

MEDICATION ADHERENCE AMONG CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS: AN INTERVENTIONAL STUDY IN A TERTIARY CARE HOSPITAL OF NEPAL

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a significant health problem, associated with mortality and morbidities. Low medication adherence is common in patients with COPD. The primary purpose of this study was to evaluate medication adherence after educational intervention was provided to COPD patients. In this interventional study, conducted at a tertiary care center of Nepal from July 2019 to December 2019, a total of 114 patients were divided randomly into two groups: intervention group (patients who received an educational intervention) and control group (patients who received no educational intervention) by using simple randomization technique. The outcomes of educational intervention are then compared between the intervention group and the control group with the aid of the leaflet. A structured questionnaire and the pre-validated Self-Administered Medication Adherence Questionnaire were used to collect information like demographic details and medication adherence. Data were entered and analyzed using SPSS-20 program. Out of 114 patients, only 93 patients came for follow-up after one month. There was a significant improvement in the medication adherence scale score in the intervention group compared to the control group ($p < 0.05$) and the level of adherence was found to be high in the intervention group after one-month follow-up. The major reasons for medication non-adherence were financial problems and symptomatic relief in both groups. This study showed that educational intervention among COPD patients plays an essential role in improving medication adherence through proper counseling about their disease and its maintenance.

KEYWORDS

Chronic obstructive pulmonary disease, medication adherence, educational intervention

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is characterized by progressive airflow limitation in the lungs, which, unlike asthma, is not completely reversible by medication.¹ The airflow limitation is usually progressive and is linked to an inappropriate inflammatory response of the lungs to harmful particles or gases.² COPD is the fourth most common cause of mortality and morbidity worldwide, accounting for 5% of all deaths globally. However, in Nepal, the prevalence of COPD ranges from 23% to 43%.³

Medication adherence is regarded as a considerable concern as it improves the management of symptoms and delays disease progression.⁴ Adherence is defined as the degree to which the conduct of an individual is correlated with medical or health advice (in terms of following diets, taking medication, or changing lifestyles).⁵

As a result, the role of health professionals is crucial in encouraging patients to improve medication adherence.⁶ The impact is often more substantial when different health professionals, such as pharmacists, doctors, and nurses, work together to counsel patients.⁷ There are many COPD patients who cannot take drugs as prescribed or visit their physicians. COPD has been described as requiring 10% medication and 90% education.⁸ Pharmacists can improve medication adherence and health outcomes in patients with COPD through medication therapy management services to reduce the risk of serious complications like acute exacerbations and hospital admissions. Pharmacists hold a unique position in the healthcare system because they are readily available primary healthcare practitioners who have frequent interactions with patients.⁹

Giving patients appropriate drug details (e.g., indication of medication, clear instructions on medication use) improves patient confidence, self-efficacy, and understanding of how to take their medication^{7,10} and appropriate patient counseling improves patient confidence, self-efficacy, and understanding of how to take their medication.¹¹

The major factor resulting in emergency hospitalizations among COPD patients is poor adherence to drug therapy.¹² In the context of Nepal, the status of drug adherence is very low, and the least number of pharmacists is involved in providing interventions. Thus, in a developing country like Nepal, patient counseling can have a significant impact on

increasing medication adherence among COPD patients.¹³

This study aimed to determine the impact of educational intervention in improving medication adherence of COPD patients, which ultimately controls the mortality rate in developing countries like Nepal.

MATERIALS AND METHODS

This interventional study was conducted at Medicine Outpatient Department of Universal College of Medical Sciences, situated at Ranigaon, Bhairahawa, Nepal. Dependent variables were medication adherence and reasons for medication non-adherence. Independent variables were sex, age, education, occupation, income, duration of disease, smoking, tobacco chewing, co-morbidity conditions, family history of disease and smoking status. The study was carried out for a period of six months from July to December 2019. The patients aged ≥ 20 years of either gender, clinically diagnosed with COPD according to GOLD (Gold Initiative for Chronic Obstructive Lung Disease) guideline with or without co-morbidities, and who were taking regular medications for their COPD were included in the study. Patients with a history of asthma, allergic rhinitis, lung operation, other respiratory disease, and pregnant/lactating women were excluded.

