Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 9, 2024

Original Research Article:

Comparison of clinco- demographic and lung spirometry profile between non-smoker versus smoker copd patients

Dr.Sourabh Solanki[1], Dr.Sanjay Tandon[2], Dr.Akash Shrikhande[3], Dr. Prabhakar Singh[4], Dr. Shubhanshu Kashayap[5]

[1]PG Resident 3rd year, Department of Pulmonary Medicine , People's College of medical sciences and research centre,Bhopal(M.P.)
[2]Professor & HOD, Department of Pulmonary Medicine , People's Medical college & research centre,Bhopal (M.P.)
[3]Professor ,Department of Pulmonary Medicine ,People's medical college and research centre ,Bhopal(M.P.)
[4]PG Resident 3rd year, Department of Pulmonary Medicine ,People's College of medical sciences and research centre,Bhopal(M.P.)
[5]PG Resident 2nd year, Department of Pulmonary Medicine , People's College of medical sciences and research centre,Bhopal(M.P.)

Author for correspondence - Dr.Sourabh Solanki

Email id ;- dr.sourbh.solanki@gmail.com

Received: 26-07-2024/ Revised: 16-08-2024/Accepted Date: 29-08-2024

Abstract:

Aim: To study clinico- demographic and lung spirometry profile between non-smoker and smoker COPD patients. **Material & Methods:** The present cross-sectional observational study was conducted among 200 clinically diagnosed COPD patients attending the Pulmonary Medicine Department at tertiary care centre, Bhopal, Madhyapradesh. Upon diagnosis of COPD, detailed past medical history and any previous exposures was recorded. Patients aged <18 years and patients who do not provide consent were excluded from the patients. Informed consent was taken from all the patients and ethical clearance was obtained form institutional ethical committee. **Result:** Out of 200 COPD patients, 134(67%) were non smokers and 66(33%) were smokers. Out of 200 COPD patients, 150 were male & 50 were female. Smokers experienced a higher frequency of acute exacerbations (3-5 times) compared to non-smokers, suggesting that smoking exacerbates the severity and recurrence of COPD episodes.(P=0.001) Smokers had a significantly higher mean CAT score compared to non-smokers, indicating more severe COPD symptoms and a greater impact on daily life for smokers.(P=0.001) Smokers had more severe shortness of breath (higher mMRC grades) compared to non-smokers, indicating a greater impact of smoking on the severity of COPD symptoms.

Conclusion: Present study found that an Environmental and occupational exposures are significant contributors to COPD among non-smokers, with biofuel smoke and second-hand smoke being primary risk factors**.**

Keywords: COPD, Lung Spirometry, smokers, Bio Fuel.

Introduction:

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of morbidity and mortality worldwide, affecting millions of individuals.[1] Cigarette smoking stands as the primary risk factor contributing to the development of COPD.[2] This debilitating condition is characterized by chronic inflammation and irreversible airflow obstruction, leading to significant structural changes in the lung. Traditionally, the focus of COPD research centered on smoking as the predominant risk factor; however, recent studies have shed light on the substantial role of nonsmokers in COPD pathogenesis. Approximately 50% of COPD cases globally are attributed to smoking, while a notable 10%-12% of individuals diagnosed with COPD have never smoked.[3]

Persistent airflow obstruction characterizes COPD, influenced by a multitude of risk factors. Notably, cigarette smoking emerges as the primary contributor, accelerating the decline in lung function among smokers, although cessation can slow this decline to a more normal rate.[4] Interestingly, the prevalence of non-smoking COPD patients appears higher in developing countries compared to developed nations. This discrepancy suggests that factors beyond cigarette smoking, such as indoor/outdoor pollution, infections, or occupational exposures, may play a more significant role in COPD development in these regions.[5]

