

# A Cross-Sectional Study of Medication Adherence Pattern and Factors Affecting the Adherence in Chronic Obstructive Pulmonary Disease

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## ABSTRACT

### Background

Chronic obstructive pulmonary disease (COPD) is considered as a major health problem, associated with mortality and morbidities. Various disease management strategies have been established to optimize patient's longevity and functional status where patient adherence to the prescribed treatment plays a key role. Poor adherence to medication is common among COPD patients and is affected by number of factors like number of medicines, delivery devices and patient-related factors.

### Objective

This study aims to investigate the adherence pattern in the management of COPD and factors affecting patient adherence to the prescribed treatment.

### Method

This study is a cross-sectional study which was conducted in a tertiary care hospital. Those patients suffering from COPD of all age were enrolled in this study and prior informed consent was obtained from patients. The structured questionnaire was used to interview those patients.

### Result

Total 100 patients were enrolled in this study, among which most patients (45%) were of age groups 60-70 years. Unintentional non-adherence to medication attributed for 65% of patients and the major reason was forgetfulness (52.3%). Most patients had discontinued the medication due to experience of side effects (63.3%). The result showed significant association between adherence and polypharmacy ( $p=0.00$ ). However, there was no significant association between adherence and age, sex, mode of administration of drugs, technics to use delivery devices etc.

### Conclusion

Majority of COPD patients were elderly (mean age= 68.4 years). Forgetfulness was associated with medication non-adherence. Most of the patients had discontinued medication because of side effects. Polypharmacy is one of the major factors associated with non-adherence to medication in COPD.

## KEY WORDS

*Adherence, COPD, Dhulikhel Hospital, non-adherence, polypharmacy*

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of mortality and morbidity worldwide in both industrialized and developing countries which, accounts for 5% of all death globally.<sup>1,2</sup> In Nepal, COPD accounts for 43% of the non-communicable disease burden, and 2.56% of hospitalizations.<sup>3,4</sup> Smoking is the main etiological factor to cause COPD followed by occupational dusts, biomass fuels etc.<sup>5,6</sup>

Once the disease is diagnosed, patient education, smoking cessation, pharmacological and non-pharmacological methods are required to ameliorate signs and symptoms of COPD.<sup>7,8</sup> The pharmacological treatments include bronchodilators, corticosteroids, immunizations, antibiotics, mucokinetics and others.<sup>9</sup> Failure to the treatment modalities may lead to exacerbations and frequent hospitalizations. Despite the efforts of Global Initiative for Chronic Obstructive Lung Diseases (GOLD) to provide clinicians with the best therapeutic guidance, adherence to pharmacological therapy among patients with COPD has been historically poor and is often the cause of the exacerbations.<sup>10</sup>

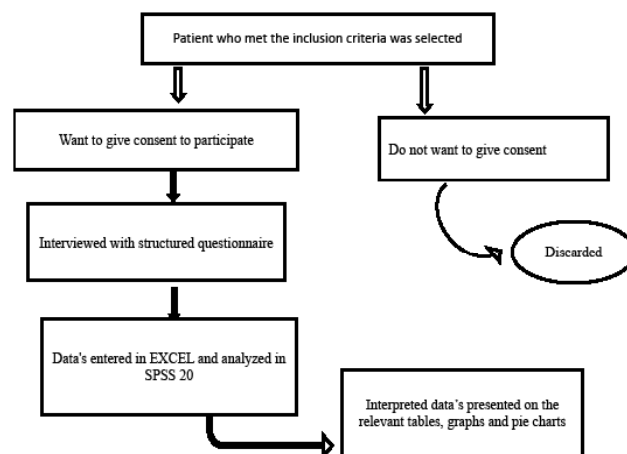
Suboptimal adherence in patients with COPD is common due to number of factors such as multiple morbidities, the medication, the delivery device, the patient, and the health professionals caring for the patient.<sup>11,12</sup> In 2001, the WHO's Adherence Project defines adherence as "the extent to which a person's behavior (taking medication, following a diet, and/or executing lifestyle changes) corresponds with agreed recommendations from a health care provider."<sup>13</sup> Deviations from medication adherence could be intentional and/or unintentional. Unintentional non-adherence may be due to simple forgetfulness, or inability to follow treatment instructions because of poor understanding or physical problems such as poor eye-sight.<sup>14</sup> Intentional non-adherence arises when the patient rejects either the doctor's diagnosis or the doctor's recommended treatment, due to experience of side effects or symptomatic relief.<sup>14,15</sup>

