Research Article

COPD, A RISING CONCERN FOR NON SMOKERS! IS IT TRUE?

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ABSTRACT

Introduction: Chronic obstructive pulmonary disorder is the leading cause of morbidity and mortality worldwide. In clinical practice non smokers COPD patients are on rise, the risk factors which are important in its development were evaluated. **Materials and Methods**: This observational cross sectional study included a total 298 patients, with age above 18 years, diagnosed clinically and on spirometry as per Gold guidelines fulfilling the inclusion criteria. **Results:** Of the 298 patients 150(50·34%) were non smokers and 148 (49·66%) were smokers. Males were the predominant gender, most of them more than 60 years, with comparable mean age.COPD were found at an early age in smoker's population. Most of the patients in non smokers group had moderate obstruction (73·34%). Statiscally significant risk factors identified were occupational exposure (86·67%), education level (55·34%), biomass exposure (39·34%), passive smoking (31·33%), associated conditions of pulmonary tuberculosis (22·67%) and chronic asthma (16%) (P<0·001). Other risk factors like outdoor air pollution (84%), low socioecomic status (70%), childhood admissions (13·34%) though not statistically significant, contributed in development of non smokers COPD. BMI in non smoker's population was lower than smokers 22.08$\pm$2.11. Most of the patients 50 (84·75%) of non smokers population having biomass exposure had index more than sixty. Patients were classified according to gold stage and compared. The predominant gender was male in both groups with almost similar mean age and most of them above sixty years. The Gold Stage II+ group had higher outdoor air pollution (95%), occupational exposure (62·5%), childhood admissions (17·5%), biomass exposure (47·5%), passive smoking years 28$\pm$2.01 and lower BMI (20·2 $\pm$ 0·75 P < 0·001). **Conclusion:** It can be concluded that non smokers COPD forms significant proportion of COPD patient in our region and early diagnosis can be made by identifying the risk factors

INTRODUCTION

COPD is becoming one of the major disease for morbidity and mortality worldwide and would be third leading cause of death by 2020[1], yet its impact is underestimated. The term COPD is not well known among the people and they are not aware of its risk factors. Identification of COPD in non smoker is much more difficult as compared to smokers, making difficult for health workers to identify and treat them at right time. This leads to increase morbidity of the disease.

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The most important risk factor in causation of COPD is smoking. However recent studies indicate that non smokers are contributing around one third of the COPD patients[2], both in developing and developed countries[3]. India being a developing country there is high risk of non smokers COPD with low socioeconomic status and poor education level confounding the disease.

It is yet to be determined whether non-smoker constitutes specific phenotype or several clinically important phenotypes of COPD may occur among non-smoker. However, if appreciable recognition is gained over diverse risk factors of disease then we can expect to bring it under early control.

Aims & Objectives

1. To understand the prevalence, risk factors and clinical presentation of COPD patients.
2. To compare COPD risk factors and clinical presentation in smokers and non-smokers.
3. To identify the risk factors of non smokers COPD and methods for is prevention.

MATERIALS AND METHODS

This is a survey based cross-sectional study carried out at department of Pulmonary/Respiratory Medicine, at NKP Salve Institute of Medical Sciences and Research Center Nagpur after approval from the institutional ethical committee from January 2017 to November 2017.

New diagnosed patients and old follow up patients who were ready to give written consent to participate in study and willing for pre and post bronchodilator test were recruited for the present study. Questionnaire Data: A detailed history of symptoms such as a cough, expectoration, breathlessness, fever, weight loss, haemoptysis, and chest pain were recorded on a specific standard questionnaire in patient's language to determine the history of exposure to various types of risk factors for COPD. Clinical examination and relevant necessary investigation were done which included chest radiograph poster anterior view, sputum acid-fast bacilli stain, and spirometry. Spirometry Testing: Spirometry was performed by trained and certified technicians on Geratherm Spirometry. Test were performed according to the standard acceptability and reproducibility criteria. Statistical calculation was done using AP Info Version 7 software. Patients were classified according to the GOLD guidelines.[4] The definitions' to define different terms were as follows:

Smoker (current or former) was defined as a person who had smoked >20 packs of cigarettes in a lifetime or >1 cigarette/day for a year.