The clinico-demographic profile of COPD patients encompasses a wide range of variables, including age, gender, socioeconomic status, comorbidities, and symptomatology. Non-smoker COPD patients often present with distinct demographic characteristics compared to their smoking counterparts. Studies have suggested that non-smoker COPD patients tend to be older at the time of diagnosis, with a higher prevalence among females.[6] Additionally, non-smoker COPD patients may exhibit a different distribution of comorbidities, with a potentially greater burden of cardiovascular diseases and genetic predispositions playing a more prominent role in disease pathogenesis.[7]

Lung spirometry serves as a cornerstone in the diagnosis and monitoring of COPD, providing objective measures of airflow limitation and lung function impairment.[8] When comparing lung

spirometry profiles between non-smoker and smoker COPD patients, several key differences emerge.

Understanding the differences in clinico-demographic and lung spirometry profiles between non-smoker and smoker COPD patients has significant implications for disease management and personalized therapeutic approaches. Additionally, pharmacological therapies targeting specific pathways implicated in COPD pathogenesis, such as bronchodilators, anti-inflammatory agents, and mucolytics, may need to be adapted according to the underlying mechanisms driving disease progression in different patient subsets.

So present study was conducted to study clinico- demographic and lung spirometry profile between non-smoker and smoker COPD patients.

Material & Methods:

The present cross-sectional observational study was conducted among 200 clinically diagnosed COPD patients attending the Pulmonary Medicine Department at tertiary care centre, Bhopal, Madhyapradesh.

All patients aged >18 years visiting the outpatient and inpatient departments with a known diagnosis of COPD, as well as new cases diagnosed based on clinical history, spirometry, and chest X-ray (posterior-anterior view), were included. Upon diagnosis of COPD, detailed past medical history and any previous exposures will be recorded. Patients aged <18 years and patients who do not provide consent were excluded from the patients. Informed consent was taken from all the patients and ethical clearance was obtained form institutional ethical committee.

Tobacco smokers with at least 10 pack-years of cigarette or bidi smoking, who have no other respiratory diseases such as asthma (based on history, clinical examination, and chest X-ray findings), who have a post-bronchodilator FEV1/FVC ratio < 70% and FEV1 < 80% predicted, and who exhibit irreversible airflow obstruction were called Smoker COPD . Subjects exposed to biomass smoke for at least 2 hours a day for 20 years or those exposed to occupational risk factors associated with COPD, who have not smoked for more than a year, who have no other respiratory diseases (based on history, clinical examination, and chest X-ray findings), who

have a post-bronchodilator FEV1/FVC ratio < 70% and FEV1 < 80% predicted, and who exhibit irreversible airflow obstruction were called Non smoker COPD.

Statistical analysis: All the data analysis were performed using IBM SPSS ver. 25 software. Descriptive analysis was performed to obtain the characteristics of the study population. Quantitative data were expressed as mean and standard deviation whereas categorical data were expressed as numbers and percentages. Chi Square test was used to compare the categorical variables whereas independent sample t-test was use to compare the means. P value of <0.05 was considered as significant.

Results:

The present cross-sectional observational study was conducted among 200 clinically diagnosed COPD patients attending the Pulmonary Medicine Department at tertiary care centre, Bhopal, Madhyapradesh. Out of 200 COPD patients, 134(67%) were non smokers and 66(33%) were smokers. Out of 200 COPD patients, 150 were male & 50 were female. A significantly higher proportion of non-smokers were female (71.2%), while the majority of smokers were male (97.8%), suggesting a gender disparity in smoking habits among COPD patients.

A higher proportion of smokers resided in rural areas (72.4%), whereas non-smokers were more likely to live in urban areas (69.7%), suggesting geographical factors may influence smoking status and COPD. Smokers were more likely to be illiterate (80.6%), while non-smokers had a higher proportion of literate individuals (56.1%), indicating a potential link between educational status and smoking behaviour in COPD patients.