Thus, adherence to medication is likely to ameliorate the condition of patients with exacerbation and patients decision to adhere to the prescribed medication depend on their belief about the medications that is intended to treat or prevent the disease. However, very little efforts have been made to explore the role of patient adherence in the management of disease. Therefore, the study aims to investigate the patient adherence and factors affecting it among patients with COPD.

## METHODS

A cross sectional study was conducted in Dhulikhel Hospital, Kathmandu University hospital, Dhulikhel, Kavre after obtaining ethical clearance from Institutional Review Committee, Kathmandu University School of Medical Sciences (IRC approval no. 09/14). Being a tertiary care

hospital and one of the referral centers, patients from various part of the country visit this hospital for the treatment. This hospital also has an adequate flow of patients suffering from COPD. Patients of all age group diagnosed with COPD who were admitted from either out-patient department or emergency department were included in the study. However, those patients who were not admitted to the hospital and who do not want to give consent to participate were excluded (Fig. 1).



**Figure 1.** Flowchart showing stepwise procedure of data collection and analysis

Patients who met the inclusion criteria's were informed about the study being done and about their contribution in this study. After taking informed consent from the patients, they were directly interviewed using structured questionnaire. The information regarding age sex, literacy, occupation, smoking/alcohol habit and exposure to any outdoor or indoor air pollution were recorded using the questionnaire. Further questions related to medication adherence like no of medications prescribed per day, reasons for discontinuance, reasons for missing dose, perception about the medication, perceptions about the disease were asked. Additional information about date of diagnosis of COPD, drug treatment for COPD and other concomitant diseases and abnormal clinical findings were recorded from medical case record.

The data collected by using structured questionnaire and reviewing medical record forms were entered in a separate spreadsheet using EXCEL (2010). The entered data was analyzed using Statistical package for social sciences (spss) software version 20. All the quantitative data were expressed as percentage and mean  $\pm$  standard deviation (SD) and the qualitative data was analyzed using chi-square test. P-value < 0.05 was considered as statistically significant.

## RESULTS

Out of hundred-studied cases, majority (n=63) of them were females and the rest (n=37) were male. The mean ( $\pm$ SD) age of patients was 68.41 years ( $\pm$ 9.64) and most

patients belong to age group of 60-70 years. More than two thirds of the respondents (82%) were illiterate and 92% of them smoked a cigarette for at least two years. Most (68%) of COPD patients were using both bronchodilators and corticosteroids (Fig. 2).

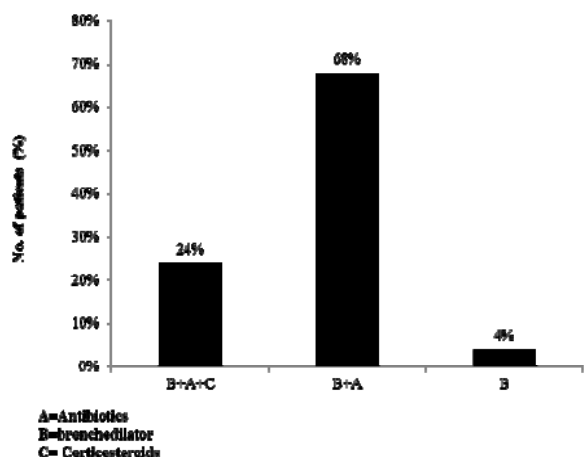


Figure 2. Bar diagram showing drug details among 100 patients

The present study revealed that most patients (65%) were not adhered to the prescribed treatment (Fig. 3) and the major barrier to adherence was found to be forgetfulness (52.6%) (Table 1).

