

Factors Associated with Medication Adherence Among Chronic Obstructive Pulmonary Disease Patients

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Keywords: COPD; Medication adherence pattern; Factors associated



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Introduction

Chronic obstructive pulmonary disease (COPD) is a common lung problem that causes obstructed airways and breathing difficulties, 3.23 million deaths were reported due to COPD in 2019 which became the third leading cause of death worldwide.¹ In low to middle-income countries like Nepal, exposure to risk factors such as cigarettes, smoking, and air pollution is even higher. A study conducted by NHRC revealed the prevalence of COPD as 11.7% in Nepal.² The prevalence of COPD is rising. The devastating nature of highly prevalent disease results in substantial social and economic burdens, including direct and indirect medical costs as well as other costs.³ Chronic Obstructive Pulmonary Disease (COPD) can negatively affect the day-to-day life of patients, leading to increased healthcare costs and long-term adverse effects on health status. COPD isn't curable but pharmacological treatment can relieve symptoms, improve lung function, and reduce the exacerbation risk, discontinuation of treatment may increase disease severity, hospitalization, and mortality rate.⁴ The pharmacological treatment in COPD includes bronchodilators, glucocorticosteroids, mucolytic agents, vaccines, antibiotics, and others.⁵ The overuse of prescription medications, especially inhaled corticosteroids (ICS), to treat COPD persists despite the evidence-based guidelines endorsed by the

Abstract

Background: Poor medication adherence among Chronic Obstructive Pulmonary Disease (COPD) patients can lead to higher costs and worse health outcomes. The study aimed to examine medication adherence patterns and the factors influencing them in patients with COPD.

Method: This is a descriptive cross-sectional study conducted at Out Patient Department of Universal College of Medical Sciences (UCMS), Bhairahawa, Nepal from 25th February 2023 to 24th August 2023. Patients having age ≥ 18 years of either sex. and diagnosed with COPD were included in this study and purposive sampling method was used. Ethical approval was obtained from the Institutional Review Committee of UCMS with reference number (Ref. No. UCMS/IRC/204/22). A validated structured questionnaire was used to collect the data and Statistical analysis performed using descriptive statistics and chi-square tests using Statistical Package for Social Sciences (SPSS) version 20.

Results: Out of 175 patients enrolled in this study, 53.7% had a medium level, 30.9% had a high level, and 15.4% had a low level of medication adherence. The chi square test showed that medication adherence pattern was significantly associated with age ($p=0.03$), education status ($p=0.047$), number of medications ($p=0.02$), medication cost ($p<0.001$) and information provided about their medication ($p=0.03$). About 56.6% of patients had missed the dose and the major reason was forgetfulness (41.9%). Most of the patients had discontinued their medication due to symptomatic relief (32.6%).

Conclusion: Factors affecting low adherence included the number of medications, age, education level, and cost. Further research should be conducted to enhance patient education among COPD patients and increase medication adherence.

Global Initiative for Chronic Obstructive Lung Disease (GOLD).⁶ Among COPD patients acute exacerbation is the frequent cause of hospital stay and death.⁷ Mostly prescribed medicines are inhaled medication so this is the mainstay for COPD management. Misuse of inhalers has been associated with the increased severity of COPD exacerbations which leads to poor adherence to medication.⁸

Medication adherence is a key part in the achievement of therapeutic outcomes in patient care which increases patient longevity and health status.⁹ Adherence is defined as "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice".⁷ Poor adherence is common in COPD patients to their medications

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and it is also evident from many studies that the non-adherence accounts for 30–50% of treatment failures in COPD patients.¹⁰ Non-adherence can be intentional and unintentional. In Intentional non-adherence patients decide not to follow the recommended treatment while unintentional may result due to the forgetfulness of the patient or exactly not knowing the method of using the medicines.¹¹