Smokers experienced a higher frequency of acute exacerbations (3-5 times) compared to non-smokers, suggesting that smoking exacerbates the severity and recurrence of COPD episodes.(P=0.001)

Smokers had a significantly higher mean CAT score compared to non-smokers, indicating more severe COPD symptoms and a greater impact on daily life for smokers.(P=0.001)

Table 1: Comparing age distribution of patients as per smoking status in COPD patients

		Groups		Total	P value
		Non-smokers	Smokers		
Age of patients (years)	40-50	31	26	57	**0.001(HS)**
	51-60	18	53	71	
	61-70	10	37	47	
	71-80	4	15	19	
	More 80	3	3	6	
Total		66	134	200	
Mean age (years)		55.77±11.11	59.73±9.2	58.43±10.07	**0.009(S)**

This table 1 compares the age distribution of non-smoker and smoker COPD patients. It includes the frequency of patients within specific age ranges, the mean age for each group, and the statistical significance of the differences observed. Smokers had a significantly higher mean age (59.73 years) compared to non-smokers (55.77 years), with the most common age group for smokers being 51-60 years, while non-smokers were more evenly distributed across younger age groups. There was statistically significant difference found in distribution of patients according to age and smoking status. (P<0.05)

Table 2: Comparing Occupation distribution of patients as per smoking status in COPD patients

		Groups		Total	P value
		Non-smokers	Smokers		
Occupation	Broom Maker	0	10	10	<0.001
	Farmer	3	67	70	
	Grain worker	6	5	11	
	House wife	47	2	49	
	Shopkeeper	8	19	27	
	Wage work	2	31	33	
Total		66	134	200	

This table 2 compares the occupational distribution of non-smoker and smoker COPD patients, detailing the frequencies for various occupations and the statistical significance of the observed differences. Non-smokers were predominantly housewives, while smokers were mainly farmers and wage workers, indicating a potential occupational influence on smoking habits and COPD risk. There was statistically significant difference found in distribution of patients according to occupation and smoking status. (P<0.001)

Table 3: Comparing Socioeconomic Status distribution of patients as per smoking status in COPD patients

		Groups		Total	P value
		Non-smokers	Smokers		
Socioeconomic Status	Lower Middle	21	63	84	**<0.001**
	Lower	18	68	86	
	Upper lower	24	0	24	
	Upper Middle	3	3	6	
Total		66	134	200	

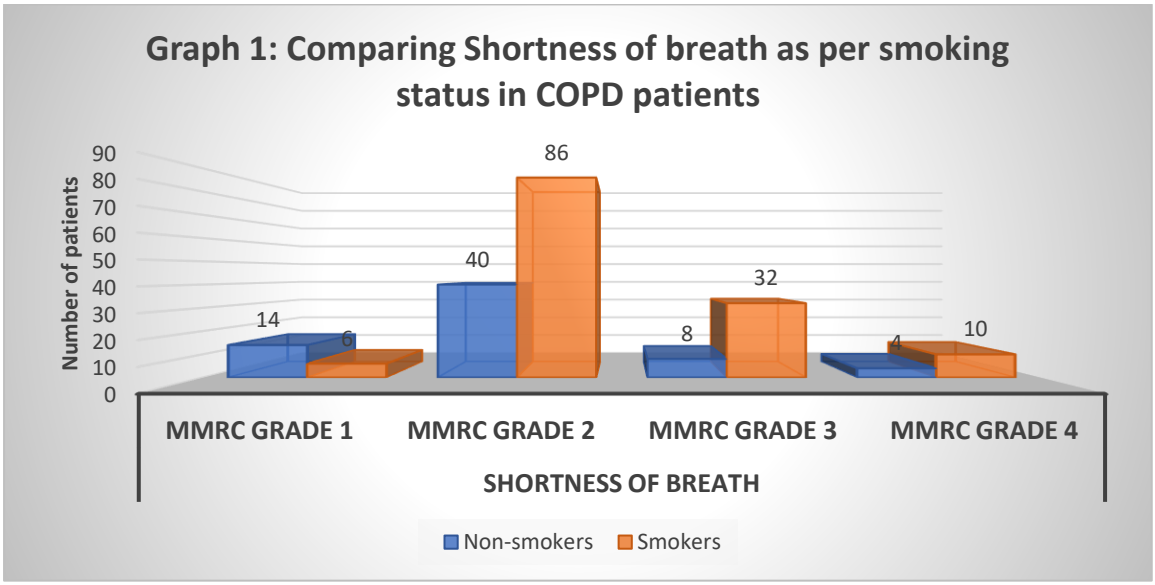
This table 3 compares the socioeconomic status of non-smoker and smoker COPD patients, showing the distribution across different socioeconomic classes and the statistical significance. Smokers were predominantly from lower and lower middle socioeconomic classes, whereas non-smokers included individuals from upper lower and upper middle classes, suggesting socioeconomic status may influence smoking habits and COPD risk. There was statistically significant difference found in distribution of patients according to Socioeconomic Status and smoking status. (P<0.001)

