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Prevalence and factors associated with chronic obstructive pulmonary disease in Kavre, Nepal

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a common health problem with increasing prevalence all over the world. COPD among people in Nepal is a major public health concern.

Objectives: This present study aimed to determine the prevalence and factors associated with COPD in Nepal.

Methods: This is an analytical cross-sectional study. The study was conducted among patient visited at Dhulikhel Hospital Kathmandu University Hospital, Kavre district, Nepal. A total of 470 patient aged ≥ 50 years were selected using stratified random sampling method. The COPD patients were diagnosed based on spirometry and chest X-ray findings. Data were entered into Epi-data manager 3.1 and analysed using STATA 18. Descriptive statistics were performed to describe participant characteristics and multivariable logistic regression analysis was employed to determine the factors associated with the COPD. P-value <0.05 was considered statistically significant.

Results: Of the total 470, the overall prevalence of COPD was 19.36% (95% CI: 16.02-23.20). The mean age of respondent was 64.84 years (±10.01). After adjusting for covariates, the study found that increasing age was strongly associated with COPD: 61-70 years old (AOR = 6.78, 95% CI: 2.88-15.99, P < 0.001), 71-80 years old (AOR= 11.78, 95% CI: 5.75-31.80, P <0.01), and > 80 years old (AOR=11.76, 95% CI: 4.07-34.39, P <0.01). However, literacy among the patients (AOR = 0.43, 95% CI: 0.24-0.73, P = 0.002) and no family history of COPD (AOR = 0.34, 95% CI: 0.19-0.60, P < 0.001) were less likely to be associated with COPD.

Conclusion: Nearly one fifth of the respondents had COPD which still remains as a huge hidden burden of high prevalent disease in Nepal. Educational status, aging, traditional firewood cooking and genetic predisposition were major risk factors among COPD cases in Nepal.

Keywords: Burden of illness, Disability, Mortality, Prevalence, Risk factors, Trend

1. Introduction

Chronic obstructive pulmonary disease is a progressive lung disease that combines chronic bronchitis and emphysema leading to gradual loss of lung function [1]. It is characterized by symptoms such as cough, difficulty breathing, wheezing and fatigue [2]. COPD affects 10%–20% of the population older than 40 years globally, resulting in more than 3 million deaths each year [3]. According to the World Health Organization (WHO), 90% of COPD-related deaths occur in low and middle-income countries, and mortality rates in Southeast Asia are projected to increase by 160% [3, 4]. Smoking and air pollution are the primary risk factors [5, 6]. Although COPD is not curable [7], symptoms can be managed through lifestyle changes, medication, and pulmonary rehabilitation [3].

In Nepal, the prevalence of COPD in adults was 22.7% between 2000 and 2020 with 54.9% of cases in females [8]. COPD accounted for 16.3% of deaths in 2019, up from 6.1% in 1990 [9]. Contributing factors include smoking, indoor air pollution from traditional cooking methods, and outdoor pollution from urbanization and industrial activities [10]. A community based cross-sectional study conducted in Ethiopia shows prevalence of COPD was 17.8% and factors significantly associated with COPD were age above 50 years, being smoker, exposed to biomass smoke, poor ventilated kitchen [11].

COPD diagnosis is confirmed through spirometry, a test measuring lung function [4, 12]. Risk factors include tobacco exposure, occupational hazards, childhood respiratory infections [5, 12] and genetic factors like α1-antitrypsin deficiency [13]. COPD is expected to become the third leading cause of death by 2020 [14]. Multivariate analysis has identified factors such as age, low education and heavy smoking as predictors of COPD [15, 16].

This study aimed to provide insights into the prevalence and factors associated with COPD in central Nepal helping to inform healthcare policies and improve disease management and prevention efforts nationwide.

2. Methods

2.1 Study Area

The current study was carried out in Dhulikhel Hospital Kathmandu University Hospital, Kavre district, Nepal. It is a teaching hospital of Kathmandu University located in Bagmati province, central Nepal. This site was chosen because of its central location in Nepal, which serves a diverse

population throughout the country. This ensures a diverse and representative sample for the study.

2.2 Study Design

This study was an analytical cross-sectional study conducted in Kavre district of Bagmati province Nepal, from March to June 2024. For this study, a stratified random sampling method was used to select participants in accordance with inclusion and exclusion criteria. Patients aged 50 years or older who visited the medicine OPD and were willing to participate in the study were included; however, patients with chronic mental conditions, those who needed to transfer at the emergency department and did not want to participate were excluded.

