians and radiological diagnosis, reason for testing are included. Descriptive statistics were used to summarize for p-value, chi square values. This study was designed as a hospital based cross-sectional study in stable patients of all four stages of COPD .

V. Results

There were a total 64 patients and following results are found (Table-1) showing that , out of 41 males, only 10 (15.63%) cases with bronchiectasis having prevalence 2.53 where as in out of 23 females, 9 (14.06%) with bronchiectasis showing the prevalence 6.62. The Chi-square statistic is 0.27 with p-value is 0.6003. (Table-2) On the basis of breathlessness (MMRC-grade), out of total 64 patients, 23 cases were in grade-2 in which only 3 were presents with bronchiectasis. (Table-3) Out of 64 COPD patients, only 26 patients showing the previous history of Pneumonia, 6 Patients with tuberculosis, 4 patients having previous history of Pneumonia and tuberculosis both. The prevalence of bronchiectasis in Pneumonia group is 4.89 noted whereas the prevalence for unknown etiology is 5.26.(Table-4,5 &6) showing prevalence in non-smoker and smoker group, In non-smoker group out of 24, 20 with history of biofuel mass exposure/passive smoking, 8 (40%) presents with bronchiectasis, and prevalence in this group was 3.76, increased than those with no history of biofuel mass exposure/passive smoking. The Chi-square statistic value is 0.32 with p-value 0.5716. In smoker group, out of 40, 32 of former smoker, in which 8 (25%) presents with bronchiectasis, prevalence in this group was 6.02, prevalence in former smoker group is increased, than current smoker group. Based on smoking index, out of 64 COPD patients, 41 with smoking index (<399) & 23 with smoking index (>=400) with prevalence 7.71 and 4.32 respectively. Total of 9 (39.13%) patients under the smoking index (>=400) and 10 (24.39%) patients under smoking index (<399) were presents with bronchiectasis. The chi-square statistic value is measured as 1.5337 with p-value is 0.2155. (Table-7) On clinical examination(Auscultation) out of 64 COPD patients, 22 patients with crepts only, 3 (13.64%) presents with bronchiectasis, prevalence in this group was 4.14, however in a group of coarse crackle only, 7 (87.5%) out of 8 presents with bronchiectasis. The calculated chi-square statistic value is 19.291 with p-value 0.0006.(Table-8) Out of 17 patients, only 6 patients found with growth of P. aeruginosa in which 5 (83.33%) presents with bronchiectasis and prevalence in this group was 1.13, while other organisms it was less.(Table-9) On spirometry out of 64 patients, 32 patients found with stage-2 group in which only 37.5% patients presents with bronchiectasis, prevalence of bronchiectasis is higher in this group which was 6.02, than other stages. Chi-Square Test-Statistic value is 1.9896 and p-value was 0.5745.(Table-10,11 &12) On radiology chest x-ray PA view, out of 64, 31 presents with abnormal chest x-ray, 16 (51.61%) presents with bronchiectasis, prevalence in this group was 48.44, which was slight lower than the normal chest x-ray. Chi-Square Test-Statistic value was 13.8458 with p-value 0.0002. On HRCT-scan out of 64 COPD patients, only 19 patients presents with bronchiectasis, so prevalence of bronchiectasis in our study was 29.69%. 45 of our patients presents without bronchiectasis, 3 patients presents with endobronchial tuberculosis and out of 19 patients, only 13 patients with cystic type of bronchiectasis while 6 with mixed type of bronchiectasis, the prevalence of cystic type of bronchiectasis was 2.44. The Chi-square statistic value is noted here as 2.5368 with p-value is 0.1112.

TABLE 1: Prevalence Of Bronchiectasis In Different Genders

Sex	Total	COPD with bronchiectasis	Prevalence	COPD without bronchiectasis	Prevalence
Male	41	10 (15.63)	2.53	31 (48.44)	7.83
Female	23	9 (14.06)	6.62	14 (21.88)	10.29
Total	64	19		45	
	Chi-square statistic value = 0.27, p-value = 0.6003.				