Table 4: Comparing Symptoms distribution of patients as per smoking status in COPD patients

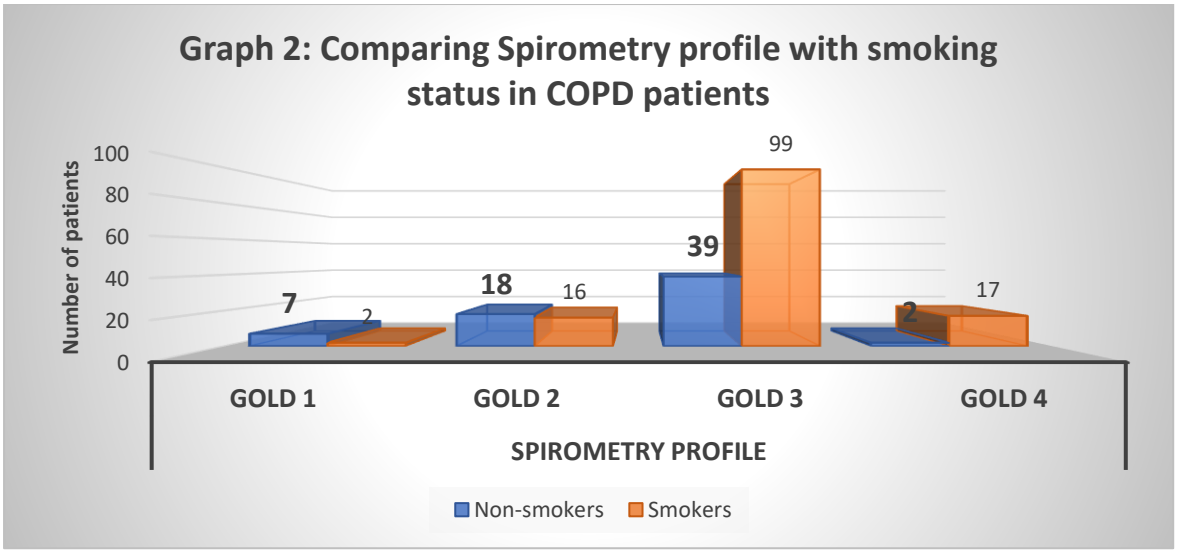
Symptoms	Groups		Total	P value
	Non-smokers	Smokers		
Cough	52	102	154	0.034(S)
Sputum	30	73	104	0.021(S)
Fever	35	83	118	0.011(S)
Chest Tightness	15	42	57	0.012(S)

This table 4 compares the distribution of common symptoms (cough, sputum production, fever, and chest tightness) among non-smoker and smoker COPD patients, providing frequencies and statistical significance. There was a statistically significant difference in the distribution of symptoms between non-smokers and smokers, indicating that the presence of these symptoms was higher in smoker COPD patients as compared to non-smokers. There was statistically significant difference found in distribution of symptoms and smoking status. (P<0.05)

