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Clinical Profile and Cardiovascular Disease among Chronic Obstructive Pulmonary Disease Patients

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ABSTRACT

Introduction: Chronic Obstructive Pulmonary Disease is a major cause of morbidity and mortality worldwide, with systemic manifestations beyond the lungs. Cardiovascular disease is one of the most significant comorbidities, yet its prevalence among Chronic Obstructive Pulmonary Disease patients in low-resource settings like Nepal is underexplored.

Objective: To assess the clinical profile of Chronic Obstructive Pulmonary Disease patients and determine the prevalence of cardiovascular comorbidities among those attending a tertiary care center in Nepal.

Methods: This prospective cross-sectional study was conducted at Tribhuvan University Teaching Hospital, Kathmandu. Seventy adult patients with spirometry confirmed Chronic Obstructive Pulmonary Disease, recruited from inpatient and outpatient services, were enrolled. Patients with pre-existing hypertension, diabetes, or major cardiovascular conditions were excluded. Demographic data, smoking history, exposure risks, symptoms, and spirometry were recorded.

Results: The mean age of participants was predominantly above 65 years, with females (61.4%) outnumbering males. Most patients were rural residents (68.6%), with 70% reporting smoking exposure. Symptomatically, half presented with dyspnea, cough, and sputum production, and 48.6% reported grade 4 dyspnea on the Modified medical research council dyspnea scale. Based on the Global Initiative for Chronic Obstructive Lung Disease classification, 57.1% of patients were in group D, indicating high symptom burden and exacerbation risk. Cardiovascular disease was documented in 11.4% of patients.

Conclusions: This study demonstrates that cardiovascular disease is a notable comorbidity among chronic obstructive pulmonary disease patients in Nepal, even after excluding common confounders such as hypertension and diabetes. Most patients were elderly, female, and from rural areas with significant smoking exposure.

Keywords: Cardiovascular disease; chronic obstructive pulmonary disease; comorbidity; nepal.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of morbidity and mortality worldwide, characterized by persistent respiratory symptoms and airflow limitation that is not fully reversible. [1]

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It is projected to become the third leading cause of death globally, with an increasing burden in low- and middle-income countries. The disease affects an estimated 251 million people worldwide and causes approximately 3.15 million deaths annually. [2] Beyond its pulmonary manifestations, COPD is now recognized as a systemic disease with significant extra pulmonary consequences, among which Cardiovascular disease (CVD) is one of the most common. Shared risk factors such as cigarette smoking, advancing age, and chronic systemic inflammation contribute to the strong epidemiological link between COPD and CVD.[3]

Systematic review evidence demonstrates that CVD prevalence in COPD patients ranges from 28% to 70%, with unadjusted rate ratios of 2.1 to 5.0 compared to patients without COPD. [4]Cardiovascular comorbidities not only worsen the overall prognosis but also complicate management, increase hospitalization rates, and contribute to excess mortality.[5] This study was conducted to determine clinical profile and CVD among COPD patients attending a tertiary care hospital in Nepal.

METHODS

This prospective cross-sectional study was conducted in the Department of Internal Medicine at Tribhuvan University

Teaching Hospital, Nepal and included both inpatient and outpatient services. Data collection was carried out over the study period from December 2020, and all eligible participants were enrolled.

A total of 70 patients were included, with the sample size calculated on the basis of an expected prevalence of albuminuria among COPD patients of 24%, using a 95% confidence level and 10% margin of error. Patients were selected using a purposive sampling technique. Adults aged 40–80 years with a confirmed diagnosis of COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria and able to provide informed consent were eligible. Patients were excluded if they had pre-existing acute or chronic kidney disease, diabetes mellitus, hypertension, major cardiovascular conditions such as myocardial infarction, heart failure, or severe arrhythmia, or if they were receiving ACE inhibitors, angiotensin receptor blockers, or diuretics likely to influence renal function. Pregnant and breastfeeding women were also excluded.

All participants provided written informed consent before enrollment, and the study protocol was reviewed and approved by Institutional review board of Institute of Medicine (IRB-IOM) with IRB number of 177 (6-11) E2 077/078 . The study adhered to the principles of the Declaration of Helsinki. Demographic and clinical information was obtained through proforma and review of medical records, including smoking history, occupational exposure, comorbidities, and symptom profile. Spirometry was performed in eligible patients to confirm COPD and classify severity according to GOLD staging. Cardiovascular evaluation included clinical examination, electrocardiography, and echocardiography. Data were recorded in a standardized proforma, anonymized, and securely stored in Microsoft Excel 365.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were used to summarize demographic characteristics, clinical features, and cardiovascular findings. Results were expressed in terms of frequency, percentage, and distribution patterns as appropriate.