Patients were divided randomly into the intervention and control group by simple randomization technique, and the sample size was calculated using the formula: $n = 2 \times SD^2 \times (Z_{\alpha/2} + Z_{\beta})^2 / d^2$. Where, n = the sample size in each of the group, SD = Standard deviation of medication adherence of COPD patients from previous studies or pilot study = 2.22,¹⁴ $Z_{\alpha/2}$ = 1.96 (From Z table) at type 1 error of 5%, Z_{β} = 0.842 (From Z table) at 80% power and d^2 = effect size = difference between the mean value of medication adherence between two different groups = 5.2-4.03 = 1.17.¹⁴ So now the formula will be:

$$n = \frac{2 \times 2.22^2 (1.96 + 0.842)^2}{(5.2 - 4.03)^2}$$

$$n = 2 \times SD^2 \times (1.96 + 0.842)^2 / d^2 \\ = 56.5 \text{ i.e. } 57.$$

Thus, a sample size of 57 subjects per group is needed to answer the research questions.

A structured questionnaire was designed to collect demographic information, and the self-reported medication adherence questionnaire

was designed to measure medication adherence. This questionnaire consists of six questions with Yes/No response options (Scoring: 'Yes'=1, 'No'=0 for all questions except for question no. 5, which was: 'Yes'=0, 'No'=1). The first four and last question is positive whereas the fifth one is the negative question. This questionnaire results in a scores ranging from 0 to 6 with three levels of medication adherence based on this score: high, medium, and low adherence with 0, 1-3, and >3, respectively to know their medication adherence at before intervention and follow-up. After one month of follow-up, the responses they provided would be recorded and compared to the before intervention data. The patients were interviewed based on Nepali version of Self-Reported Medication Adherence Questionnaire as most of the people speak and understand Nepali language.

The intervention was provided through patient counselling with the aid of the leaflet. Leaflet was prepared using the standard reference and was further approved by the research supervisor and the physicians at the Internal Medicine Unit of the hospital. The test group received the intervention provided by the pharmacist but the control group did not receive intervention.

After patients were selected based on inclusion and exclusion criteria, they were divided into intervention and control groups by using simple randomization technique. Written informed consent of patients was taken before enrolling them in the study. Data collection was carried out through a face-to-face interview. Self-Reported Medication Adherence Questionnaire was pre-tested in 10% of the total sample where its Cronbach's alpha value was 0.767 and the value greater than 0.7 was considered reliable.¹⁵ The patients were counselled for nearly 10-15 minutes. The leaflets were given to the patients at the time of counselling. The intervention group patients were counseled with the aid of a leaflet which contained information such as medications, lifestyle changes, and their disease management. Further it also included information like disease knowledge, smoking status, medication adherence, self-efficacy in managing breathing difficulty, exercise and diet habit. The control group didn't receive any counseling and leaflets were not distributed to them. The patients were asked to follow up after one month.

All statistical analysis was done in SPSS-20.0. Descriptive statistics including frequency and percentage were used to describe socio-demographic patterns of COPD patients. Associations between the variables were

analyzed by using paired sample t-test. The paired sample t-test was used to compare p-value before and after intervention in each group (Control Group (CG) and Intervention Group). The independent sample t-test was used to compare p-value between control and intervention group. The reasons for medication non-adherence were determined by using frequency and percentage. A p-value of <0.05 was considered as statistically significant throughout the study. Finally the data were represented as tables and figures as appropriate.

Ethical approval was obtained from the Institutional Review Committee of UCMS-TH with reference number (Ref. No. UCMS/IRC/150/19) and declaration of Helsinki Guidelines were followed.¹⁶ The patient's personal data were kept confidential, and anonymity was maintained.

RESULTS

A total of 114 patients were enrolled in the study and were divided into intervention and control, 57 in each group. However, only 93 patients could be met up after follow-up, 48 in the intervention group and 45 in the control group. The following were the causes for dropout: (a) patients who failed to return for follow-up (6 in the intervention group and 5 in the control group) (b) Patients who died between the before intervention and follow-up visits (7 in control group and 3 in intervention group).