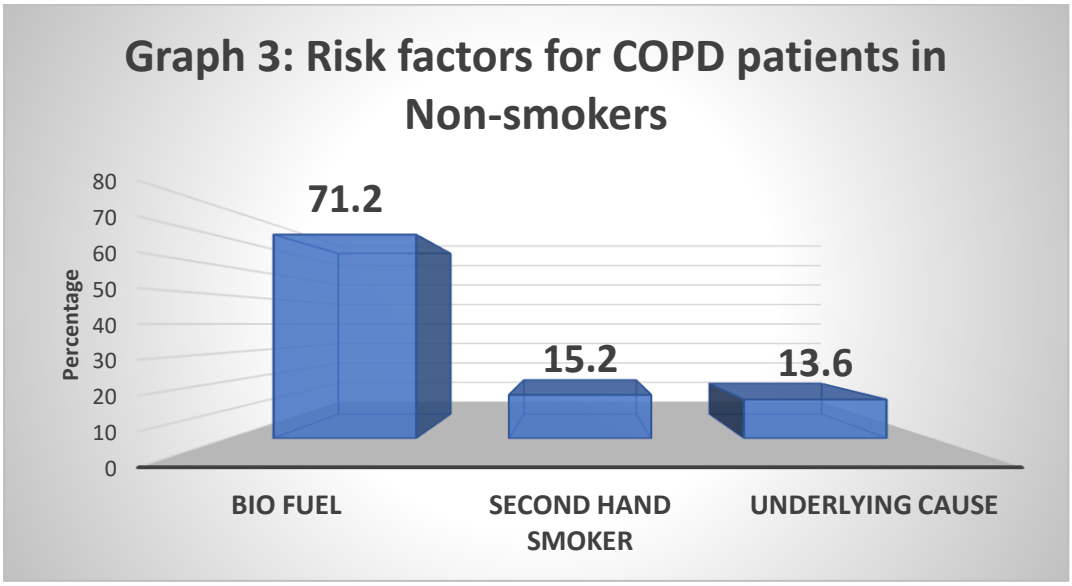
This figure 1 compares the severity of shortness of breath (using mMRC grades) between non-smoker and smoker COPD patients, showing frequencies and statistical significance. Smokers had more severe shortness of breath (higher mMRC grades) compared to non-smokers, indicating a greater impact of smoking on the severity of COPD symptoms. There was statistically significant difference found in distribution of patients according to shortness of breath and smoking status. (P<0.001)



This figure 2 compares the spirometry profiles of non-smoker and smoker COPD patients, categorized by GOLD stages, with frequencies and statistical significance. Smokers predominantly fell into more severe GOLD stages (GOLD 3 and 4), indicating worse lung function compared to non-smokers, who were more likely to be in the milder stages (GOLD 1 and 2). There was statistically significant difference found in distribution of patients according to spirometry profile and smoking status. (P<0.001)



This figure 3 identifies risk factors for COPD among non-smokers, including the frequency and percentage of patients exposed to each risk factor. The majority of non-smoker COPD patients were exposed to biofuel (71.2%), followed by second-hand smoke (15.2%) and other underlying causes (13.6%), highlighting the importance of these risk factors in non-smoker COPD development.



Discussion:

The majority of COPD patients in our study are smokers, making up 67% of the total, while non-smokers constitute 33%. This indicates a strong association between smoking and COPD prevalence, consistent with findings from other studies. For instance, Bajpai et al.[6] (2020) reported that a significant proportion of COPD patients were smokers, highlighting the critical role of smoking in the development of the disease. Similarly, Sinha et al.[9] (2017) found that smoking was significantly associated with the occurrence of COPD, with the majority of their COPD patients being smokers. Zhang et al.[10] also observed a high prevalence of smoking among COPD patients, further emphasizing the strong link between smoking and COPD. Alamgir et al.[11] (2021) demonstrated that smoking was a major risk factor, with smokers exhibiting significantly lower lung function and more severe disease progression compared to non-smokers. These studies collectively support the notion that smoking is a predominant risk factor for COPD, contributing to both its development and exacerbation, thereby underscoring the importance of smoking cessation programs in reducing the burden of COPD.