According to WHO, various predictors causing poor medication adherence can be normally classified into five categories: socioeconomic factors, therapy-related factors, patient-related factors, condition-related factors, and health system/health care team- (HCT-) related factors. By understanding whether the non-adherence is primary (initiation of pharmacotherapy) or secondary (implementation of the prescribed regimen), and other factors associated with it, a proper intervention can be done individually to improve the medication-taking behavior of each patient.¹² Due to the complexity of COPD treatment and the possible added co-morbidities patients may be unable to follow the required medications. Therefore, patients' adherence is crucial because not taking medications effectively and correctly increases the risk of complications and financial burden to patients.¹³

Medication adherence and factors associated with it might get varied relative to the nature of population and different geographical regions (in terms of prescribing pattern of general practitioners, socioeconomic status of patients) due to this the previous studies couldn't represent medication adherence among COPD patients all over in Nepal.¹⁴

This study aimed to explore the factors associated with medication adherence among COPD patients in the Universal College of Medical Sciences (UCMS) teaching hospital, Bhairahawa. Moreover, the outcome of this study may improve poor adherence and quality of life of COPD patients.

Materials and Methods

The descriptive cross-sectional study was conducted at the outpatient medicine department of Universal College of Medical Sciences (UCMS), Bhairahawa, Nepal. Study was carried out for a period of six months from 25th February 2023 to 24th August 2023 which included the time for literature review, data collection and data analysis. Patients who were willing to participate and given consent for the study, having age ≥ 18 years of either sex, and diagnosed with COPD were included in this study. Patients having a history of asthma, rhinitis and respiratory diseases other than COPD were excluded from the study. Purposive sampling was used to identify the COPD patients meeting inclusion criteria for this study. Sample size was calculated using Cochran's formula for cross sectional study ($N = Z^2pq/d^2$, N =sample size, prevalence rate of COPD (p)=11.7%, $q=1-p$, desired confidence level at 95% (Z)=1.96 (for the level of confidence of 95%, which is Conventional Z value is 1.96) and degree of precision (d)=5% (0.05). so, (N)= $Z^2pq/d^2=(1.96)^2 \times 0.117 \times 0.883 / (0.005)^2=158.8 \sim 159$ Therefore, adding 10% non-response rate, the sample size was 175.

Data was collected by face-to-face interview method. The structured questionnaire was designed to collect data socio-demographic and clinical characteristics.^{10,11} The self-made questionnaire was designed to measure medication adherence by studying different literatures.^{15,16} The questionnaire consists of eight questions with scoring point alongside of response, 7 questions with Yes/No response options and 1 question with 4-point likert scale. This questionnaire results in a score ranging 0 to 8 with three level of medication adherence based on the score: high, medium, and low 0, 1-4 and > 4 respectively. There were also questionnaires for determining other contributing factors to adherence.^{16,17}

First of all, approval was taken from Institutional Review Committee (IRC) with IRC approval number: (UCMS/IRC/204/22). When dealing with patients, the respondent was asked for their written

informed consent before each interview, and the research's goals was explained to them. Respondents were assured that their privacy, anonymity and confidentiality would be maintained.

A total of 175 patients were enrolled in this study. Written informed consent was taken from the patient who were willing to participate and meeting the inclusion criteria. Data collection carried out through a face-face interview. Self made Medication Adherence Questionnaire was pre-tested in 10% of total sample where its Cronbach's alpha value was 0.75 and the value greater than 0.7 was considered reliable.^{16,18}

Data was entered and analyzed using SPSS version. 20 was used. Data was analyzed as per the objective of the study. Analysis was based on descriptive (frequency and percentage) and inferential (Chi square test) statistical methods. $p < 0.05$ was considered as statistically significant with 95% confidence interval.