Among 93 COPD patients, there were more female 52 (55.9%) than male patients. Regarding the age of the participants the majority of them were between age 60-79 years (55.9%) followed by age between 40-59 years (22.6%). Half of the study participants were housewives (50.5%). The majority of the patients were illiterate (72.04%) and were without income (65.6%). The study further revealed that maximum patients had COPD for more than five years (38.7%) and had a habit of smoking (59.1%) and chewing tobacco (44.1%) in both the groups. Hypertension was the most common comorbidity seen in 32.3% patients. The majority of the patients (69.9%) had a family history of COPD, and 48.4% patients were ex-smokers in both groups (Table 1).

The mean adherence score between control and intervention group was compared by using Paired t-test. The result showed that the mean adherence score of control and interventional group at before intervention was 0.91 ± 1.294 and

Table 1: Demographic patterns of the COPD patients.

Variables	Category	Control Group Frequency (%)	Interventional Group Frequency (%)	Total
Sex	Male	24 (53.3)	17 (35.4)	41 (44.1)
	Female	21 (46.7)	31 (64.6)	52 (55.9)
Age	20-39	3 (6.7)	3 (6.3)	6 (6.5)
	40-59	11 (24.4)	10 (20.8)	21 (22.6)
	60-79	24 (53.3)	28 (58.3)	52 (55.9)
	>80	7 (15.6)	7 (14.6)	14 (15.1)
Education	Illiterate	33 (73.3)	34 (70.8)	67 (72.04)
	Primary School	10 (22.2)	13 (27.1)	23 (24.7)
	High School	2 (4.4)	1 (2.1)	3 (3.2)
	Pre-university	0 (0)	0 (0)	0 (0)
	Degree	0 (0)	0 (0)	0 (0)
Occupation	Factory worker	0 (0)	0 (0)	0 (0)
	Unemployed	8 (17.8)	5 (10.4)	13 (13.97)
	Housewife	21 (46.7)	26 (54.2)	47 (50.5)
	Employed	0 (0)	0 (0)	0 (0)
	Business	3 (6.7)	1 (2.1)	4 (4.3)
	Farmer	13 (28.9)	12 (25.0)	25 (26.9)
	Others	0 (0)	4 (8.3)	4 (4.3)
Income	Nil	29 (64.4)	32 (66.6)	61 (65.6)
	<10,000	11 (24.4)	6 (12.5)	17 (18.3)
	10,001-20,000	5 (11.1)	4 (8.3)	9 (9.7)
	20,001-30,000	0 (0)	5 (10.4)	5 (5.4)
	>30,000	0 (0)	1 (2.1)	1 (1.1)
Duration of disease	< 1 year	11 (24.4)	8 (16.7)	19 (20.4)
	1-3 years	9 (20.0)	12 (25.0)	21 (22.6)
	3-5 years	7 (15.6)	10 (20.8)	17 (18.3)
	>5 years	18 (40.0)	18 (37.5)	36 (38.7)
Smoking	Yes	24 (53.3)	31 (64.6)	55 (59.1)
	No	21 (46.7)	17(35.4)	38 (40.9)
Tobacco chewing	Yes	18 (40.0)	23 (47.9)	41 (44.1)
	No	27 (60.0)	25 (52.1)	52 (55.9)
Co-morbidity	Diabetes mellitus	3 (6.7)	4 (8.3)	7 (7.5)
	Anemia	1 (2.2)	2 (4.2)	3 (3.2)
	Hypertension	12 (26.7)	17 (35.4)	30 (32.3)
	Kidney disease	3 (6.7)	1 (2.1)	4 (4.3)
	Heart disease	3 (6.7)	4 (8.3)	7 (7.5)
	Others	15 (33.3)	15 (31.3)	29 (31.2)
	Don't have	8 (17.8)	5 (10.4)	13 (13.97)
Family history of COPD	Yes	14 (31.1)	14 (29.2)	28 (30.1)
	No	31 (68.9)	34 (70.8)	65 (69.9)
Smoking status	Ex-smoker	20 (44.4)	25 (52.1)	45 (48.4)
	Current smoker	2 (4.4)	5 (10.4)	7 (7.5)
	Non-smoker	23 (51.1)	18 (37.5)	41 (44.1)

Table 2: Comparison of mean score of the questionnaire.