RESULTS

A total of 70 participants were enrolled in the study. The majority of participants were in the age group of 65–74 years (44.3%), followed by those aged ≥75 years (37.1%). (Table 1, Figure 1) The mean age distribution thus reflected an older population. Females constituted a larger proportion of the cohort (61.4%) compared to males (38.6%).

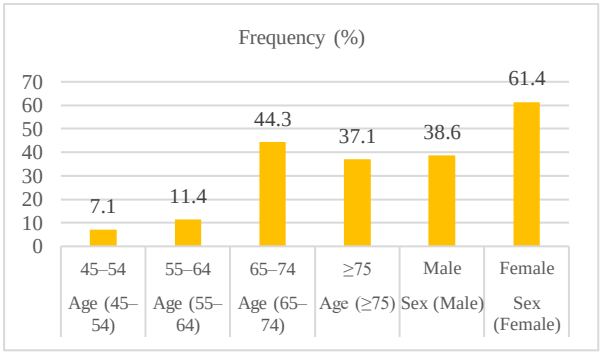

Figure 1. Age and sex distribution of COPD patients (n = 70).

The clustered bar chart illustrates the number of male and female participants across four age categories

With respect to nutritional status, most participants (68.6%) had a BMI within the normal range (18.5–22.9 kg/m²), whereas 8.6% were underweight and 5.7% were obese (BMI ≥25). Rural residence predominated, accounting for 68.6% of the study population. Regarding occupation, a considerable proportion were dependent (44.3%), followed by farmers (27.1%) and housewives (15.7%), while only a small proportion were employed in health-related, government, or private sectors.

Table 1: Baseline Characteristics of Study Participants.

Parameter	Category	Frequency (%)
Age (years)	45–54	5 (7.1)
	55–64	8 (11.4)
	65–74	31 (44.3)
	≥75	26 (37.1)
Sex	Male	27 (38.6)
	Female	43 (61.4)
BMI (kg/m²)	<18.5	6 (8.6)
	18.5–22.9	48 (68.6)
	23–24.9	12 (17.1)
	≥25	4 (5.7)
Area of Residence	Rural	48 (68.6)
	Urban	22 (31.4)
Occupation	Farmer	19 (27.1)
	Housewife	11 (15.7)
	Dependent	31 (44.3)

	Health worker	2 (2.9)
	Government Job	3 (4.3)
	Private Job	4 (5.7)
Exposure	Smoking	49 (70.0)
	Biomass	6 (8.6)
	Both	15 (21.4)
Smoking Pack-years	<15	19 (27.1)
	16–30	45 (64.3)
	31–45	3 (4.3)
	46–60	3 (4.3)
Education level	Illiterate / No formal education	66 (94.3)
	Primary	1 (1.4)
	Secondary	2 (2.9)
	Above Secondary	1 (1.4)

Exposure history revealed that 70% of participants were smokers, 8.6% were exposed to biomass, and 21.4% had dual exposure. Smoking burden was notably high, with 64.3% having 16–30 pack-years of exposure. Educational attainment was poor, as 94.3% of participants were illiterate or had no formal education, while only 4.3% had received education beyond primary level.

The most common presenting symptom was the triad of increased shortness of breath, cough, and sputum production (50%), followed by shortness of breath with cough (31.4%) and isolated breathlessness (18.6%). Functional assessment using the mMRC scale showed that nearly half of the participants (48.6%) had grade 4 dyspnea, while only 8.6% reported grade 2 symptoms. (Table 2)

Table 2: Distribution of Participants.

Parameter	Category	Frequency (%)
Symptoms of presentation	Increased shortness of breath	13 (18.6)
	Increased shortness of breath and cough	22 (31.4)
	Increased shortness of breath, cough and sputum production	35 (50.0)
mMRC	1	16 (22.9)
	2	6 (8.6)
	3	14 (20.0)
	4	34 (48.6)
Cardiovascular disease	Present	8 (11.4)
	Absent	62 (88.6)

In terms of GOLD classification, the majority of participants fell into group D (57.1%), indicating higher symptom burden and risk of exacerbation. Group B and groups A and C accounted for 20.0% and 11.4% each, respectively. (Figure 2) The prevalence of comorbid cardiovascular disease was 11.4%, while the remaining 88.6% of participants had no such history. The bar chart depicts the proportion of patients in each GOLD group. The majority belonged to group D (57.1%), followed by group B (20.0%), with groups A and C comprising 11.4% each.