TABLE 2: Bronchiectasis On Different Dyspnea (Mmrc Grade) Group

Dyspnea (breathlessness) MMRC Grade	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis
G-0	6	4	2
G-1	8	4	4

G-2	23	3	20
G-3	16	4	12
G-4	8	1	7

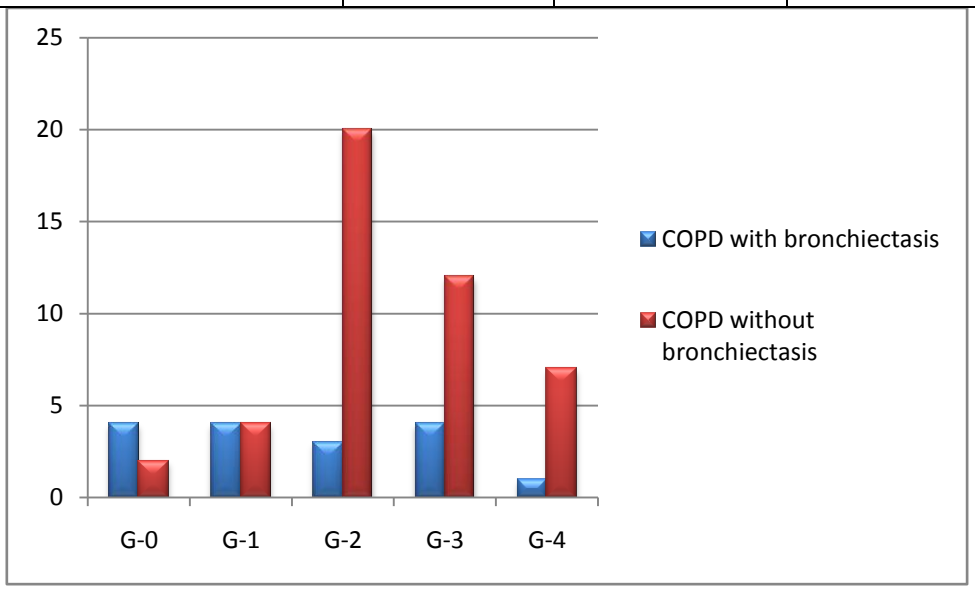


TABLE 3:- Prevalence Of Bronchiectasis On Basis Of Previous History

Previous History	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
Pneumonia	26	10 (38.46)	16 (61.54)	4.89
Tuberculosis	6	5 (83.33)	1 (16.67)	1.13
Pneumonia and TB both	4	1 (25)	3 (75)	0.75
Unknown etiology	28	3 (10.71)	25 (89.29)	5.26
Total	64	19	45	12.03

