

**Adherence to Prescribed Medication and Its Association with Quality of Life
Among COPD Patients Treated at a Tertiary Care Hospital in Puducherry – A
Cross Sectional Study**

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Abstract

Introduction: Medication adherence is a major determinant for the success of therapy among chronic obstructive pulmonary disease (COPD) patients. The research objectives of the present study were to assess the adherence to prescribed medications and its association with quality of life among COPD patients, to determine the major factors that influence the medication adherence and to assess patient's knowledge on COPD and its relation to medication adherence.

Methods: It was a hospital based cross-sectional study. Patient demographic characteristics, smoking and alcoholic status, severity grading of COPD, concomitant disease, affordability of patients to medication, patient knowledge on COPD (Knowledge Questionnaire), adherence to medication and inhaler, major factors influencing adherence, disease control and quality of life (COPD Assessment Test) were recorded.

Results: Most of the patients were non-smokers and patients exposed to occupational air pollutants was high. Complete adherence to prescribed medication was found among 47% (MAS Score 6) of the participants and 81% of the participants were partially adherent (MAS score, range of 1-6). Highly adherent group was found to have high CAT score which was statistically significant. ($P=0.020$). Major factors for medication non-adherence were forgetfulness (82.5%) and symptomatic relief of illness (12.5%). There was no statistically significant association between individual knowledge questions and medication adherence except the question "COPD medicines prevent the disease from getting worse" ($P=0.021$).

Conclusion: There was a statistically significant association between medication adherence and quality of life. Appropriate health education should be implemented for improving patient awareness and medication adherence.

Introduction

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant

exposure to noxious particles or gases (1). In industrialized and developed countries, it is one of the leading causes of morbidity and mortality (2). The World Health Organization predicts that COPD will become the third leading cause of death by 2030 (3). Currently, various drugs like β_2 agonist (long and short acting), inhalational anticholinergics, inhalational corticosteroids and methyl xanthines are utilized to prevent, control the symptoms and also to minimize the occurrence of COPD exacerbations (4,5).

The main factor that determines the success of therapy appears to be medication adherence. The medication adherence rates among COPD patients in clinical trials has been found to be 70 to 90% but in clinical practice it was very low accounting for only 10 to 40% (6-11). Non-adherence to therapy may lead to poor health and increased morbidity and health care cost, which in turn alters the quality of life (12). There appear to be few studies in India on medication adherence among COPD patients. This study is novel in assessing the adherence to drug therapy and its relation to quality of life, patients' knowledge on COPD and its relationship to medication adherence and major factors influencing the medication adherence among COPD patients attending the tertiary care Institute in one of the Union Territory in India.

Methods

Study design and setting: A cross-sectional study was conducted in a tertiary care hospital. The study center was a referral hospital for nearby primary and secondary care hospitals and a separate COPD clinic was run every week for treating COPD patients. The study was conducted for a period of 6 months after obtaining Institutional Ethics Committee clearance.

Study Population: Eligible patients were those referred and diagnosed with COPD by FEV1 and categorized according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) staging and were receiving medications (with no alterations in treatment regimen during the past 3 months). Since the study was on medication adherence, all the COPD patients attending the outpatient department during the study period were considered. Patients with a history of asthma, allergic rhinitis, hospitalization for COPD exacerbation in last 3 months, heart failure or serious liver disease or renal failure or acute coronary syndrome patients and mental illness patients were excluded.

Data Collection: The patients satisfying the inclusion criteria were interviewed after obtaining their written informed consent. Patient demographic details, smoking and alcoholic status, occupational exposure to air pollutants, age at diagnosis of COPD, duration of COPD, concomitant disease, affordability of patients to medication were recorded. Post-bronchodilator FEV1 was measured with spirometry and grading of COPD was done following Global Initiative for Chronic Obstructive Lung Disease (GOLD) staging (13).

Questionnaires used: Patient knowledge on COPD was assessed using COPD Knowledge Questionnaire (COPD-Q) (14). It is a valid, reliable and low-literacy tool to assess COPD related knowledge in patients. Adherence to medication and inhaler was evaluated by using Medication Adherence Scale (MAS) and Medication adherence report scale (MARS) (15,16). Reasons for non-adherence (missing or discontinuing the dose) were also obtained from the patients. Disease control and quality of life was assessed by using COPD assessment Test (CAT) (17). CAT score varies with changes in treatment and exacerbations of disease due to poor adherence. CAT scoring ranges between 0 and 40. Score of

- > 30 - very high impact of COPD on patients
- >20 - high impact of COPD on patients
- 10 to 20 - medium impact of COPD on patients
- <10 - low impact of COPD on patients
- 5 - very low impact of COPD on patients

Statistical Analysis: Data entry was done in MS Excel 2010. Data was analyzed using professional statistics package EPI Info 7.0 version for windows. Descriptive data was represented as mean \pm SD, median and interquartile range for numeric variables, percentages and proportions for categorical variables. Appropriate tests of significance were used depending on nature & distribution of variables like Chi square test, student's t test for categorical variables. Values of $p < 0.05$ were considered statistically significant. Spearman's correlation test was used to find out the relationship between medication adherence and quality of life.