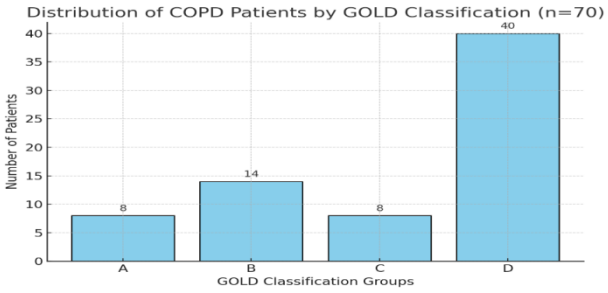

Figure 2. Distribution of COPD patients

DISCUSSION

This study determines the clinical profile and cardiovascular diseases among COPD among patients attending a tertiary care center in Nepal. Our findings demonstrate that a significant proportion of COPD patients had cardiovascular comorbidities, though the overall prevalence (11.4%) was relatively lower compared to some international reports.[2-4] The majority of participants were elderly, female, and from rural settings, with smoking history being the predominant risk factor. Clinically, most patients presented with advanced disease severity (GOLD group D), substantial symptom burden, and impaired functional status, underscoring the heavy impact of COPD in this population. The observed prevalence of CVD among COPD patients in our cohort is somewhat lower than the 20–40% reported in other studies. [2-5] Hospital-based studies report CVD prevalence ranging from 28-70% in COPD patients, with one Indian study finding 60% prevalence, most commonly ischemic heart disease (21%) and congestive heart failure (20%).[6] Another study of CVD patients found 43.9% had concurrent COPD diagnosis. [7] First, underdiagnosis of cardiovascular conditions in low-resource settings is likely, given limited access to echocardiography, cardiac biomarkers,

and specialist care. Second, our exclusion of patients with pre-existing hypertension and diabetes mellitus two major CVD risk factors may have led to an underestimation of the true burden. Nevertheless, the presence of CVD in more than one-tenth of COPD patients in this study.

In South Asian studies, the prevalence of cardiovascular comorbidities among COPD patients has ranged widely. A systematic review across eight South Asian countries found COPD prevalence ranging from 8.0% to 20%, with highest rates in north India (19.4%) and Bangladesh (13.5%) aligning with our findings. [8] These regional similarities may reflect shared demographic characteristics, smoking patterns, and biomass exposure. However, disparities with Western data highlight the importance of context-specific epidemiological research. The strong association between COPD and CVD is supported by several biological mechanisms. Systemic inflammation, a hallmark of COPD, is thought to accelerate atherosclerosis and endothelial dysfunction, thereby increasing cardiovascular risk.[9,10] Hypoxemia and oxidative stress further contribute to myocardial strain, arrhythmogenesis, and vascular remodeling. Shared exposures such as smoking amplify these risks by causing both airway damage and vascular injury.[11] In our study, nearly 70% of patients had a substantial smoking history, supporting its central role as a unifying etiological factor. Additionally, reduced physical activity due to chronic dyspnea may predispose COPD patients to metabolic derangements, thereby indirectly influencing cardiovascular health.[12] Interestingly, despite excluding patients with diabetes and hypertension, a notable burden of CVD remained, underscoring the independent contribution of COPD to cardiovascular pathology. The coexistence of COPD and CVD presents significant diagnostic and therapeutic challenges due to overlapping symptoms that often lead to misdiagnosis or delayed recognition of comorbid conditions. [13] Symptoms such as dyspnea and chest discomfort often overlap, making it difficult to distinguish between pulmonary and cardiac etiologies in routine practice. In resource-limited settings like Nepal, the lack of advanced diagnostic modalities may lead to under recognition and under treatment of CVD in COPD patients. This means COPD patients should be systematically evaluated for cardiovascular comorbidities during their routine follow-up visits through ECG, echocardiography, and relevant biomarkers to enable early detection and management of coexisting heart disease.