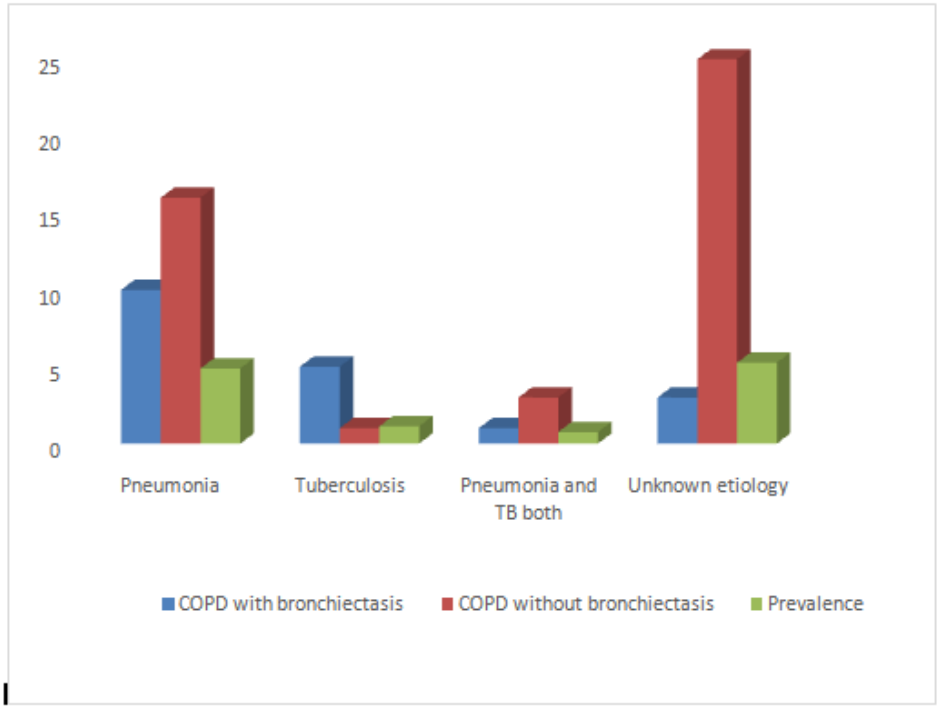


TABLE 4:- Prevalence Of Bronchiectasis In Non-Smoker Group

Non smoker group	Total no of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence (%)
History of Bio-fuel mass/passive smoking	20	8 (40)	12 (60)	3.76
No history of Bio-fuel mass/passive smoking	4	1 (25)	3 (75)	0.75
Total	24	9	15	4.51
	Chi-Square Test Statistic value = 0.32 with p-value 0.5716			

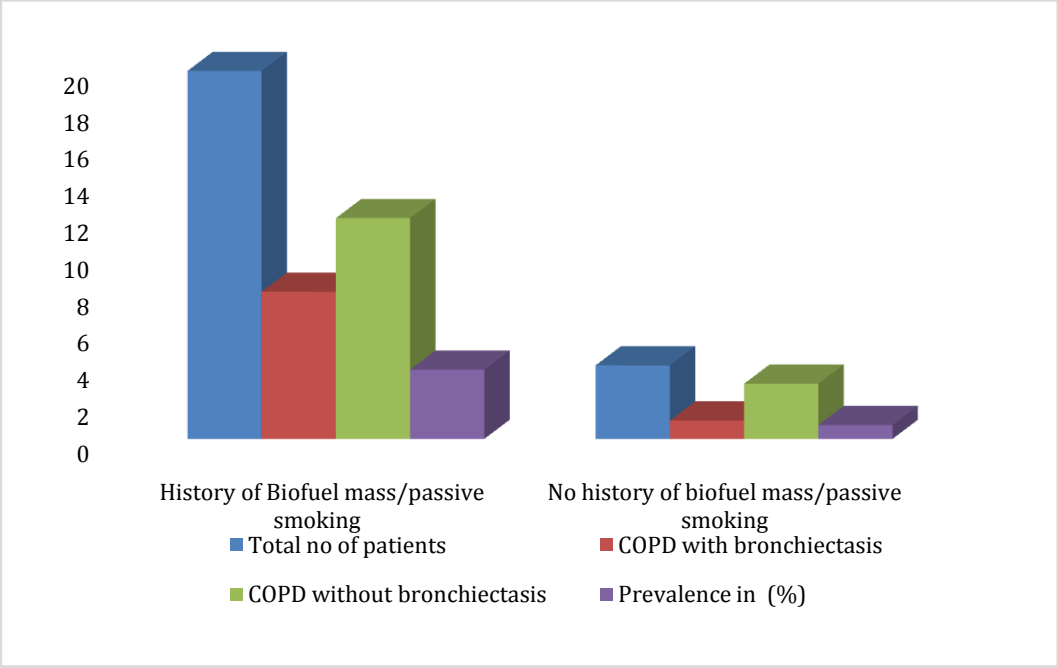


TABLE 5 - Prevalence Of Bronchiectasis In Smoker Group

History of smoking in different groups	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
Current Smoker	8	2 (25)	6 (75)	1.50
Former Smoker	32	8 (25)	24 (75)	6.02
Total	40	10	30	7.52