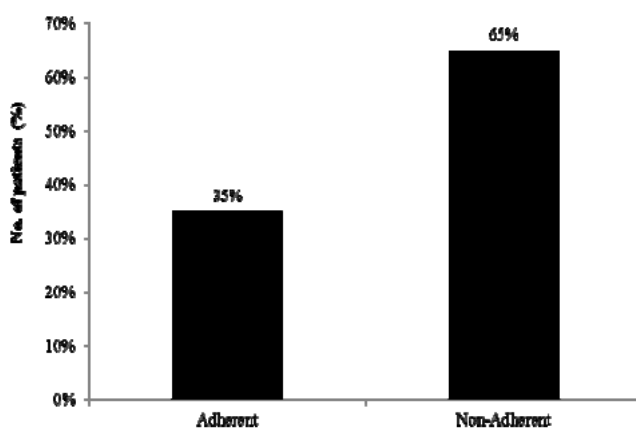


Figure 2. Bar diagram showing adherence pattern among 100 patients

Table 1. Adherence pattern among 100 patients

| Characteristics                                | No. of patients (%) |
|------------------------------------------------|---------------------|
| <b>Patient who had missed dose</b>             |                     |
| <b>Reason for missing dose n=65</b>            |                     |
| Forgetfulness                                  | 34(52.3)            |
| Carelessness                                   | 14(21.53)           |
| Forgetfulness + Carelessness                   | 9(13.84)            |
| Financial problem                              | 8(12.3)             |
| <b>Patients who had discontinued dose</b>      | <b>60(60)</b>       |
| <b>Reason for discontinued n=60</b>            |                     |
| Side effects                                   | 38(63.34)           |
| Symptomatic relief (lack of clinical symptoms) | 19(31.67)           |
| Both                                           | 3(5)                |
| Lack belief                                    | 0                   |

Table 2. Factors affecting adherence among 100 patients

| Variable                               | Total (n) | Adherent* (n=65) No.(%) | Non adherent** (n=35) No.(%) | p-value |
|----------------------------------------|-----------|-------------------------|------------------------------|---------|
| <b>Route of administration</b>         |           |                         |                              |         |
| Oral                                   | 7         | 1(14.2%)                | 6(85.7)                      |         |
| Inhaler                                | 44        | 16(36.3)                | 28(63.6)                     | 0.58    |
| Both                                   | 49        | 18(36.7)                | 31(63.2)                     |         |
| <b>Proper knowledge to use inhaler</b> |           |                         |                              |         |
| Yes                                    | 49        | 20(34.6)                | 29(65.3)                     | 0.368   |
| No                                     | 44        | 14(38.6)                | 30(61.3)                     |         |
| <b>Difficult using inhaler</b>         |           |                         |                              |         |
| Yes                                    | 26        | 10(38.4)                | 16(61.5)                     | 0.812   |
| No                                     | 67        | 24(35.8)                | 43(64.1)                     |         |
| <b>No. of medication (n=100)</b>       |           |                         |                              |         |
| One                                    | 10        | 9(90)                   | 1(1)                         | 0.000   |
| Greater or equal to 2                  | 90        | 26(28.8)                | 64(71.1)                     |         |
| <b>Education</b>                       |           |                         |                              |         |
| Illiterate                             | 82        | 20(24.3)                | 53(64.6)                     | 0.87    |
| Literate                               | 18        | 6(33.3)                 | 12(66.6)                     |         |
| <b>Perception about disease</b>        |           |                         |                              |         |
| Curable                                | 80        | 30(37.5)                | 50(62.5)                     |         |
| Incurable                              | 9         | 1(11.1)                 | 8(88.8)                      | 0.32    |
| Only be managed                        | 11        | 4(36.3)                 | 7(63.6)                      |         |
| <b>Family support</b>                  |           |                         |                              |         |
| Self                                   | 32        | 17(53.1)                | 15(46.8)                     | 0.009   |
| Family                                 | 68        | 18(26.4)                | 50(73.5)                     |         |
| <b>Medication Costs</b>                |           |                         |                              |         |
| Affordable                             | 83        | 26(31.3)                | 57(68.6)                     | 0.089   |
| Not affordable                         | 17        | 9(52.9)                 | 8(47.05)                     |         |