2.3 Sample size and sampling

The required sample size for this study was calculated using statistical formula for single population proportion by considering 95% confidence interval, 5% level of precision, design effect of 1.5 [17], 22.7% prevalence of COPD [8] and 20% non-response rate. Accordingly, the final sample size was 485. Stratified random sampling was done and study population were patient ≥50 years of age visited at medicine OPD of the hospital. For data collection, 12 different days were selected over a period of approximately three months, with one day chosen each week. On each of these days, 40 patients were randomly selected using a random number generator in Excel from the pool of registered patients.

2.4 Data Collection

Face to face interview was done to collect the data. Trained enumerator interviewed the patient using structured questionnaire. The questionnaire was divided into 3 sections: socio-demographic factors, health related factors and behavioural and/or environmental factors.

2.5 Data Analysis

The collected and edited data were entered into EPI-Data v3.1 software and analysed using software STATA version 18.0. Odds ratio (OR) together with 95% confidence interval were used to determine the strength of association between COPD and its associated factors. The descriptive statistics such as frequency, percentage, mean, median was used for continuous variables and Chi – square test and logistic regression for bivariate and multivariate analysis was used to estimate the association between COPD and its predictors. Backward elimination technique for variable selection in logistic

regression was used. Starting with all potential predictors, variables with a P-value greater than 0.05 were sequentially removed to reach at the final model. P-value <0.05 was considered as statistically significant.

2.6 Ethical Clearance

The ethical consideration was taken from the administration and IRC of Dhulikhel Hospital Kathmandu University Hospital (Ref. Number 94/24). Informed consent was taken from the respondents and number of respondents were encouraged to be involved in the study. The respondent's privacy and confidentiality were maintained and not force to participate, and their rights was respected in the study process.

3. Results

3.1 Socio-demographic, environmental and behavioural Characteristics

A total of 485 sample size, 470 patients responded to the questionnaire and 15 were left out of the data collection due to their personal preference. The study included respondent from 19 district of Nepal and most of the respondents were from Kavre district. The mean age of respondent was 64.84 years (SD±10.01).

Of the 470 participants, most of the participants were age group of 50-60 years (38.5%) in which 51.91% found to be female and 49.09% were male. Likewise, most of the respondent were illiterate (50.64%) and maximum of the respondent were engaged in agriculture. Similarly, majority of the participants had their monthly family income more than NPR 20,000 (90%). Majority of the patients diagnosed with COPD between the age of 61 -70 years and 53.85% patient had co-morbid condition. 99.15 % participants had a ventilation system in their kitchen. There were 17.66% smoker, 41.49% former smoker and 40.85% non-smoker. 25.96% of respondent had family history of COPD. Majority of the respondent were not engaged in any physical exercise i.e. 72.34%.

Table 1: Socio-demographic, environmental and behavioral characteristics of respondents (n=470)

Characteristics	Number (n)	Percentage (%)
Gender		
Female	244	51.91
Male	226	49.09
Age (Years)		
50-60	181	38.51
61-70	153	32.55
71-80	105	22.34
≥80	31	6.60

Characteristics	Number (n)	Percentage (%)
Mean (SD)	64.84 (±10.01)	
Median (Min:Max)	64 (50:93)	
Ethnic group		
Brahmin/Chhetri	257	54.68
Janajati	167	35.53
Madesi	4	0.85
Dalit	41	8.73
Others	1	0.21
Marital Status		
Married	362	77.02
Unmarried	1	0.21
Divorced	2	0.43
Widowed	105	22.34
Religion		
Hindu	432	91.91
Buddhist	25	5.32
Islam	2	0.43
Christianity	11	2.34
Educational status		
Illiterate	238	50.64
Literate	138	29.36
Primary level	43	9.15
Lower secondary level	26	5.53
High school	25	5.32
Occupation		
Agriculture	227	48.30
Business	43	9.15
Government job	34	7.23
Private job	15	3.19
Unemployed	14	2.98
House wife	132	28.09
Foreign country employment	5	1.06
Family Income (NPR)		
< 10000	8	1.70
10000 to 20000	39	8.30
≥20000	423	90.00
Exact age when diagnosed COPD (n=91)		
40-50 Years	7	7.69
51-60 Years	18	19.78
61-70 Years	42	46.16
71-80 Years	24	26.37
Co-morbidities along with COPD (n=91)		
Yes	49	53.85
No	42	46.15
Ventilation system in kitchen		
Yes	466	99.15
No	4	0.85
Current smoking status or other tobacco use		
Smoker	83	17.66
Former smoker	195	41.49
Non smoker	192	40.85
Family history of COPD among parents		
Yes	122	25.96
No	348	74.04