Adherence questionnaire	Control group	Interventional group	^a P value
Before intervention	0.91 ± 1.294	1.35 ± 1.211	0.092
After intervention (Follow up)	0.98 ± 0.988	0.08 ± 0.279	0.0001*
^b P value	0.636	0.0001*	

^aP value for differences between control and intervention group and ^bP value for differences between before and after intervention in each group. *Statistically significant ($p < 0.05$).

Table 3: Reasons for non-adherence among COPD patients.

Reasons for non-adherence	Before intervention		Follow up	
	Control Group n (%)	Intervention Group n (%)	Control Group n (%)	Intervention Group n (%)
Reasons for missing dose				
Forgetfulness	5 (11.1)	10 (20.8)	4 (8.9)	0 (0)
Carelessness	2 (4.4)	7 (14.6)	3 (6.7)	1 (2.1)
Forgetfulness + Carelessness	5 (11.1)	6 (12.5)	5 (11.1)	0 (0)
Financial problem	12 (26.7)	15 (31.3)	11 (24.4)	8 (16.7)
Reasons for discontinuing dose				
Side effects	2 (4.4)	8 (16.7)	1 (2.2)	0 (0)
Symptomatic relief	4 (8.9)	10 (20.8)	7 (15.6)	4 (8.3)
Both (Side effects + Symptomatic relief)	3 (6.7)	9 (18.8)	1 (2.2)	0 (0)
Lack of belief	4 (8.9)	4 (8.3)	1 (2.2)	0 (0)

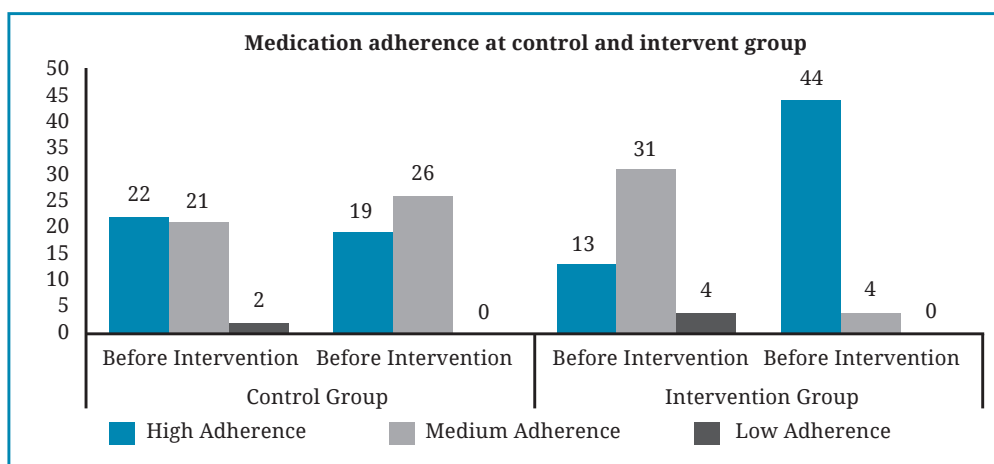


Fig. 1: Patients' level of medication adherence.

1.35±1.211 respectively. The mean difference was found statistically insignificant ($p=0.092$). Likewise, the mean adherence score at before intervention in the interventional group and in follow up was 0.98±0.988 and 0.08±0.279 respectively. The mean difference was found statistically significant ($p=0.0001$).

Similarly, mean adherence score of control group at before intervention and follow up

was 0.91±1.294 and 0.98±0.988 respectively. The mean difference was found statistically insignificant ($p=0.636$). Likewise, mean adherence score of interventional group at before intervention and follow up was 1.35±1.211 and 0.08±0.279 respectively. The mean difference was found statistically significant ($p=0.0001$) (Table 2). Thirteen patients had a high level of medication

adherence before intervention which got increased to forty-four after intervention in the intervention group (Fig. 1).

Before intervention, both forgetfulness and forgetfulness + carelessness (11.1%) as well as financial problems (26.7%) were the primary reasons for medication non-adherence in the control group.

Among the reasons for discontinuation of dose, symptomatic relief (8.9% in the control group and 20.8% in the intervention group) was the primary reason for non-adherence. At follow-up, in the intervention group, reasons for non-adherence decreased compared to the control group (Table 3).