\*Patients who had not missed or discontinued medication

\*\*Patients who had missed or discontinued medication

Furthermore, in our study, non-adherence to medication was significantly associated ( $p < 0.001$ ) with polypharmacy and response from the family ( $p < 0.01$ ; Table 2). There were, however, no association between adherence and route of administration of drugs, proper knowledge to use inhaler, difficulty using inhaler, medication costs and perception about the disease. Non-adherence (73.33%) was comparatively higher in patients with age group of 60-70 years and less in patients above 70 years of age. Both literate and illiterate patients had missed the dose but frequency was higher for illiterate patients (64.6%).

## DISCUSSION

Adherence to medication in patients with COPD is important for optimal management of disease and improved functional status.<sup>16</sup> Hence, the therapeutic goal of the treatment cannot be achieved till the patient does not adhere to the prescribed medication.

The present study has shown that a greater number (63%) of females were affected by COPD which was consistent with several studies conducted in Nepal and several other developing countries where women are disproportionately affected.<sup>17-19</sup> The higher prevalence of female smokers in our study might be due to increasing number of female smokers and higher exposure to biomass fuels by female in our country. This implies that the extensive use of biomass fuels by female individuals increases the risk of exposure to indoor air pollution for long period of time.<sup>17</sup> Also, another study showed the prevalence of COPD has remained higher in women than in men in United States because of increasing incidence of female smokers than male.<sup>20</sup> However, a study conducted in India showed a higher number of male affected by COPD which might be due to the higher incidence of male smokers and increased urbanization and air pollution.<sup>21</sup>

The prevalence of COPD patients were found to be increasing with age, reaching a peak in those aged 60-70 years while decrease in those aged older than 70 years. COPD is a slowly progressive disease characterized by airflow limitations and severity of airflow obstruction might be present in elderly patients.<sup>22</sup> The decreasing rate of COPD after the age of 70 years might be related with the average life expectancy in Nepal, which was proposed to be 68.2 years.<sup>23</sup> Similar findings were seen in one of the studies.<sup>24</sup> COPD was found to be less prevalent among patients less than 60 years of age. Similarly, several studies have suggested that patients aged 40–65 years comprise more than half of the total number of COPD patients worldwide.<sup>25</sup>

The present study showed that most patients were smokers and smoking is considered to be one of the risk factors for COPD.<sup>26,27</sup> This finding correlates with other studies in which cigarette smoking has been established as the most common cause of COPD.<sup>26,27</sup> However, 8% of COPD patients were nonsmokers. Although the primary cause of COPD is tobacco smoke, passive smoking also carries serious risks, especially for children and those chronically exposed to smoke.<sup>28</sup> WHO also estimates that passive smoking is associated with a 10 to 43 percent increase in risk of COPD in adults.<sup>28</sup> In addition, another reason for prevalence of COPD among nonsmokers might be due to the use of biomass fuels especially in rural areas.<sup>17</sup>

Further, the present study shows that majority of patients were non-adherent to the prescribed medication. In consistence with this result, a previous study has shown the majority of patients who were non-adherent to the treatment had missed their dose.<sup>29</sup> In contrary to our

findings, another study has revealed a lesser number of patients were non-adherent to the prescribed treatment.<sup>30</sup> Moreover, though this study has revealed the highest number of male patients was non-adherent to medication regimen, there is not significant relationship between adherence and gender. This result is consistent with the findings from previous studies which have also shown no relation between gender and patient adherence.<sup>31-33</sup> Nevertheless, differences in adherence pattern between men and women have been reported in the literature, which is suggested to be due to some psychological factors.<sup>34</sup> The prevalence of anxiety and depression were suggested to be higher in women with COPD, and these psychiatric comorbidities have been independently linked with non-adherence.<sup>35,36</sup>