Passive smoking was defined as divulgence to tobacco smoke in the form of cigarette, cigar, shisha, or pipe at the subject's workplace or home.

Occupational exposure of organic dust, inorganic dust, irritant gases, and fumes or vapours of more than three months were considered as risk of developing occupational related lung disease. The number of years spent in such environment was recorded.

Biomass exposure was defined as use of fire or heating indoors for cooking for not less than 6 months. Total number of years was recorded Additional risk factors evaluated included body mass index [BMI (kg/m2)]; total number of years of education; self-reported childhood hospitalizations for respiratory diseases before the age of 10 years; and self-reported physician-diagnosed bronchial asthma, COPD, chronic bronchitis, emphysema or TB i.e. respiratory diseases.

The non smoker's population was further classified according to Gold Staging into Stage 1 and Stage II+ [i.e. stage II, III, IV] and their characteristics were observed. Education level was classified into two groups of more than 10 years and less than 10 years of education.

OBSERVATION AND RESULTS

Table 1 Population characteristics in Non Smokers and Smokers

	Non Smokers N=150	Smokers N=148	Chi Square	P
Sex				
Male	87(58·78%)	146(97·35%)		
Female	63(42·58%)	2(1·35%)		
			72·17	0·000
Age(>60)	101(67·34%)	94(63·51%)	1·024	0·311
Mean Age	63·13±9·11	61·36 ±10·48	T Value 1·55	0·121
Spirometry(Mean+SD)				
FEV1 L/min	2·53±14·94	1·78±7.20	0·56	0·005
FEV1%	60·13 + 22·55	53·42±18·17	-2·83	<0·001
FVC L/min	2·26±0·55	1·85 ±0·92	4·69	<0·001
FVC %	75·55±67·38	72·50±16·94	-0·54	0·593
FEV1/FVC L/min	63·73±14·64	57·79±14·14	-3·56	<0·001
FEV1/FVC%	63·73 ±14·64	57·79 ± 14·14	-3·73	<0·001
Gold Classification				
mild	30(20%)	17(11··8%)		
mod	110(73·34%)	74(50%)		
severe	7(4·67%)	46(31·08%)		
very severe	3(2%)	11(7·43%)		
			6·08	0·109
Occupational Exposure	130(86·67%)	55(37·16%)	71·55	0·000
Outdoor Air Pollution	126(84%)	134(90·54%)	2·86	0·091
Low Socioeconomic Status	105(70%)	96(64·86%)	0·89	0·34
Education(>10)	83(55·34%)	55(37·16%)	1·33	<0·001
Biomass Exposure	59(39·34%)	4(02·7%)	59·59	0·000
Passive Smoking	47(31·33%)	85(57·43%)	20·56	<0·001
Pulmonary Tuberculosis	34(22·67%)	7(4·73%)	20·2	<0·001
Chronic Asthma	24(16%)	4(2·7%)	15.47	<0·01
Childhood Admission	20(13·34%)	28(18·9%)	1·73	0·19
BMI Kg/M^2 (Mean±SD)	22·08±2·11	24·28±35·5	Z score 1·75	0·44
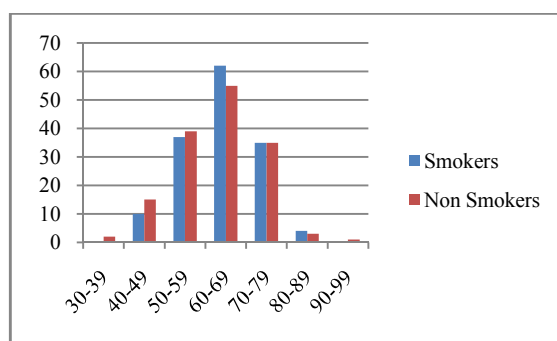
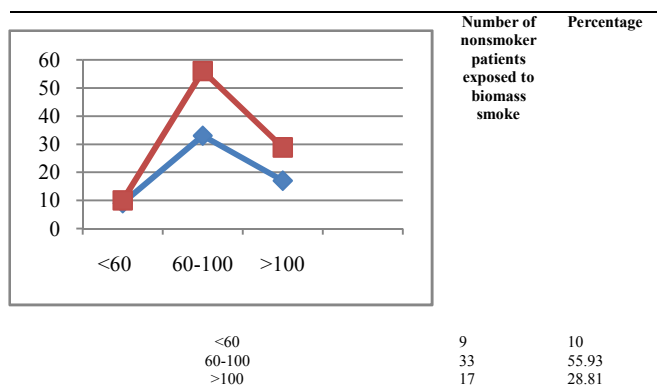**Graph 1** Distribution of Non Smokers and Smokers according to Age

