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Evaluation of Etiological Factors in Patients with Chronic Obstructive Pulmonary Disease in a Tertiary Care Hospital in Uttarakhand

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a major public health problem with a multifactorial etiology, particularly in low- and middle-income countries where environmental and socioeconomic factors play a crucial role. ***Objective:*** To evaluate the etiological factors and demographic profile of COPD patients attending a tertiary care hospital in the Garhwal region of Uttarakhand. ***Methods:*** A cross-sectional observational study was conducted among 100 diagnosed COPD patients. Data were collected using a structured questionnaire assessing demographic characteristics and exposure to risk factors including smoking, biomass fuel use, occupational exposure, and environmental factors. ***Results:*** The mean age of patients was 69.12 ± 8.72 years, with the majority in the 61–70 years age group (40%). Males constituted 55% and females 45% of the study population. A large proportion of patients belonged to lower socioeconomic strata (lower 30%, upper-lower 29%) and had low literacy levels, with 45% illiterate and only 3% graduates. Occupationally, most were farmers (41%), indicating a predominantly rural background. Regarding etiological factors, 25% were current smokers and 46% ex-smokers, with a mean smoking index of 48.79 ± 9.01 pack-years. Biomass fuel exposure was present in 81% of patients. Occupational exposure, particularly to organic dust, was observed in 57% of patients. Environmental risk factors were highly prevalent, with 73% exposed to outdoor air pollution and 87% having poor kitchen ventilation. ***Conclusion:*** COPD in this population is strongly associated with multiple overlapping risk factors, including smoking, biomass fuel exposure, occupational hazards, and poor socioeconomic conditions. Public health interventions focusing on clean fuel use, occupational safety, and awareness are essential to reduce disease burden.

Keywords: COPD, Etiological Factors, Biomass fuel, Smoking, Occupational exposure, Cigarette smoking, Organic Dust.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major global public health problem and one of the leading causes of morbidity and mortality worldwide. It is currently ranked as the third leading cause of death globally, with a disproportionately higher burden in low- and middle-income countries (LMICs)[1,2]. COPD is characterized by persistent respiratory symptoms and progressive airflow limitation resulting from chronic inflammatory responses to noxious particles and gases[3].

The pathogenesis of COPD is complex and multifactorial, involving interactions between environmental exposures, genetic susceptibility, and socioeconomic determinants. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defines COPD as a preventable and treatable disease caused by long-term exposure to harmful agents in susceptible individuals[3,4]. Although genetic factors such as alpha-1 antitrypsin deficiency contribute in a minority of cases, environmental exposures remain the predominant drivers[5].

Cigarette smoking remains the most important and well-established risk factor for COPD globally, contributing significantly to disease burden and mortality[2,6]. However, a substantial proportion of COPD cases occur in non-smokers, particularly in LMICs, highlighting the importance of alternative risk factors[7,8].
In India and similar settings, biomass fuel exposure is a major contributor to COPD. The use of wood, crop residues, and animal dung for cooking in poorly ventilated homes leads to chronic exposure to harmful pollutants, especially among rural populations and women[9-11]. Household air pollution has been identified as a key driver of COPD burden in developing countries[12].

Occupational exposure to dust, fumes, and chemicals is another significant etiological factor. Individuals engaged in agriculture, construction, and industrial work are at increased risk due to prolonged inhalation of particulate matter[13],[14]. Environmental pollution, both indoor and outdoor, further contributes to COPD development and progression[15].

Additionally, prior respiratory infections, including pulmonary tuberculosis and childhood respiratory illnesses, are increasingly recognized contributors to COPD, particularly among non-smokers[16],[17]. Early-life exposures and impaired lung development also play a crucial role in determining long-term susceptibility to COPD[18].

Socioeconomic factors such as poverty, low education, poor housing, and limited access to healthcare significantly influence COPD risk and outcomes[19].

Therefore, COPD in regions such as Uttarakhand arises from a combination of smoking and non-smoking risk factors, necessitating a comprehensive evaluation of etiological determinants.