The occupation distribution in COPD patients shows a distinct pattern between smokers and non-smokers. Our study indicates that non-smokers are predominantly housewives (71.2%), whereas smokers are mainly farmers and wage workers. This suggests that occupational factors might influence smoking habits and consequently, the risk of developing COPD. Supporting this, Zhang et al.[10] and Bajpai et al.[6] highlighted similar trends where smokers with COPD were largely engaged in labor-intensive occupations, underscoring the potential occupational exposure to dust and pollutants as additional risk factors for COPD among smokers.

Geographical distribution data reveals that a higher proportion of smokers (72.4%) reside in rural areas, while non-smokers are more likely to live in urban areas (69.7%). This finding aligns with the studies by Sze et al.[12] (2022) and Alamgir et al.[11] (2021), which also reported a higher prevalence of smokers in rural regions.

Regarding education status, our study found that the majority of smokers with COPD are illiterate (80.6%), while a higher proportion of non-smokers are literate (56.1%). This suggests a potential link between lower educational levels and higher smoking rates. The studies by Sinha et al.[13] and Bajpai et al.[6] (2019) corroborate this, indicating that educational interventions could play a crucial role in smoking prevention and COPD management.

Lastly, socioeconomic status analysis reveals that smokers with COPD predominantly belong to lower and lower-middle socioeconomic classes, whereas non-smokers include individuals from upper-lower and upper-middle classes. This socioeconomic disparity suggests that lower socioeconomic status may influence smoking habits and increase the risk of COPD. Studies by Alamgir et al.[11] (2021) and Sinha et al.[13] similarly highlight that socioeconomic factors significantly affect health behaviors and access to healthcare resources, thereby impacting COPD prevalence and outcomes among different socioeconomic groups.

Symptoms such as cough, sputum production, fever, and chest tightness are significantly more common in smokers compared to non-smokers. This indicates that smokers experience more severe COPD symptoms. Bajpai et al.[6] observed that smokers with COPD had a higher prevalence of these symptoms, which can be attributed to the direct irritant effects of tobacco smoke on the respiratory tract. Similarly, Sinha et al.[13] reported that cough and sputum production were significantly more frequent in smokers, emphasizing the chronic inflammatory response induced by smoking. Alamgir et al.[11] (2021) found that respiratory symptoms such as fever and chest tightness were more pronounced in smokers, suggesting that smoking exacerbates the inflammatory process and contributes to more severe disease presentation. Additionally, Shin et al.[14] (2023) noted that the frequency of respiratory symptoms was higher in smokers with preserved ratio impaired spirometry (PRISm), further supporting the notion that smoking intensifies COPD symptoms.

Smokers exhibit more severe shortness of breath (higher mMRC grades) compared to non-smokers, indicating a greater impact of smoking on the severity of COPD symptoms. In our study, a significant proportion of smokers presented with higher mMRC grades, which was consistent with findings from Bajpai et al.[6] (2020), who reported that smokers had worse dyspnea scores. Sinha et al.[13] also found that smokers had higher mMRC grades, correlating with more advanced disease stages and greater airflow limitation.

Smokers have a higher frequency of acute exacerbations (3-5 times) compared to non-smokers, suggesting that smoking exacerbates the severity and recurrence of COPD episodes. Our study's findings are in line with Bajpai et al.[6] (2020), who observed a higher rate of exacerbations among smokers, likely due to increased susceptibility to respiratory infections and environmental triggers.