In addition, our study has shown that non-adherence to the prescribed treatment was seen in later age of the patients. This result was consistent with several other studies which have linked non-adherence to polypharmacy and comorbid diseases.<sup>13,31,37</sup> Several studies revealed that patients of advanced age were more likely to adhere to prescribed medication but associated complex drug regimen and co-morbid conditions make those patients non-adherent to the prescribed treatment.<sup>31,38</sup> Moreover, both age and COPD durations are associated with memory loss and cognitive impairment, which adversely affect adherence.<sup>39</sup> Several researchers reported that patients with COPD are generally of age greater than 60 and are associated with cognitive disabilities which could be the reasons behind non-adherence in such patients.<sup>16,40</sup>

Furthermore, the current study has shown that the most common cause of non-adherence was forgetfulness, which is consistent with the results of several other studies on medication adherence on various chronic diseases along with COPD which have shown that poor adherence is due to forgetfulness and discontinuance of drugs due to side effects.<sup>29,41-43</sup> Forgetting was related most often with feeling good, interruptions, or changes to normal routine and inconvenience of dosing.<sup>43</sup> In consistence to previous results, in this study also some patients decided not to take medication because of feeling 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.<sup>42</sup> Lack of clinical symptoms might often be interpreted as disease free by patients resulting on tendency to discontinue the daily medications as suggested by various studies.<sup>36,44,45</sup> Hence, adherence to treatment regimen can be improved if patients believe that taking medicines daily can improve their quality of life and their functional status.

COPD patients are likely to be on complex oral and inhaler respiratory medications,<sup>11,46</sup> as well as other prescribed medications,<sup>47</sup> as most patients are associated with multiple co-morbidities.<sup>48</sup> Hence, polypharmacy is one of the important precipitating factors of poor adherence.<sup>18</sup>

In our study, most patients were on more than two oral medications and majority of such patients showed poor adherence to medication regimen. In agreement to our findings, there are several studies which suggest polypharmacy to be one of the common factors to poor adherence.<sup>18,49</sup> In addition, researches have also shown that over one-third of patients with COPD were found to use complementary and alternative drugs adding further complexity to their already complex medication regimens.<sup>48,50</sup> Further, in consistent with our results, another study has also suggested that the lengthier and complicated the treatment regimen is, the greater will be the possibility of non-adherence and simple therapy will inevitably lead to improved patient adherence.<sup>51</sup>

Regarding the route of administration, the present study showed that the majority of patients were on inhalation route and those patients showed adherence to the prescribed treatment. Inhaler forms of medication is preferred over oral doses because of improved breathing, greater self-confidence, and less need to contact health care providers.<sup>52</sup> However, though patients may adhere to the dosing schedule, they may use the inhaler improperly which might reflect unintentional deviations from treatment regimen.<sup>53</sup> Among patients who used inhaler forms of medications, our study revealed that those patients who had proper knowledge to use inhaler were more adherent to the prescribed treatment. It has been shown that the lack of proper knowledge or errors in inhalation technique may be associated with additional complexity to inhaled medications.<sup>12</sup> COPD patients are usually elderly (greater or equals to 60) with multiple comorbidities, as well as impaired physical like hand joint arthritis,<sup>12,54</sup> and cognitive function,<sup>16,41</sup> that may interfere with adherence to inhaler and their proper use. Although improper use and underuse often coexist in the same patient, improper use may not correlate with underuse.<sup>55</sup> Several studies have suggested that the poor inhalation techniques among patients is not surprising when health professionals such as doctors, respiratory therapists, nurses and pharmacists who are involved in educating patients on inhalation techniques, themselves are known to have poor knowledge to use those devices.<sup>56,57</sup> However, in contrast to our findings, some studies have reported that adherence is higher to oral form of medication than to inhalation form.<sup>29,58</sup> This could be due to the ease of administering the drug orally in comparison to inhalation mode of drug administration.