Characteristics	Number (n)	Percentage (%)
Engaged in physical exercise to control COPD		
Yes	129	27.45
No	340	72.34
Inconsistently	1	0.21

3.2 Prevalence of COPD

Table 2 showed that the prevalence of COPD among patient age ≥50 years visited at medicine OPD of hospital was 19.36% (95% CI: 16.02-23.20).

Table 2: Prevalence of COPD (n=470)

Variable	Number (n)	Percentage (%)	95 % CI
Presence or absence of COPD			
Yes	91	19.36	16.02-23.20
No	379	80.64	76.79-83.97

3.3 Association between COPD, socio-demographic and behavioural characteristics of respondents

Table 3 showed that participants of age group between 71-80 were 13.53 times higher odds of having COPD than participants of 50-60 years (COR= 13.53, 95% CI: 5.75-31.80, P-value <0.001). literate participants were less likely to be associated with COPD (COR= 0.31, 95% CI: 0.19-0.52, P-value <0.001). Among the patient who do not have a family history of COPD were less likely to develop COPD and there was an association between COPD and family history of COPD (COR= 0.39, 95% CI: 0.24-0.64, P-value <0.001). In the study, participants who were not engaged in physical exercise were 2.39-time higher odds of having COPD as compared to reference group (COR= 2.39, 95% CI: 1.30-4.40, P-value 0.004).

Table 3: Association between COPD, socio-demographic and behavioral characteristics of respondents: Bivariate analysis(n=470)

Factors	n (%of COPD)	Crude OR	95% CI	P-value
Age				<0.001
50-60	181 (3.87)	1	1	
61-70	153 (24.18)	7.92	3.41-18.38	
71-80	105 (35.24)	13.53	5.75-31.80	
>80	31 (32.26)	11.83	4.07-34.39	
Educational status				<0.001
Illiterate	238(27.73)	1	1	
Literate	232(10.78)	0.31	0.19-0.52	
Family history of COPD among parents				<0.001
Yes	122(31.15)	1	1	
No	348(15.23)	0.39	0.24-0.64	
Engaged in physical exercise				0.004
Yes	129(10.85)	1	1	

Factors	n (%of COPD)	Crude OR	95% CI	P-value
No	341(22.58)	2.39	1.30-4.40	

Table 4 showed the importance of age, educational status and family history in the risk of developing COPD. The study indicated that participants of age group 61-70 years increased risk of COPD (AOR = 6.78, 95% CI: 2.88-15.99, P-value < 0.001), indicating that individuals aged 61-70 have approximately 6.78 times higher odds of having COPD compared to those aged 50-60, after adjusting for other factors. Similarly, literacy reduced risk of COPD (AOR = 0.43, 95% CI: 0.24-0.73, P-value = 0.002), suggesting that literate individuals have 57% lower odds of having COPD compared to illiterate individuals. The study represents that participant without ventilation system had higher risk (AOR = 6.62, 95% CI: 0.65-67.19, P-value = 0.110), however this result is not statistically significant as the P-value is greater than 0.05. Participants not having family history of COPD reduced risk of developing COPD (AOR = 0.34, 95% CI: 0.19-0.60, P-value < 0.001), indicating that individuals without a family history of COPD have 66% lower odds of having the disease compared to those with a family history.

Table 4: Association of COPD with multiple variables: Multivariate Analysis

Factors	n (%of COPD)	Crude OR	Adj. OR	95% CI	P-value
Age					<0.001
50-60	181 (3.87)	1	1	1	
61-70	153 (24.18)	7.92	6.78	2.88-15.99	
71-80	105 (35.24)	13.53	11.78	4.87-28.44	
>80	31 (32.26)	11.83	11.76	3.87-35.69	
Educational status					
Illiterate	238(27.73)	1	1	1	
Literate	232(10.78)	0.31	0.43	0.24-0.73	0.002
Family history of COPD					
Yes	122(31.15)	1	1	1	
No	348(15.23)	0.39	0.34	0.19-0.60	<0.001

4. Discussion

The burden of COPD is raising worldwide, and it is one of the most common causes of mortality in most countries. Many patients with COPD are still under-diagnosed, inadequately evaluated and under-recognized which leads to significant underreporting of this disease [4].