Smokers have higher mean CAT scores (31.43) compared to non-smokers (29.17), indicating more severe COPD symptoms and a greater impact on daily life for smokers. Ji et al.[15] found that smokers exhibited more significant structural lung changes, such as increased emphysema, which likely contribute to higher CAT scores due to greater symptom severity. Anwar et al.[16] observed that non-smokers with COPD, often exposed to biomass smoke, also had significant pulmonary impairment, though their symptoms were generally less severe than those in smokers.

Similarly, Ojuawo et al.[17] found that although never-smokers with COPD had substantial symptoms, their overall disease severity was lower compared to smokers. Alamgir et al.[11] (2021) confirmed that smokers had significantly lower FEV1 and FVC values, contributing to higher CAT scores due to increased respiratory burden.

Smokers are more likely to be in severe GOLD stages (GOLD 3 and 4), indicating worse lung function, whereas non-smokers are more often in milder stages (GOLD 1 and 2). This observation is supported by several studies focusing on the spirometric profiles of COPD patients. Ji et al.[15] found that smokers exhibited more significant structural lung changes, such as increased emphysema and airway wall thickening, which contribute to worse lung function and higher GOLD stages.

A study by Bajpai et al.[6] observed that smokers had more severe airflow limitation, with a greater proportion falling into GOLD stages 3 and 4. This is in contrast to non-smokers, who were predominantly in the milder stages (GOLD 1 and 2), reflecting less severe lung function decline

Shah et al.[18] (2021) reinforced these findings, showing that smokers had more severe COPD and higher dyspnea grades, which corresponded to their placement in higher GOLD stages. Rodríguez García et al.[19] (2023) emphasized that non-smokers with COPD often have less severe lung function impairment and are more likely to be in the milder GOLD stages, supporting the observed differences in spirometric profiles between smokers and non-smokers. Collectively, these studies indicate that smoking exacerbates lung function decline, resulting in a higher proportion of smokers being classified into severe GOLD stages.

A study by Salvi et al.[20] (2020) found that non-smoking COPD patients exhibited distinct characteristics such as less emphysema and more small airway obstruction, which typically correspond to milder GOLD stages. In contrast, smoking COPD patients had more significant emphysematous changes and worse spirometric indices, aligning with higher GOLD stages.

The majority of non-smoker COPD patients in our study are exposed to biofuel (71.2%), followed by second-hand smoke (15.2%) and other underlying causes (13.6%). This highlights the significant role of these risk factors in the development of COPD among non-smokers. Anwar et al.[16] emphasized that occupational and environmental exposures, including biomass fuel smoke, were common risk factors among non-smokers with COPD, leading to significant pulmonary function impairment.

A study Ojuawo et al.[17] (2019) highlighted that firewood exposure was the primary non-smoking risk factor (47.4%) among COPD patients in their study, which aligns with our findings that biofuel exposure is a major risk factor. Salvi et al.[20] (2020) observed that non-smokers with COPD, particularly in rural areas, were often exposed to biomass smoke, leading to a distinct COPD phenotype characterized by small airways obstruction.

Conclusion: Present study found that an Environmental and occupational exposures are significant contributors to COPD among non-smokers, with biofuel smoke and second-hand smoke being primary risk factors. This highlights the need for public health interventions aimed at reducing exposure to these pollutants, particularly in rural areas where biofuel use is prevalent. Recognizing these risk factors is essential for understanding the broader etiology of COPD beyond smoking, emphasizing the importance of addressing environmental health. Effective public health policies and education on the risks of biofuel and second-hand smoke exposure are crucial for reducing COPD incidence and improving patient outcomes.

References:

1. Prasad B. Chronic obstructive pulmonary disease (COPD). Int J Pharm Res Technol IJPRT. 2020;10(1):67–71.

2. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. The lancet. 2009;374(9691):733–43.

3. Ho T, Cusack RP, Chaudhary N, Satia I, Kurmi OP. Under-and over-diagnosis of COPD: a global perspective. Breathe. 2019;15(1):24–35.

4. Postma DS, Bush A, van den Berge M. Risk factors and early origins of chronic obstructive pulmonary disease. The Lancet. 2015;385(9971):899–909.