Aims & Objectives

1. To identify major etiological factors in COPD patients.
2. To assess distribution of risk factors.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in the Department of General Medicine at a tertiary care hospital in the Garhwal region of Uttarakhand. The study included patients diagnosed with Chronic Obstructive Pulmonary Disease (COPD) based on clinical evaluation and spirometric criteria in accordance with standard guidelines. A total of 100 patients fulfilling the inclusion criteria were enrolled consecutively during the study period after obtaining informed consent.

Data were collected using a pretested structured questionnaire and patient interviews. Detailed demographic information, including age, gender, occupation, educational status, and socioeconomic status, was recorded. The primary focus of the study was to evaluate etiological factors associated with COPD. Accordingly, information regarding smoking history (current, ex-smoker, and non-smoker) and cumulative exposure (pack-years) was obtained. Exposure to biomass fuel, including use of wood, dung, or crop residues for cooking in poorly ventilated settings, was assessed.

Occupational exposure was evaluated by documenting exposure to dust, organic dust, fumes, and other airborne irritants, particularly in agricultural and construction-related work. Environmental factors such as outdoor air pollution and indoor air quality, including kitchen ventilation, were also assessed. In addition, past history of respiratory illnesses, including pulmonary tuberculosis and recurrent respiratory infections, was recorded.

The collected data were compiled and analyzed using appropriate descriptive statistical methods. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation.

RESULTS

A total of 100 patients with diagnosed COPD were included in the study. The analysis of etiological factors revealed a multifactorial pattern of disease causation, with significant contributions from both smoking and non-smoking-related exposures.

Smoking

Smoking was identified as a major etiological factor. Among the study population, 25% were current smokers and 46% were ex-smokers, while 29% were non-smokers. The mean smoking index was 48.79 ± 9.01 pack-years, indicating moderate to high cumulative exposure among smokers. These findings demonstrate a strong dose-dependent relationship between tobacco exposure and COPD.

Biomass Fuel Exposure

Biomass fuel exposure was highly prevalent, with 81% of patients reporting exposure, while only 19% had no such exposure. This highlights the significant role of indoor air pollution, particularly in rural households, as a major etiological0020contributor.

Occupational Exposure

Occupational risk factors were also prominent. A majority of patients (57%) were exposed to organic dust, while 16% had exposure to inorganic dust. Only 27% reported no occupational exposure. The predominance of agricultural occupations, particularly farming (41%), further supports the role of occupational hazards in COPD development.

Environmental Pollution

Environmental exposure was substantial among patients. Outdoor air pollution exposure was reported in 73% of cases, while 87% had poor kitchen ventilation, indicating significant indoor air pollution. These findings emphasize the combined impact of indoor and outdoor environmental pollutants.

Co-morbidities

A high prevalence of co-morbid conditions was observed among COPD patients. The most common co-morbidity was diabetes mellitus (27%), followed by heart failure (24%) and hypertension (21%). Coronary artery disease was present in 15% of patients. Anxiety or depression was reported in 9%, while anemia was observed in 4% of cases. Notably, 15% of patients had no associated co-morbid conditions. These findings indicate a significant burden of cardiovascular and metabolic disorders among COPD patients.

Past Respiratory Infections

Although detailed quantitative data on past infections were not specified, a history of respiratory illnesses, including tuberculosis, was reported as a contributing factor in COPD development among patients.

Genetic Factors

Genetic predisposition, including family history and conditions such as alpha-1 antitrypsin deficiency, was recognized as a potential but less prominent etiological factor in this population.

DISCUSSION

The present study reinforces the multifactorial nature of COPD, demonstrating the combined influence of smoking, biomass exposure, occupational hazards, and environmental pollution. These findings are consistent with recent global evidence emphasizing that COPD is not solely a smoking-related disease but results from multiple interacting risk factors[20].