Total of 298 patients were recruited in study that had completed the questionnaire and had spirometry results as per the criteria. Characteristics of Non Smokers and Smokers are summarized in Table 1. The proportion of nonsmoker individuals among total COPD patients was found to be higher than smokers, 150`(50·34%) were non smokers and 148(49·66%) were smokers. Majority of them were male's i.e. 58·78% of non smokers and 97·35% of smokers population were males. Most of the patients in both groups were above 60 years of age 67·34% and 63·51% (p=0·311) with comparable mean age. Smokers developed COPD at an early age as compared to non smokers. (Graph 1) The spirometry values showed slightly more decline in smokers group as compared to non smokers. Non smokers had higher FEV1/FVC 63·73±14·64 ratio, higher FEV1% 60·13 + 22·55, higher FVC75·55±67·38 as compared to smokers (p<0·001). Of 150 nonsmokers COPD patients, maximum number of patients belonged to low socioeconomic status (69·03%). Significant risk factors were occupational exposure, education, bio mass exposure, passive smoking, childhood admissions, pulmonary

tuberculosis and chronic asthma (p<0·001) and was higher in non smokers population whereas childhood admissions and outdoor air pollution though not statically significant were comparable in both groups. The non smokers group had lower BMI 22·08+2·11 which was not statically significant. (P=0·44)

Table 2 Population characteristics among Non Smokers according to the GOLD stage

Characteristics	Gold Stage I n=30	Gold Stage II+ n=120	Chi Square	P value
Sex				
Male	21(70%)	67(55·84%)		
Female	9(30%)	53(44·16%)		
			1·39	0·23
Age	63·15+9·85	62·07+9·86	T VALUE 0·69	0·491
Age(>60)	18(60%)	83(69·17%)	2·013	0·311
Outdoor Air Pollution	26(86·67%)	114(95%)	0·023	0·878
Education (>10)	22(73·34%)	24(20%)	32·11	0·001
Occupational Exposure	16(53·34%)	75(62·5%)	0·84	0·35
Childhood Admission	4(13·34%)	21(17·5%)	0·3	0·58
Biomass Exposure	2(6·67%)	57(47·5%)	16·77	0·001
Pulmonary Tuberculosis	15(50%)	19(15·84%)	18·24	<0·001
Chronic Asthama	9(30%)	15(12·5%)	6·51	0·010
Passive Smoking years(Mean+SD)	12·75+3·19	28+2·01	-42·93	0·001
BMI Kg/M^2(Mean+SD)	25·14 + 2·41	20·2 + 0·75	Z score 28·48	0·001

Most of the patients of non smokers group were in stage II i.e. 70% whereas there were only 4·67% and 2% in Gold Stage III and IV respectively. They were classified into two groups Gold Stage I and Gold Stage II + which include Gold stage II, III & IV patients and their characteristics were as shown in Table 2.Most of the patients of Gold Stage I and II+ were male, the mean age of both the group was almost same slightly higher in Gold Stage I (p=0·491), most of the patients had age more than sixty, 60% and 69·17 % in gold Stage I and II + respectively (p=0·311). Statistically significant risk factors were education, biomass exposure, passive smoking and BMI (p<0·001) .When we compared the two groups the Gold Stage II+ group had higher outdoor air pollution (95%), occupational exposure (62·5%), childhood admissions (17·5%), biomass exposure(47·5%),passive smoking years 28+2.01 and lower BMI(20·2 + 0·75 (P < 0·001). [Table2].