CONCLUSION

This study highlights that cardiovascular disease is a relevant comorbidity among patients with COPD in Nepal, even after excluding common confounders such as hypertension and diabetes. The coexistence of these conditions has important implications for disease management and prognosis. Given the aging population and high prevalence of smoking in Nepal, COPD- CVD overlap is likely to become an increasing public health challenge. Early recognition, routine screening, and integrated multidisciplinary management should be prioritized to improve outcomes in this vulnerable patient group.

Future research should focus on larger, multicenter cohorts across Nepal to better capture the epidemiological spectrum of COPD- CVD overlap. Incorporating advanced diagnostic methods would provide more accurate prevalence estimates and clarify subclinical disease burden. Moreover, prospective cohort studies assessing the impact of cardiovascular comorbidities on COPD outcomes such as exacerbation frequency, hospitalizations, and mortality would be valuable. Interventional studies evaluating the effectiveness of integrated care models where pulmonary and cardiovascular management are coordinated could also inform national guidelines and improve patient outcomes.

Conflict of Interest: None

REFERENCES

1. Vermeire P. The burden of chronic obstructive pulmonary disease. Respir Med. 2002 Aug;96 Suppl C:S3-10. [PubMed | Full Text | DOI]
2. Hossain MM. Burden of Chronic Obstructive Pulmonary Disease in India: Status, Practices and Prevention. Int J Pulm Respir Sci [Internet]. 2018 Mar 14 [cited 2025 Sept 17];2(5). [Full Text | DOI]
3. Groenewegen A, Zwartkruis VW, Smit LJ, De Boer RA, Rienstra M, Hoes AW, et al. Sex-specific and age-specific incidence of ischaemic heart disease, atrial fibrillation and heart failure in community patients with chronic obstructive pulmonary disease. BMJ Open Respir Res. 2022 Dec;9(1):e001307. [PubMed | Full Text | DOI]
4. Müllerova H, Agusti A, Erqou S, Mapel DW. Cardiovascular comorbidity in COPD: systematic literature review. Chest. 2013 Oct;144(4):1163–78. [PubMed | Full Text | DOI]
5. Chen W, Thomas J, Sadatsafavi M, FitzGerald JM. Risk of cardiovascular comorbidity in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Lancet Respir Med. 2015 Aug;3(8):631–9. [PubMed | Full Text | DOI]

6. Gupta AS, Rajesh V, James P. Cardiovascular comorbidities associated with patients with chronic obstructive pulmonary disease – a hospital-based study. Egypt J Bronchol. 2019 Dec;13(5):591–5. [Full Text | DOI]
7. Riesco JA, Hidalgo M, Chipayo D, Gómez JJ, Zaragozá F. Profile of Cardiovascular Disease Patients Who are Diagnosed with COPD in a Smoking-Cessation Unit. Adv Ther. 2020 Aug 1;37(8):3562–70. [PubMed | Full Text | DOI]
8. Jarhyan P, Hutchinson AF, Khaw D, Prabhakaran D, Mohan S. Prevalence of chronic obstructive pulmonary disease and chronic bronchitis in eight countries: a systematic review and meta-analysis. Bull World Health Organ. 2022;100:216–30. [PubMed | Full Text | DOI]
9. Ghoorah K, De Soyza A, Kunadian V. Increased Cardiovascular Risk in Patients With Chronic Obstructive Pulmonary Disease and the Potential Mechanisms Linking the Two Conditions: A Review. Cardiol Rev. 2013 Aug;21(4):196. [PubMed | Full Text | DOI]
10. Ragnoli B, Chiazza F, Tarsi G, Malerba M. Biological pathways and mechanisms linking COPD and cardiovascular disease. Ther Adv Chronic Dis. 2025 Mar;16:20406223251314286. [PubMed | Full Text | DOI]
11. Kotlyarov S. The Role of Smoking in the Mechanisms of Development of Chronic Obstructive Pulmonary Disease and Atherosclerosis. Int J Mol Sci. 2023 Jan;24(10):8725. [PubMed | Full Text | DOI]
12. Watz H, Waschki B, Boehme C, Claussen M, Meyer T, Magnussen H. Extrapulmonary Effects of Chronic Obstructive Pulmonary Disease on Physical Activity. Am J Respir Crit Care Med. 2008 Apr;177(7):743–51. [PubMed | Full Text | DOI]
13. Leong P, Macdonald MI, Ko BS, Bardin PG. Coexisting chronic obstructive pulmonary disease and cardiovascular disease in clinical practice: a diagnostic and therapeutic challenge. Med J Aust. 2019;210(9):417–23. [PubMed | Full Text | DOI]