DISCUSSION

The present study showed that a higher number (55.9%) of women were affected by COPD, consistent with several studies in Nepal and several other developing countries.^{17,18} The higher prevalence of females in this study might be due to the increasing number of female smokers and higher exposure to biomass fuels in females in Nepal. This implied that female individuals' extensive use of biomass fuels increased the risk of exposure to indoor air pollution for a long period. Patients in the 60-79 year age range were the most affected in both the intervention (30%) and control groups (26%). The prevalence of COPD patients increased with age, reaching a peak in those aged 60-70 years while a decrease in those aged older than 70 years. COPD is a slowly progressive disease characterized by airflow limitations, and the severity of airflow obstruction might be present in elderly patients.⁹ COPD was more common among patients older than 60 years and was associated with cognitive disabilities, which could be the reasons behind non-adherence in such patients.¹⁰

This study mainly focused on the importance of educational intervention as one of the effective strategies for improving medication adherence among COPD patients. Patients' adherence to medications also improved after brief counseling (Table 2 and Fig. 1). Almost the same finding was noted by the previous study.¹¹

The main part of this study was medication adherence. It was found that there was no significant difference at before intervention ($p = 0.092$), followed by follow up which was $p < 0.0001$. This clearly showed a good improvement in medication adherence behavior of COPD patients in intervention compared to control because the intervention

group patients were provided with effective counseling materials. The patients were motivated to follow the medications regularly as prescribed but some may fail for some reason, and hence pharmacist intervention was essential to improve the adherence to medications. It concluded that pharmacist intervention played an important role in improving adherence. However, the control group showed a little improvement as well, which could be due to the control group's frequent hospital visits.

Educational intervention is a cost-effective and practical method, particularly given the increasing burden of non-communicable disease in resource-poor developing countries. The results (Table 2) shown in this study revealed that medication adherence can be improved significantly ($P < 0.001$) in COPD patients by pharmacist-led intervention. Similar findings were noted by the previous studies where pharmacist-led intervention improved medication adherence in COPD patients in Northern Ireland and Jordan respectively.^{12,13}

Furthermore, the current study revealed that the most common cause of non-adherence was forgetfulness, which was consistent with the results of several other studies.¹⁴ Inconsistent with previous results, in this study, some patients also decided not to take medication because of wellness. It can be correlated with the tendency of patients to be careless and discontinue the medication when they lack any clinical symptoms in chronic diseases like in a previous study done in diabetic patients. Lack of clinical symptoms might often be interpreted as disease-free by patients resulting in the tendency to discontinue the daily medications suggested by various studies.¹⁵ Hence, adherence to the treatment regimen can be improved if patients believe that taking medicines daily can improve their quality of life and functional status. Additionally, one of the barriers to achieving adequate adherence was the cost of the medications.¹³ The intentional causes for non-adherence reduced more considerably than unintentional reasons, indicating the substantial role of pharmacist-led intervention prescribed in this study (Table 3).

To confirm the generalizability of our findings, a multi-centre prospective randomized controlled study is warranted in large samples of COPD patients from other geographical areas of Nepal. The previous studies have shown that interventions administered throughout several follow-ups are more successful than those delivered in a single follow-up. In this study, only a single follow-up is done after one month,

which is insufficient for continuous medication adherence management. Therefore, future recommendation of this study is to increase follow-up at regular intervals of time for better COPD outcomes.

The outcomes of this study provide evidence on the benefit of a pharmacist-led intervention and support the future implementation of a medication adherence management service in regular practice. The application of this type of educational intervention in routine practice should be investigated in future studies.

In conclusion, the findings of this study showed an effective improvement in the medication adherence in intervention than control group. The educational intervention with the help of leaflets and counseling was proved to be effective in improving medication adherence in COPD patients. It can be concluded that

financial crisis was the primary reason for medication non-adherence. Overall, this study first finds out the level of medication adherence and major reasons of medication non-adherence to overcome those problems by a proper intervention which ultimately showed the positive and strong impact of educational intervention in creating awareness about the disease, health conditions and also about their medications resulting in the increase rate of medication adherence.

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