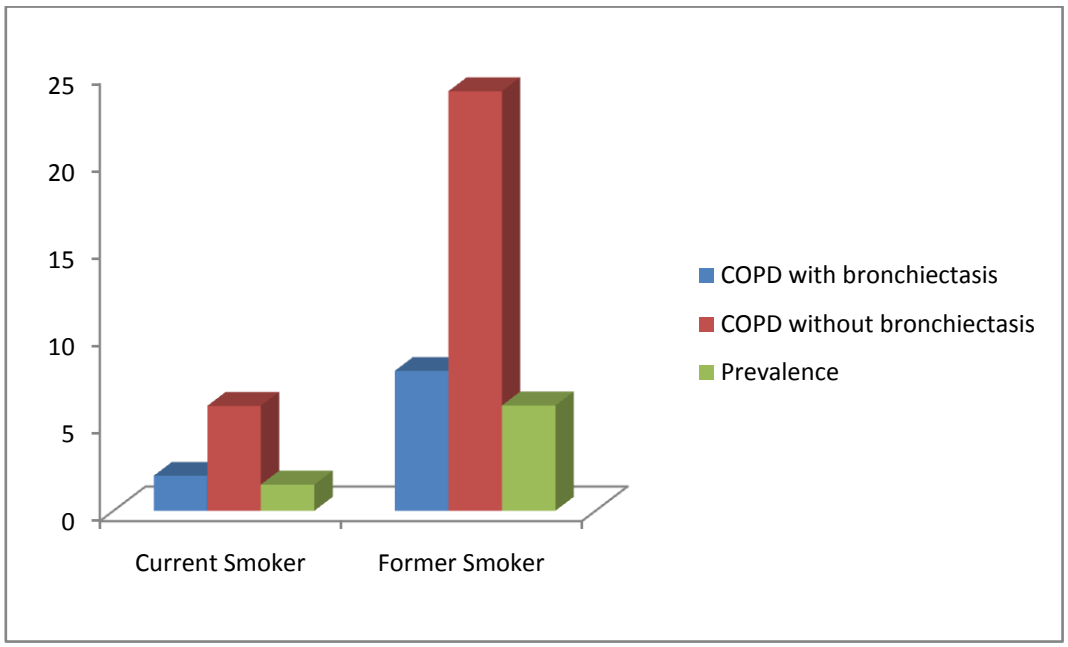


TABLE 6- Prevalence Of Bronchiectasis On Smoking Index Basis

Smoking Index	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
<399	41	10 (24.39)	31 (75.61)	7.71
>=400	23	9 (39.13)	14 (60.87)	4.32
Total	64	19	45	12.03
	Chi-Square Test-Statistic value = 1.5337 and p-value = 0.2155			

TABLE 7 -On The Basis Of Clinical Examination (Auscultation)-

Clinical Examination	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
Crackles coarse only	8	7 (87.5)	1 (12.5)	1.5
Crepts leathery only	5	2 (40)	3 (60)	0.94
Rhonchi only	8	0 (0)	8 (100)	1.5
Crepts only	22	3 (13.64)	19 (86.36)	4.14
Rhonchi and Crepts(all types)	21	7 (33.33)	14 (66.67)	3.95
Total	64	19	45	12.03
	Chi-Square Test-Statistic value = 19.291 with p-value 0.0006			

TABLE 8-Prevalence Of Bronchiectasis On The Basis Of Growth Of Microorganisms

Organisms grown in Sputum Samples	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
P. Aeruginosa	6	5 (83.33)	1 (16.67)	1.13
H. Influenza	2	1 (50)	1 (50)	0.38
K. Pneumonia	3	2 (66.67)	1 (33.33)	0.56
E. Coli	2	1 (50)	1 (50)	0.38
Other Organism	4	3 (75)	1 (25)	0.75
Total	17	12	5	3.2