Results

Table 1: Socio-demographic and Clinical Characteristics of Patient

Variables		Frequency	Percent (%)
Age groups	≤ 60	37	21.1
	> 60	138	78.9
Gender	Male	66	37.7
	female	109	62.3
Education Status	literate	48	27.4
	illiterate	127	72.6
Occupation	farmer	41	23.4
	housewife	105	60.0
	business	0	0
	Other	29	16.6
Monthly Income	$< 10,000$	153	87.4
	10,000-25,000	14	8.0
	$> 25,000$	8	4.6
Co-morbidities	Yes	142	81.1
	No	33	18.9
Family history of COPD	Yes	52	29.7
	No	123	70.3
Smoking history	Yes	140	80.0
	No	35	20.0
Cigarette per day	≤ 5 sticks	26	14.9
	> 5 sticks	117	66.9
Number of medications	≤ 2	80	45.7
	> 2	95	54.3
Route of administration	Oral	3	1.7
	inhalational	110	62.9
	Both	62	35.4
Difficult to use inhaler	Yes	30	17.4
	No	142	82.6
Support	Self	10	5.7
	Family	165	94.3
Medication cost	affordable	109	62.3
	not affordable	66	37.7

Out of 175 patients included in this study, female 62.3% were more than male 37.7%. Majority of patients were above 60 years (78.9%) and illiterate (72.6%). Most of them were housewives (60%) and smokers (80%). Among the smokers, 66.9% smoked greater than 5 sticks cigarette per day. A total of 87.4% had monthly income less than 10,000. More than two third of respondents had co-morbidities (81.1%) and family history of COPD (70.3%). The patient having number of medications greater than two (54.3%) were more and 62.9% were through inhalational route. Among the inhaler user, 82.6% had no difficult in using inhaler. 94.3% of patients had family support whereas 62.3% had affordable medication cost.

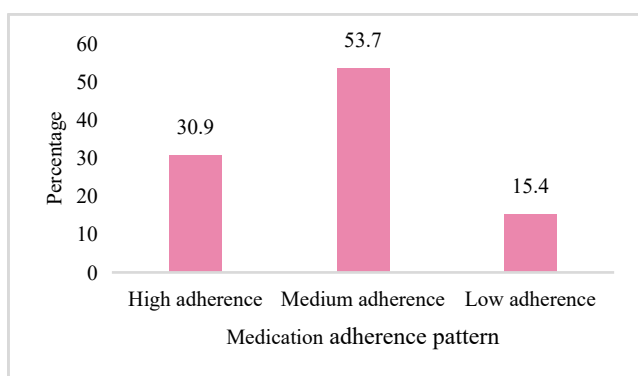


Figure 1: Pattern of medication adherence among COPD patients

Based on the score, 53.7% of patient were middle adherence, 30.9% were high adherence followed by 15.4% low adherence. The present study revealed that most of the respondents were non adherent to medication (fig 1).

Table 2: Association between Socio-demographic and Medication Adherence

Variables		Pattern of adherence			p value
		High adherence	Middle adherence	Low adherence	
Age	< =60	17	18	2	0.034*
	>60	37	76	25	
Gender	male	18	40	8	0.345
	female	36	54	19	
Education status	literate	21	23	4	0.047*
	illiterate	33	71	23	
Occupation	farmer	8	27	6	0.193
	housewife	36	50	19	
	other	10	17	2	
Monthly income	< 10,000	44	84	25	0.364
	10,000-25,000	7	5	2	
	> 25,000	3	5	0	

Table 3: Association between Clinical Characteristics and Medication Adherence

Variables		Pattern of adherence			p value
		High adherence	Middle adherence	Low adherence	
Co-morbidities	yes	40	78	24	0.220
	no	14	16	3	
Family history	yes	15	25	12	0.188
	no	39	69	15	
Smoking	yes	40	79	21	0.328
	no	14	15	6	
Cigarette per day	≤ 5 sticks	7	13	6	0.631
	> 5 sticks	33	66	18	
Number of medications	≤ 2	33	36	11	0.023*
	> 2	21	58	16	
Route of administration	oral	0	1	2	0.088
	inhalational	38	58	14	
	both	16	35	11	
Difficult to use inhaler	yes	8	21	1	0.078
	no	46	72	24	
Support	Self	4	5	1	0.772
	Family	50	89	26	
Medication cost	affordable	51	53	5	0.000*
	not affordable	3	41	22	

Table 2 and Table 3 showed that middle and low adherence was significantly ($p < 0.05$) associated with age ($p = 0.034$), education status ($p = 0.047$), number of medication ($p = 0.023$) and medication cost ($p < 0.001$). However, there was no association with gender, occupation, monthly income, co-morbidities, family history, smoking history, cigarette per day, route of administration, difficult to use inhaler and support.