Patient's perception of the disease and drugs also influence the adherence.<sup>48</sup> Patient's awareness about the possible side effects shared by the doctors and health care professionals are likely to influence the adherence to medications in COPD.<sup>48</sup> The current study revealed that experiences of side effects and negative perception about their prescribed medications have affected adherence to medications. So, the complexity of drug regimen, concerns for side effects might affect the day-to-day activities, which might be associated with non-adherence

in COPD as suggested by other studies.<sup>11,16,39</sup> Such kind of problems is often encountered in various other chronic diseases like diabetes,<sup>42</sup> Hypertension,<sup>59</sup> human immune-deficiency virus-acquired immune-deficiency syndrome (HIV-AIDS),<sup>60,61</sup> and Tuberculosis as well.<sup>62</sup>

Patient's health beliefs are affected by their health literacy and these beliefs are also contributors to adherence.<sup>63</sup> Studies have shown that the risk of non-adherence is very high when patients cannot read and understand basic written medical instructions.<sup>64</sup> Misunderstanding of this type is common.<sup>64</sup> In agreement to those studies, the current study has shown that majority of non-adherent patients were found to be illiterate. Language barrier might create difficulty in understanding the medical instructions and even if they are able to understand the language of their medical instructions, they cannot comprehend the medical information.<sup>65</sup> In addition to this, studies have also suggested that the condition is worse if the patient is elderly with cognitive impairments.<sup>63,64,66</sup>

On the other hand, the present study has shown that poor adherence was observed in those patients having less understanding of their illness. They believed that the disease was incurable and had less belief on the prescribed medications. This result is consistent with the findings from another study which suggested that adherence to treatment regimens may be partly affected by patient's understanding of their illness and management options.<sup>67</sup> Similar results were also shown by other studies in which patients having difficulty in understanding the disease management process showed increased incidence of non-adherence.<sup>39,48</sup> In addition, our study has shown that patients receiving family/social supports were less adherent to medications than those who were self-concerned about the disease. This might be due to poor understandings of family members about patient's disease and drugs which could be because of low health literacy rates among them.<sup>63</sup> Similarly, several other studies have suggested that if their family or social group members hold divergent views about their illnesses and treatments, patients might get confused whether or not to adhere to medication leading to higher chances of poor medication adherence.<sup>68-71</sup> However, other studies have shown that patients who received support from their family members while taking medications had better adherence to medication regimens.<sup>58,72</sup> So, adherence to medication is not only influenced by the patient's views towards the disease and drugs but also by other people's concern and attitude towards the disease sufficient to influence the patient's belief.<sup>58</sup> Thus, positive attitude of family members along with patient's self-motivation is essential for improving patient's adherence to medication. Additionally, though affordability of drugs is considered to be one of the barriers to achieving adequate adherence,<sup>72,73</sup> the present study did not show a significant association with medication affordability. This disparity might be due to the limited sample size with mono-centered study.



## CONCLUSION

Non-adherence to medication is common problem in COPD. Poor adherence to medication regimen and to other non-drug therapy possess significant barrier to optimum management of COPD. It affects individual's lifestyles and socioeconomic status. In this study forgetting or deciding not to take medication due to concerns of side effects was reported as the most frequent cause of non-adherence. Non-adherence to medication seems to be influenced by various factors like medication and regimen and patients perception of disease and drug. Polypharmacy is found to be one of the major factors that increases non-adherence whereas, proper knowledge of drug administration, patient's knowledge and perception of disease/drugs also affect the patient adherence to the prescribed treatment.

However, there is no association between adherence and various factors like age, sex, literacy, route of administration of drugs, patient's perception, proper knowledge to use inhaler and difficulty using inhaler.

The study shares several limitations as it was mono-centered and was a cross-sectional study. A multi-centered follow-up study might provide a better scenario of adherence related frequent hospitalization.

However, this study provides various evidence regarding adherence pattern and factors influencing it in COPD. Strategies for overcoming non-adherence have to be formulated based on the nature and reasons for non-adherence. Further research to reinforce these issues including health literacy rate is needed in Nepal to improve medication adherence to COPD.

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