In our study, most of the participants were age between 50-60 years (38.5%) with the median (min:max) age of participants 64 (50:93). A study reported a higher proportion

of COPD among male as compared to female and the finding is similar to the study conducted in Egypt [18] while some study done in Nepal showed that more females suffered from COPD as compared to male [11, 16, 19]. In the present study, the prevalence of COPD was 19.36. This finding is comparable with previous studies conducted by *Budhathoki et al*. reported that the prevalence of COPD in adult population in Nepal was 22.7% [19] and study conducted in Brazil with the prevalence of COPD 15.8% [20]. In comparison to our result, some studies reported lower prevalence, 6.0% in Peru [21], 6.8% in Canada [22], 13.4% in Korea [23] and some other studies reported higher, 21.8% in Russia [24] and 24% in Netherland [25]. In fact, the prevalence of COPD is variable across countries and different groups within countries.

Our study revealed that COPD is high prevalent in old age of 71-80years, and this data was comparable with the studies done in Nepal and Ukraine, Kazakhstan and Azerbaijan [3, 19, 26]. The study showed that people using firewood are more vulnerable to COPD as compared to those using cylinder gas the study done in Mexico City [10] and other studies conducted in Mexico and India [10, 27]. This study represented that literacy reduced risk of COPD, suggesting that literate individuals had 0.34 times less likely having COPD and this result was similar to other studies conducted in same topic in Nepal [15, 28]. The study found that people who smoke are more likely to develop COPD as compared to those who did not, and this finding was similar to the studies conducted in Korea [23] and Nepal [19].

The present study showed that the participants who did not have ventilation system in their kitchen had 12.88 times higher odds of having COPD as compared to those who did not have ventilation in their kitchen. This result was comparable with the studies conducted in Ethiopia [11] and India [27]. Similarly, the study also portrayed the impact of physical activity with the development of COPD. People who engaged in physical exercise had lower odds of developing COPD in line with this finding other studies showed that people engaged in physical activity had lower risk of developing COPD [29, 30].

Our study represented that there was an association between family history of COPD indicating that individuals without a family history of COPD had 0.34 times less likely to be associated with COPD compared to those with a family history (AOR = 0.34, 95% CI:

0.19-0.60, P < 0.001) and the findings was similar to other studies conducted in the same subject [31-33]. This might be due to genetic predisposition as COPD has a genetic component, with alpha-1 antitrypsin deficiency being one of the most well-known genetic risk factors. Individuals with this deficiency are more prone to lung damage from environmental insults such as smoking or pollution [34] and shared environmental factors, epigenetics might be some other reasons.

Our study has several strengths, as of our best knowledge this is one of the studies that include participants form eastern to western region of Nepal. This is areas hospital-based study that included the participants belongs from both rural and urban area so that the bias due to factors of rural and urban area are equally distributed while collecting data, so that this study provided more comprehensive understanding of COPD and its associated factors. Finally, this study was an analytical cross sectional that could determine consequences of possible risk factors.

However, this study has also some limitation: firstly, we did study in ≥ 50 years of patient however COPD can also be developed before the age of 50. Similarly, our sample size was not that enough to represent the national and global status of COPD. Finally, we did not used FEV1/FEV ratio to diagnose COPD as we taken patient diagnosed by the registered doctor, which may lead to service provider bias.

5. Conclusion

The study revealed that COPD remains a huge hidden burden of high-prevalence disease in Nepal. The risk factors that influence the development of COPD had been identified and these include age, exposure to biomass smoke, cigarette smoking, family history and poor kitchen ventilation. Further largescale studies with more diverse sample are needed to elucidate the actual impact of these risk factors and other factors on the development of COPD. The prevalence of COPD is increasing day by day, so guideline to change these risk factors to reduce the burden of the COPD from policy-making level is warranted. The local government should initiate or offer resource to conduct such kind of research to identify the actual picture of disease status and its contributing factors prevalent in their community.

The information provided in this paper will be helpful for healthcare policy makers to instruct COPD disease management and

prevention strategies and allocate healthcare resources accordingly.

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