Table 4: Association of medication adherence with other contributing factors to adherence:

Variables		Pattern of adherence			Frequency (percent %)	p value
		High adherence	Middle adherence	Low adherence		
Is distance between hospital and residence is concern for your treatment?	yes	37	63	21	121 (69.1)	0.56
	no	17	31	6	54 (30.9)	
Is transportation obstacle for treatment?	yes	20	42	16	78 (44.6)	0.17
	no	34	52	11	97 (55.4)	
Do you think information provided about medications was enough for you to understand?	yes	54	90	23	167 (95.4)	0.03*
	no	0	4	4	8 (4.6)	
Do you think this treatment is waste of time for you?	yes	0	2	0	2 (1.1)	0.42
	no	54	92	27	173 (98.9)	

Table 5: Reasons for missing and stopping medication:

Variables	Frequency	Percent
Ever missed dose		
Yes	99	56.6
No	76	43.4
Reason for missing dose		
Forgetfulness	39	41.9
Carelessness	35	37.6
forgetfulness + carelessness	15	16.1
financial problem	4	4.3
Stopped taking medication		
Yes	57	32.6
No	118	67.4
Reason for stopping medication		
side effect	0	0
symptomatic relief	57	32.6
Both	0	0
Lack of belief	0	0

There was a statistically significant association between the perceived adequacy of medication information and adherence patterns ($p=0.03$). The vast majority of participants (95.4%, $n=167$) believed that the information provided about their medications was sufficient for them to understand. Among those who felt the information was insufficient ($n=8$), half ($n=4$) demonstrated low adherence (Table 4). The present study showed that 56.6% patients missed their dose and reason for missing dose in most of the patient was forgetfulness (41.94%) whereas 32.6% patients stopped taking their medications mostly due to symptomatic relief (32.6%) (Table 5).

Discussion

COPD is a chronic disease requiring long term medication adherence for effectiveness of therapy. Hence, the treatment goal cannot be achieved until patient adheres to their prescribed medication.¹¹ This study was conducted among 175 COPD patients. This study determines the medication adherence pattern among COPD patients. Also determines the factors associated with medication adherence. Nearly one-third of COPD patients have a high level of medication adherence. The most important factors associated with medication adherence were age, educational status, medication cost, number of medication and information provided about patient's medication.

The present study showed that the higher numbers of female (62.3%) were affected, consistent with several studies in Nepal and other developing countries.^{2,9,10,11,19} The higher prevalence of female in this study might be due to higher exposure to biomass fuels as most of them were housewives which increased the risk of indoor air pollution for long time. However, study conducted in India and Vietnam revealed greater number of males affected by COPD.^{20,21} COPD was more prevalent among people > 60 years of age in our study. Similar findings can be seen in one of the studies in Nepal.¹¹

The prevalence of COPD was higher among patients who were illiterate which was similar to previous study in Nepal.² As smoking is considered as one of the main risk factors for COPD, present study

showed that more than two third of patients were smokers. These findings correlate with other studies which shows smoking as most common cause of COPD.²²

This study revealed that 53.7% of patient had a middle level of adherence, 30.9% had a high level of adherence and 15.4% had a low level of adherence to medication which was consistent with several studies.^{7,14} However, other studies showed high adherence to medication.^{10,19} Missing the dose due to forgetfulness, stopping the medication after symptomatic relief, age, affordability of medication cost were the factors for middle and low level of medication adherence in this study.