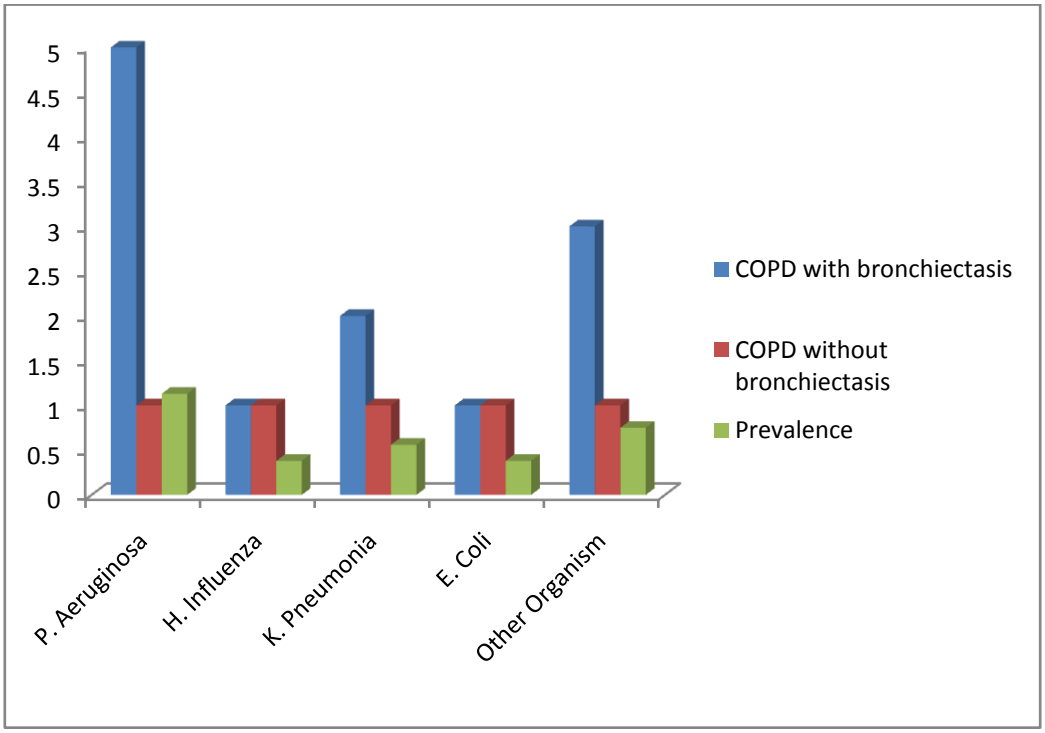


TABLE 9 - Prevalence Of Brochiectasis In Different Copd (Gold Stages)

COPD GOLD staging	Total number of patients	COPD with bronchiectasis	COPD without bronchiectasis	Prevalence
Stage 1	13	3 (23.08)	10 (76.92)	2.44
Stage 2	32	12 (37.5)	20 (62.5)	6.02
Stage 3	11	2 (18.18)	9 (81.82)	2.07
Stage 4	8	2 (25)	6 (75)	1.5
Total	64	19	45	12.03
	Chi-Square Test-Statistic value = 1.9896 with p-value = 0.5745			

TABLE 10- Prevalence Of Bronchiectasis On Chest X-Ray Basis

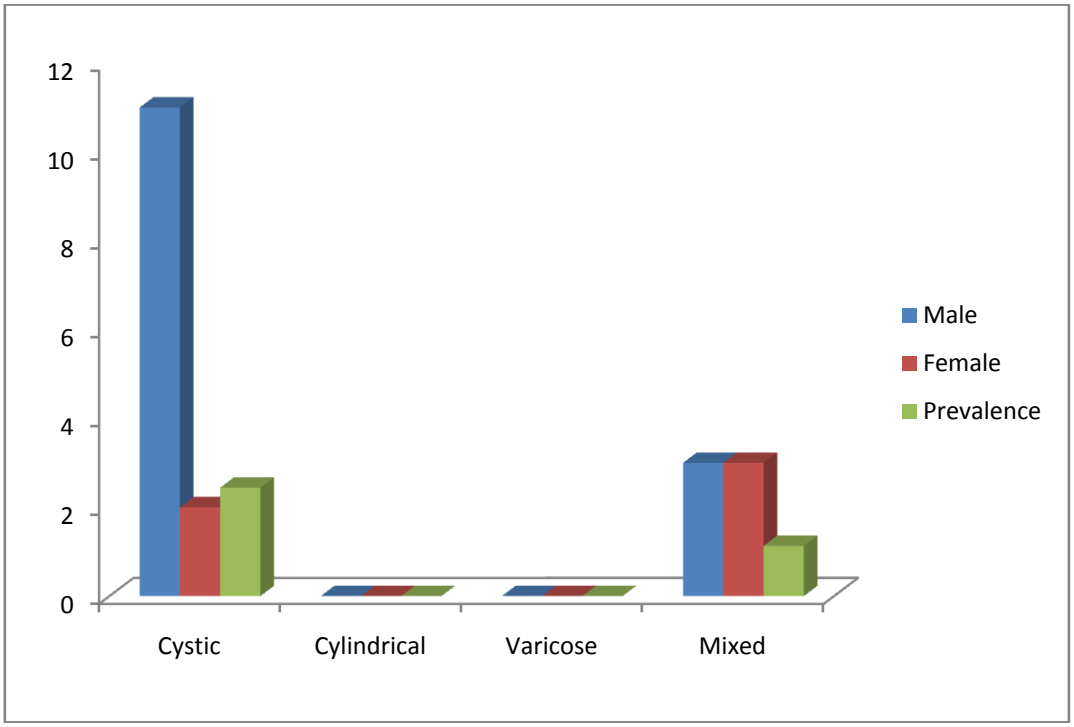
X-Ray Findings	Total	Findings suggestive of Bronchiectasis	Findings non- suggestive of Bronchiectasis	Prevalence
Abnormal X-Ray	31	16 (51.61)	15 (48.39)	48.44
Normal X-Ray	33	3 (9.09)	30 (90.91)	51.56
Total	64	Chi-Square Test-Statistic value =13.8458 with p-value = 0.00012.		