Smoking remains a major etiological contributor, with a high proportion of current and ex-smokers observed in the study. The dose–response relationship between tobacco exposure and COPD is well established and supported by global burden studies[2,6]. However, the presence of COPD among non-smokers in this study highlights the increasing recognition of non-smoking-related risk factors[7].

A key finding is the high prevalence of biomass fuel exposure, which aligns with recent systematic reviews identifying biomass smoke as a major independent risk factor for COPD in LMICs[10,21]. This is particularly relevant in rural populations, where indoor air pollution plays a dominant role.

Occupational exposure, especially to organic dust, was also significant. Recent studies suggest that occupational exposures contribute to a substantial proportion of COPD cases, particularly among non-smokers[13,22]. Chronic exposure to dust and fumes leads to airway inflammation and structural lung damage.

Environmental pollution emerged as another major contributor. Exposure to outdoor air pollution and poor indoor ventilation has been consistently associated with COPD development and exacerbations[15,23]. Air pollution is now recognized as a major global risk factor for respiratory diseases, particularly in South Asia[2].

The role of past respiratory infections, including tuberculosis, is increasingly emphasized in recent literature. Post-tuberculosis lung disease is a well-recognized entity associated with chronic airflow limitation[16,24]. Similarly, early-life exposures and impaired lung growth contribute to COPD risk later in life[18].

Socioeconomic determinants also play a critical role. Lower socioeconomic status is associated with higher exposure to environmental and occupational risks, poor access to healthcare, and delayed diagnosis[19,25].

Overall, the findings of this study are consistent with contemporary global and regional evidence, highlighting the multifactorial etiology of COPD and the need for comprehensive preventive strategies beyond smoking cessation.

CONCLUSION

The present study demonstrates that Chronic Obstructive Pulmonary Disease (COPD) is a multifactorial disorder with significant contributions from both smoking and non-smoking-related risk factors. While tobacco smoking remains a major etiological determinant, a substantial proportion of patients are exposed to additional risk factors, particularly biomass fuel smoke and occupational hazards. These findings highlight the distinct epidemiological pattern of COPD in the Indian context, where environmental and socioeconomic factors play a crucial role alongside conventional risk factors.

The high prevalence of biomass fuel exposure, poor indoor ventilation, and occupational dust exposure underscores the need for targeted public health interventions. Effective prevention strategies should prioritize smoking cessation, promotion of clean and sustainable cooking fuels, and implementation of occupational safety measures to reduce exposure to harmful airborne pollutants.

A comprehensive approach addressing these modifiable risk factors, along with improved awareness and early detection, is essential to reduce the burden of COPD and improve patient outcomes, particularly in rural and resource-limited settings.