5. Hogea S, Tudorache E, Fildan AP, Fira-Mladinescu O, Marc M, Oancea C. Risk factors of chronic obstructive pulmonary disease exacerbations. Clin Respir J. 2020;14(3):183–97.

6. Bajpai J, Kant S, Bajaj DK, Pradhan A, Srivastava K, Pandey AK. Clinical, demographic and radiological profile of smoker COPD versus nonsmoker COPD patients at a tertiary care center in North India. J Fam Med Prim Care. 2019;8(7):2364–8.

7. Eapen MS, Hansbro PM, Larsson-Callerfelt AK, Jolly MK, Myers S, Sharma P, et al. Chronic obstructive pulmonary disease and lung cancer: underlying pathophysiology and new therapeutic modalities. Drugs. 2018;78:1717–40.

8. Haynes JM, Kaminsky DA, Ruppel GL. The Role of Pulmonary Function Testing in the Diagnosis and Management of COPD. Respir Care. 2023;68(7):889–913.

9. Sinha T, Nalli SK, Toppo A. A study of clinical profile of patients with chronic obstructive pulmonary disease. Int J Community Med Public Health. 2017;4(4):1000–4.

10. Zhang J, Lin X feng, Bai C xue. Comparison of clinical features between non-smokers with COPD and smokers with COPD: a retrospective observational study. Int J Chron Obstruct Pulmon Dis. 2014;57–63.

11. Alamgir S, Talukder A, Hossain S, Afroz F, Begom S, Mehjabin M. The Clinical and Spirometric Profiles and Staging of COPD, Asthma in Smokers and Nonsmokers, Bangladesh. Sch J App Med Sci. 2021;9:1332–5.

12. Sze DF, Howarth TP, Lake CD, Ben Saad H, Heraganahally SS. Differences in the spirometry parameters between indigenous and non-indigenous patients with COPD: a matched control study. Int J Chron Obstruct Pulmon Dis. 2022;869–81.

13. Sinha T, Nalli SK, Toppo A. A study of clinical profile of patients with chronic obstructive pulmonary disease. Int J Community Med Public Health. 2017;4(4):1000–4.

14. Shin YY, Park S, Kim KJ, Rhee CK, Yoo KH, Jung KS, et al. Clinical characteristics and medical utilization of smokers with preserved ratio impaired spirometry. Int J Chron Obstruct Pulmon Dis. 2023;2187–94.

15. Ji W, Lim MN, Bak SH, Hong S, Han S, Lee S, et al. Differences in chronic obstructive pulmonary disease phenotypes between non-smokers and smokers. Clin Respir J. 2018;12(2):666–73.

16. Anwar MR, Ishrat N, Khan GAN. Demographic Profile & Pulmonary Function Parameters in Non-Smoker COPD Patients. Int Arch Biomed Clin Res. 2017;3(4):145–9.

17. Ojuawo O, Aladesanmi A, Opeyemi C, Desalu O, Fawibe A, Salami A. Profile of patients with chronic obstructive pulmonary disease in Ilorin who were never-smokers. Niger J Clin Pract. 2019;22(2):221–6.

18. Shah DM, Kshatriya RM, Paliwal R. Comparison of demographic, clinical, spirometry, and radiological parameters between smoking and non-smoking COPD patients in rural Gujarat, India. J Fam Med Prim Care. 2021;10(9):3343–7.

19. García CR, Ruano-Ravina A, Ríos MP, Gisbert LM, Varela-Lema L, Candal-Pedreira C, et al. Clinical characteristics of chronic obstructive pulmonary disease in never-smokers: A systematic review. Respir Med. 2023;107284.

20. Salvi SS, Brashier BB, Londhe J, Pyasi K, Vincent V, Kajale SS, et al. Phenotypic comparison between smoking and non-smoking chronic obstructive pulmonary disease. Respir Res. 2020;21:1–12.