TABLE 11- Bronchiectasis On Hrct-Scan Basis

According to HRCT findings	Total	Bronchiectasis	Endobronchial tuberculosis	No Bronchiectasis
	64	19	3	45

TABLE 12- Type Of Bronchiectasis On Hrct Scan

Type of bronchiectasis	Total	Male	Female	Prevalence
Cystic	13	11 (84.62)	2 (15.38)	2.44
Cylindrical	0	0	0	0
Varicose	0	0	0	0
Mixed	6	3 (50)	3 (50)	1.13
Total	19	Chi-Square Test-Statistic value = 2.5368 with p-value 0.1112		



VI. Discussion

Based on our results, the severe airflow obstruction, purulent sputum production, a positive culture of microorganisms in a sputum sample, and increased exacerbations associated with bronchiectasis in patients with COPD. In our study, the prevalence of bronchiectasis in COPD patients was found out to be higher in females 10.29 in comparison of males 7.83 patients. In present study, we evaluated all diagnosed patients of COPD, on the basis of breathlessness (Dyspnea) on mMRC scale[22,23], bronchiectasis in grade-0 (66.67 %), grade-1 (50%), grade-2 (13%), grade-3 (25%), grade- 4 (12,5%), in our study as the severity of dyspnea increased, percentage of bronchiectasis decreased, same as found in a study of Ramakrishna, A Ambica et al[24] . A study by Eman O .Arram et al[25] .In a study by Bei Mao et al[26] the severity of dyspnea in patients with cylindrical brochiectasis was moderate compared with that in patients with cystic or mixed brochiectasis, where dyspnea was severe . In our study 6 patients had a history of tuberculosis, 5 patients having bronchiectasis, prevalence in this group was 1.13, 26 patients has a history of at least one episode of pneumonia, 10 presented with bronchiectasis and prevalence was 4.89. 4 patients presented with history of pneumonia and tuberculosis both, 1 with bronchiectasis and prevalence was 0.75. In a recent study done by Bei Mao et al [26] out of 896 patients, 117 patients have previous history (108 of tuberculosis and 9 pneumonia), 65 (55.55%) patients presents with bronchiectasis. In non-smoker group where history of biofuel mass exposure, passive smoking was present, out of 24, 9 (37.5%) present with bronchiectasis, prevalence was 3.76, in comparision to patients with no such history, prevalence was 0.76. In current smokers prevalence was 1.5, while in former smokers were 6.02.. In our study patients with smoking index <399, prevalence was 7.71, in patients with smoking index >=400 prevalence was 4.32, increase in prevalence as the decrease in smoking index. In a study by Eman O Arram et al [28,25], Haemophilus influenza is the most frequent pathogen followed by Streptococcus pneumonia in COPD cases, while Pseudomonas aeruginosa is the most frequent pathogen in COPD cases with brochiectasis. In a recent study, Bei Mao et al [26] the most frequent microorganism was Monilia albicans, and Klebsiella peumoniae. Patel et al[29] observed that even though the number of exacerbations was not related to bronchiectasis in their study, patients with bronchiectasis did experience longer exacerbations. The discordance between these studies can be explained that, in our study, only data from exacerbations that required medical consultation were included, whereas the study by Patel et al[29] collected information from a symptom diary covering the full severity range of exacerbations. It has been reported that, in both COPD and bronchiectasis, the increased bronchial inflammation and lung damage induced by the presence of potential pathogenic microorganisms leads to increased volume and greater frequency of expectoration. The lack of symptom diary in our study, probably excluded information on less severe exacerbations. Furthermore, some causes of bronchiectasis could not be ruled out with certainty, as no 24-hours pH-metry studies were perfomed in our study to rule out gastroesophageal reflux disease. Out of 64 patients, 13 (20.3%) patients were of GOLD stage I, 32 (50%) patients were of GOLD stage II, 11 (17.1%) patients were of GOLD stage III, 8 (12.5%) patients were