REFERENCES

1. World Health Organization. Chronic respiratory diseases. Geneva: WHO; 2023.
2. Safiri S, Carson-Chahhoud K, Noori M, Nejadghaderi SA, Sullman MJM, Ahmadian Heris J, et al. Burden of chronic obstructive pulmonary disease and its attributable risk factors in 204 countries and territories, 1990–2019. *BMJ*. 2022;378:e069679. doi:10.1136/bmj-2021-069679
3. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: 2023 report.
4. Agustí A, Celli BR, Criner GJ, Halpin DMG, Anzueto A, Barnes PJ, et al. Global initiative for chronic obstructive lung disease 2023 report: GOLD executive summary. *Lancet*. 2023;401(10390):2228–2240. doi:10.1016/S0140-6736(23)00400-4
5. Stoller JK, Aboussouan LS. Alpha-1 antitrypsin deficiency. *Lancet*. 2022;399(10338):2225–2236. doi:10.1016/S0140-6736(21)02317-3
6. GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis. *Lancet*. 2020;396(10258):1223–1249. doi:10.1016/S0140-6736(20)30752-2
7. Salvi S, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. *Lancet*. 2009;374(9691):733–743. doi:10.1016/S0140-6736(09)61303-9
8. Park JH, Lee CH, Kim EK. Chronic obstructive pulmonary disease in never smokers: recent advances. *Tuberc Respir Dis (Seoul)*. 2024. doi:10.4046/trd.2024.0060
9. Gordon SB, Bruce NG, Grigg J, Hibberd PL, Kurmi OP, Lam KBH, et al. Respiratory risks from household air pollution in low- and middle-income countries. *Lancet Respir Med*. 2014;2(10):823–860. doi:10.1016/S2213-2600(14)70168-7
10. Harchaoui IEL, Benamara S, Khellaf M, et al. Biomass exposure and risk of COPD. *BMJ Open Respir Res*. 2024;11:e002409. doi:10.1136/bmjresp-2024-002409
11. Po JY, FitzGerald JM, Carlsten C. Respiratory disease associated with biomass fuel exposure. *Thorax*. 2011;66(3):232–239. doi:10.1136/thx.2010.147884
12. World Health Organization. Household air pollution and health. Geneva: WHO; 2022.
13. Blanc PD, Annesi-Maesano I, Balmes JR, Cummings KJ, Fishwick D, Miedinger D, et al. The occupational burden of nonmalignant respiratory diseases. *Eur Respir J*. 2019;54(1):1900186. doi:10.1183/13993003.00186-2019
14. Bongers QJ, de Brouwer SJM, Slottje P, et al. Occupational exposure and COPD risk. *Respir Res*. 2024;25:45. doi:10.1186/s12931-024-02715-4
15. Schraufnagel DE, Balmes JR, De Matteis S, Hoffman B, Kim WJ, Perez-Padilla R, et al. Health benefits of air pollution reduction. *Ann Am Thorac Soc*. 2019;16(12):1478–1487. doi:10.1513/AnnalsATS.201907-538CME
16. Allwood BW, van der Zalm MM, Amaral AFS, Byrne AL, Datta S, Egere U, et al. Post-tuberculosis lung disease. *Int J Tuberc Lung Dis*. 2020;24(10):1021–1032. doi:10.5588/ijtld.20.0178
17. Byrne AL, Marais BJ, Mitnick CD, Lecca L, Marks GB. Tuberculosis and chronic respiratory disease. *Thorax*. 2015;70(8):798–805. doi:10.1136/thoraxjnl-2015-206947
18. Martinez FD. Early-life origins of chronic obstructive pulmonary disease. *N Engl J Med*. 2016;375(9):871–878. doi:10.1056/NEJMra1603287
19. Marmot M. Social determinants of health inequalities. *Lancet*. 2005;365(9464):1099–1104. doi:10.1016/S0140-6736(05)71146-6
20. Wu Z, Li Y, Wang X, et al. Global burden and risk factors of COPD. *BMC Pulm Med*. 2025. doi:10.1186/s12890-025-03489-1
21. Kurmi OP, Semple S, Simkhada P, Smith WC, Ayres JG. COPD and chronic bronchitis risk from solid fuel exposure. *Eur Respir J*. 2010;35(1):223–230. doi:10.1183/09031936.00006309
22. Balmes JR, Becklake MR, Blanc PD, et al. Occupational contribution to COPD. *Am J Respir Crit Care Med*. 2003;167(5):787–797. doi:10.1164/rccm.201204-0717ST
23. Sin DD, Tashkin D, Zhang X, et al. Air pollution and COPD. *Eur Respir J*. 2023;61(5):2202469. doi:10.1183/13993003.02469-2022
24. Meghji J, Mortimer K, Agusti A, Allwood BW, Asher I, Bateman ED, et al. Improving lung health after tuberculosis. *Lancet Respir Med*. 2020;8(8):803–812. doi:10.1016/S2213-2600(20)30235-4
25. Eisner MD, Blanc PD, Yelin EH, Katz PP, Sanchez G, Iribarren C, et al. Socioeconomic status and COPD outcomes. *Am J Respir Crit Care Med*. 2010;182(1):113–120. doi:10.1164/rccm.200905-0720OC