Graph 2: Distribution of Non Smokers Patients and Biomass Index

We observed that 39·34% of non smokers' population had positive history of biomass exposure. Maximum number 50 (84·75%), of nonsmoker COPD patients were exposed to biomass smoke had biomass exposure index more than sixty with most of them between 60 to 100(33 i.e55·93%).(Graph2).

Table 3 Multivariate logistic analysis of Independent predictors of COPD severity among never smokers

Parameter Estimates						
SMOKER[a]	B	Std. Error	Wald	df	P value.	Adjusted ODDS Ratio
Intercept	-3·119	·607	26·399	1	0·000	
[PASSIVESMOKER=NO]	-·384	·302	1·619	1	0·203	·681
[PASSIVESMOKER=YES]	0[b]	.	.	0	.	.
[BIOMASSEXPONSURE=NO]	2·979	·573	27·035	1	0·000	19·671
No [BIOMASSEXPONSURE=YES]	0[b]	.	.	0	.	.
[OCCUPTIONALEXPONSURE=NO]	2·206	·335	43·467	1	0·000	9·079
[OCCUPTIONALEXPONSURE=YES]	0[b]	.	.	0	.	.

a. The reference category is: YES.
b. This parameter is set to zero because it is redundant.

The multivariate analysis of risk factors shows a positive correlation between non smokers COPD and biomass and occupational exposure, however passive smoking was not statically significant risk factor among never smokers for development of COPD in this study population. (Table 3).

DISCUSSION

In the present study 50·34% of COPD patients were non smokers. 80% of non smokers were in stage II+ [Moderate+Severe+Very Severe]. Higher percentage i.e. 68·6% of non smokers COPD smokers was reported by Brashier *et al*. [5] in 12055 never smoker participants above 45 years of age. Ehrlich *et al*.[6] Zhou *et al*.[7] Bridevaux *et al*. [2] reported 47.6%, 38.6% and 29.3% non smoker's population with airway obstruction in South Africa, Chinese and Swiss population respectively which was lesser than the present study. This suggests that nonsmokers contribute major proportion of COPD population.

In our study in non smoker group we observed 58·78% were males and 42·58 % were females (P=0·000). COPD Gold stage II+ have higher female percentage 44·16% as compared to mild COPD GOLD stage I whose female population was 30% (p=0·023). Similar results were observed in studies conducted by Miravitlles *et al*. [8], Xu *et al*. [9], Silverman *et al*.[10], Dransfield *et al*.[11], Lamprecht *et al*.[12] and Bridevaux *et al*.[2]. Their study concluded that females contribute major proportion of population of non smokers suggesting association between female gender and non smokers COPD.

Different studies among specific occupational lung diseases have shown decreased lung function.[13]. Workplace and occupational exposure contribute 10 to 20 % of symptoms and altered lung functions as per American Thoracic Society (ATS) [14]. In our study we observed 86·67% of non smokers group had history of occupational exposure (p=0·000) which was statistically significant. Hnizdo and colleagues [15] NHANES III data suggests 31·1% of COPD in non smokers is due to occupational exposures. According to Behrendt CE [16] many occupations were associated with COPD of which 31% were non-smokers. Trupin *et al*.[17] found COPD associated with occupational exposure varying between 9% and 31%. According to Lamprecht *et al*. [12] workplace organic dust exposure results in moderate to severe COPD in 30.4 %of non smokers.

84% of patients of COPD Non Smokers group had exposure to outdoor air pollution, however statistically it was not found to be significant.(P=0·091).Outdoor air pollution may be one of

the risk factors contributing to non smokers COPD and the major reason being automobile air pollution.[18].

Regarding the level of education, never smokers reported higher education 55·34%, than smokers 37·16%. Non smokers with COPD GOLD stage II+ 20% have less education than never smokers with COPD GOLD stage I 73·34% (p=0·001). These results are similar to those found by Nizankowska Mogilnicka *et al*.[19] suggesting inverse relation of COPD with education. Lamprecht *et al*.[12] showed that more years of education was associated with lower odds of spirometrically determined COPD in female never smokers. The more the level of education the lesser the chance of detecting spirometically determined COPD in female non smoker COPD.