of GOLD stage IV. In comparision to a study SE Brill et al [30] where 39% patients were in GOLD stage 2 in our study 50% of patients were in GOLD stage 2. The unique feature of our study that out of 45 patients of non-bronchiectatic group, 3 patients showing ENDO-BRONCHIAL TUBERCULOSIS, showing percentage of endo-bronchial tuberculosis in COPD patients, in our study it is 6.66%, as HRCT scan is also the investigation of choice for endo-bronchial tuberculosis, but this needs further research . Therefore, the prevalence of bronchiectasis has been found out to be 29.68 % in COPD patients in our study; it is primarily of a cystic type, which mainly localized in lower lobes, Patel et al[29] it was (50%) in moderate to severe COPD mainly in lower lobes, Agusti et al[31] (4%), while Miguel Angel Martinez-Garcica[27] (57.6%), Eman O. Arram[25] et al(47.8%), Bei Mao et al[26] (34.7%) and Ramakrishna, A Ambica et al[24] it was primarily of cylindrical type. In bronchiectasis, the hypothesis of ; vicious cycle, describe recurrent chronic inflammation and infection has been well accepted[32]. As for COPD, inhalation of cigratte and noxious fumes results in dysfunction of mucociliary transport system and loss of tight connection of epithelial cells, which can also promote inflammatory reaction, bacterial infection and colonization[33]. The factor most associated with the presence of bronchiectasis was positive culture of a pathologic microorganism from at least one sputum sample. These results concur once again with those reported by Patel et al[29], who observed that greater bacterial colonization by potential pathologic microorganism was associated with presence of bronchiectasis, with a distribution of microorganisms very similar to that found in our study.

According to GOLD 2015 updated[34], bronchiectasis is a major co-morbidity in COPD but it is also an independent prognostic factor. However with increasing use of computed tomography in the assessment of patients with COPD, the presence of previously unrecognized radiographic bronchiectasis is being identified[34]. Weather this radiological change has the same impact as the patients with a primary diagnosis of bronchiectasis remains unknown as present, although it is associated with longer exacerbations [29] and increased mortality[35]. Our study has shown a high prevalence of radiologic bronchiectasis in a group of patients with moderate to severe COPD with or without clinical signs of this condition. Further studies should be performed to assess this relationship. During follow-up 2 patients expired one with bronchiectasis, one without bronchiectasis. Thus presence of bronchiectasis was associated with an increase in all-cause mortality in patients with COPD, bronchiectasis was an independent risk factor for all-cause mortality in COPD patients. For this reason, the early diagnosis and treatment of bronchiectasis is very important for patients who has been diagnosed with moderate to severe COPD.

VII. Conclusion

The increase prevalence of bronchiectasis were present in females. The prevalence of bronchiectasis is more in smoker, prevalence increased in those having smoking index (< 399). Among non- smoker group prevalence of bronchiectasis is more in patients with history of biofuel-mass exposure and passive smoking is present. Bronchiectasis increased with increase in severity of COPD as evident by, maximum cases of bronchiectasis were seen in patients of GOLD stage II.The present study concludes that the duration of symptoms, chronic sputum production, isolation of potential pathogenic microorganisms in sputum sample, previous history of tuberculosis and pneumonia, increased exacerbations are associated with increased prevalence of bronchiectasis among COPD patients. Association of bronchiectasis may lead to poor prognosis with recurrent exacerbations and there is definite need to pay specific attention to its pathogenesis, clinical features and early identification with the help of HRCT scan of chest to initiate early treatment. There are limited trials and researches that reveal the underlying relationship or interaction between bronchiectasis and COPD, as well as the exact prognosis and specific therapies targeted as these patients.

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