Further, the present study showed that there was a significant association between medication adherence pattern and socio-demographic variables (age and education status). The prevalence of COPD was more common in patients older than 60 years. Cognitive impairment, memory loss could be the reason behind non-adherence in such patients.¹⁶ Mostly illiterate patients were non adherent to their medication due to lack of education and awareness on the disease. COPD patients require adequate education on the disease, use of medications and devices.²⁰ Consistent to these finding, studies conducted in Nepal, India and Hungary showed association between medication adherence and socio-demographic variable.^{10,19,23} However, several other studies showed that there is no association between medication adherence and socio-demographic variables.^{11,14}

Moreover, this study showed significant association between medication adherence pattern and clinical variables (number of medications and medication cost) which was consistent with previous findings.^{4,19} In our study, most of the patients were on more than two inhalational medications majority of such patients were non adherent to medication regimen. Patients who cannot afford medication costs showed low adherence to medication regimen. In contrast several studies showed that medication adherence was not associated with number of medications (14) and medication costs.^{14,11}

The present study revealed 95.4% of patient thinks that the information provided about their medication was enough for them to understand regarding (frequency, use of inhaler techniques, gargling after the use of inhaler) and associated with the medication adherence pattern which was consistent with study.⁷ It shows that the patient counseling was done properly. Even though patient thinks information was enough but most of them were middle and low adherence to medication because of their carelessness. In contrast to these findings other study in Nepal showed no association between medication adherence and information provided by physician.¹⁴

This study revealed that 53.1% of patient had missed their dose and reason for missing the dose was forgetfulness. This finding was consistent with Dolce et al²⁴ which have shown that forgetfulness and discontinuation of medication due to symptomatic relief were the reason for missing and stopping the dose. Forgetting was related mostly with feeling good, age and busy due to work. Therefore, if patients feel that taking their prescriptions regularly enhances their quality of life and functional status, then this will help them stick to treatment regimens more closely.¹¹

The present study found that the majority of patients were on inhalational route and adhered to their prescribed medication. Inhalational route was preferred over oral route because of rapid onset of action, improved breathing and greater self-confidence.¹¹ This study found that patients who had not difficulty in using inhaler were more likely to stick to their prescribed treatment plan. In contrast, another study reported higher adherence to oral route than inhalational route of medication.²⁵ It might be due to ease of administration of medicine orally rather than by inhalational route.¹¹

This study had certain limitations because it was cross-sectional and single-centered. Additionally, the study population was OPD-attended patients conducted in relatively small sample size and duration of study was limited to only six months. As a result, it is difficult to extrapolate the study's conclusions to the whole population. However, this study offers a variety of data about medication adherence patterns and factors associated to it in COPD patients.

Conclusion

This study assesses the overall medication adherence and associated factors in COPD patients. Nearly one third of COPD patients have a high level of medication adherence. The factors that influenced medication adherence among COPD patients were age, educational status, number of medications, affordability of medication cost, and information provided to patients.

Patients over 60 and illiterate patients had a higher non-adherence rate. Patients having number of medications >2 showed middle and low adherence. Patients having affordable medication costs were more adhere to their medications. Although they received appropriate counseling regarding their medication (dosage, frequency, inhaler use, and gargling after use), the majority of them failed to follow to the advice because of forgetfulness and discontinued their medication after symptomatic relief. However, there is no association between adherence and factors like gender, occupation, monthly income, comorbidities, smoking, and variables.

More research can be done in future to determine the extent of prescription filling practices. There is need for studies related to pharmaceutical care programs conducted by pharmacists to determine role of pharmacist in enhancing medication adherence.

Additional Informations and Declarations

Acknowledgments

The authors would like to thank all the patients who volunteered and gave their precious time in this study.

Source of Research Fund: This work was supported by Research Grant Committee of Universal College of Medical Sciences, Bhairahawa, Nepal. (Grant number: UCMS/Prin./030/23)

Conflicts of Interest:

None

Data Availability: Data will be available upon request to corresponding authors after a valid reason.

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