Biomass exposure is important risk factor in development of non smokers COPD. The exposure to biomass is much more as compared to tobacco smoker i.e 3: 1·01 billion respectively. In developing countries 50% of deaths of COPD can be attributed to biomass exposure. [20]. Our results showed that 39·34% of non smoker's population, 6·67% of Gold Stage 1 and 47.5% of Gold Stage II+ had biomass exposure.(p=0·000). Of the non smokers' population 39·34% had positive history of biomass exposure and most of them between 60 to 100 biomass exposure index (33 i.e 55·93%). Smith KR[21], Chan-Yeung *et al*. [22], Ezzati [23], Oroczo-Levi *et al*. [24], Ekici *et al*.[25], Ramirez-Venegas *et al*.[26] and Lamprecht *et al*. [12] showed positive correlation between COPD development and biomass exposure.

Non smokers had more exposure to passive smoking which was 31·33%.(P<0·001) Non smokers with COPD GOLD stage II+ reported more years of exposure to passive smoking 29 ± 2·02 years, than those with COPD GOLD stage I 13·75 ± 4·19 years (p< 0·001) which was statistically significant. Yin *et al*.[27], Eisner *et al*. [28], Simoni *et al*.[29], Iribarren *et al*.[30] and Larsson *et al*.[31] revealed that COPD is associated with exposure to environmental tobacco smoke. Lamprecht [12] and Celli BR [13] found no association between passive smoking and increased risk of GOLD stage II + COPD.

History of pulmonary tuberculosis was present in 22·67% of nonsmoker COPD patients, which was statistically significant (P < 0·001) risk factor for development of COPD. Similar result was observed by Ehrlich *et al*. 2004 in South Africa[32] as these countries have high prevalence of pulmonary tuberculosis. In a survey of 13,826 adults in South Africa, the odds of pulmonary tuberculosis associated with COPD were 4·9 for men and 6·6 for women.[33]. In treated patients of pulmonary tuberculosis airflow obstruction varies from 28% to 68%.[34]

Chronic asthma as a risk factor for COPD was found in 16% of patients of nonsmoker COPD group, which was statistically significant (P <0·001) risk factor for the development of COPD. Tucson epidemiological study of airway obstructive disease, observed that patients with asthma have twelve times more risk of developing COPD.[35] In one more study it was observed that 20% of asthmatics' develop irreversible airflow limitation and reduced transfer coefficient.[36]

History of lower respiratory tract infection during childhood was observed in 13·34% of nonsmoker COPD patients, and this was not a statistically significant (P = 0·91) risk factor for development of COPD. GOLD guideline suggests that severe

childhood respiratory infection is associated with decreased pulmonary functions and increase symptoms in adulthood.[37].

BMI, is a recognized risk factor for prognosis and a predictor of death in COPD [38] Our data showed that non smokers had lower BMI 22·08 ±2·11 compared to smokers 25·28 ± 4·45, (p < 0·05) and non smokers with severe COPD GOLD stage II+ had lower BMI 20·2 ± 0.75), than non smokers with mild COPD GOLD stage I 25·14 ± 2·41 ,(p < 0·001)In one of the study by Celli *et al* [13] low BMI was associated with obstruction whereas Lamprecht *et al*[12] reported increase incidence of Gold Stage I.

SUMMARY AND CONCLUSIONS

This study carried out to understand non smokers COPD population characteristics which revealed that non smokers constitute a substantial portion of COPD patient's in our place .It also helped to identify different risk factors that are important in contribution to morbidity and mortality of the disease of the population in our region. The risk factors apart from tobacco smokers, are increasing age, exposure to occupational irritants, biomass fuel, low education level, passive smoking, history of pulmonary tuberculosis, chronic asthama, childhood infections and admissions and low BMI that may play a significant role in development and pathogenesis of the disease.

Limitation

The number of participants was less as compared to other studies however the study concentrated on only one region over a specific population group whereas most of the earlier studies were meta analysis.

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