Results

During the six months study period, 157 COPD patients were contacted. Out of the 157 patients, 19 patients refused to participate in the study, 5 patients were not able to answer appropriately and 42 patients had not satisfied the inclusion criteria. A total of 91 patients completed the study and gave complete responses to the questionnaire.

Sociodemographic characteristics of the patients were summarized in Table 1.

Table 1. Sociodemographic characteristics of the study participants.

Sociodemographic characteristics		*Values
Total sample		91(100)
Gender	Male	36(39.6)
	Female	55(60.4)
Age		62.26 ± 12.974
Locality	Urban	46(50.5)
	Rural	45(49.5)
Literacy status	Illiterate	46(50.5)
	Primary	34(37.4)
	High school	11(12.1)
Occupation	Unemployed	30(33)
	Unskilled	49(53.8)
	Skilled	12(13.2)
Occupational exposure to air pollutants		37(40.7)
Smokers		20(22)
Non smokers		71(78)
Alcoholics		16(17.6)
Non alcoholics		75(82.4)
Mean age at diagnosis of COPD		51.78 ± 16.934
Median duration with COPD, IQR**		6.00, 12**
FEV ₁ % predicated		48.1 ± 11.4
FEV ₁ /FVC, %		55.4 ± 5.2

Most of the patients were non-smokers and patients exposed to occupational air pollutants was high. Based on GOLD staging of severity of COPD, 14% were graded as mild, 63% were graded as moderate, 20% were graded as severe and 3% of patients had very severe form of COPD. Concomitant diseases like diabetes, hypertension and hyperthyroidism was found in 74.7% of the participants. Nearly 50% of the participants belong to very low socioeconomic status as per Modified Prasad Classification and medication cost was affordable only by 24.2%.

Patient responses to COPD – Knowledge Questionnaire (COPD-Q) and its relation to medication adherence were summarized in Table 2.

Table 2. COPD Knowledge Questionnaire responses and its relation to medication adherence among study participants.

COPD-Q item	Correct responses (%)	Mean \pm S.D	P value
People with COPD may feel shortness of breath	87(95.6)	0.96 \pm 0.20	0.619
People with COPD often have a cough that won't go away	33(36.3)	0.36 \pm 0.48	0.486
COPD can be prevented	25(27.5)	0.27 \pm 0.45	0.577
COPD can be reversed	37(40.7)	0.41 \pm 0.49	0.825
Cigarette smoking or second-hand smoke causes most COPD	54(59.3)	0.59 \pm 0.49	0.282
Stopping smoking will keep COPD from getting worse	50(54.9)	0.54 \pm 0.50	0.051
People should only use their COPD medicines when they can't breathe	53(58.2)	0.58 \pm 0.49	0.985
COPD medicines prevent the disease from getting worse	86(94.5)	0.94 \pm 0.23	0.021*
The inhaler can be used anytime in case of shortness of breath	37(40.7)	0.41 \pm 0.49	0.055
People can stop taking their medications when their COPD symptoms gets better	39(42.9)	0.43 \pm 0.50	0.544
Using oxygen at home can help people with COPD live longer	66(72.5)	0.72 \pm 0.45	0.930
People with COPD should receive pneumonia vaccination	0(0)	0	NA
People with COPD should receive flu vaccination every year	0(0)	0	NA
Average COPD knowledge score	43 (47)	6.23 \pm 1.57	

*p<0.05 - statistically significant.

There was no statistically significant association between individual knowledge questions and medication adherence except the question "COPD medicines prevent the disease from getting worse" (P=0.021). Average COPD-knowledge score was 6.23 \pm 1.57.

Responses to medication adherence scale were summarized in Table 3.

Table 3. Responses to COPD medication adherence.

Medication adherence scale item	Number of patients adherent (%)	Mean \pm S.D
Have you at times been careless about taking your medications	62(68.1)	0.68 \pm 0.46
Have you ever forgotten to take your medications because you felt better?	62(68.1)	0.68 \pm 0.46
Have you ever stopped taking your medications because you felt better?	77(84.6)	0.85 \pm 0.36
Have you ever taken less of your medications than the doctor prescribed because you felt better?	76(83.5)	0.84 \pm 0.37
Have you ever stopped taking your medications because you felt worse?	89(97.8)	0.98 \pm 0.14
Have you ever taken more of your medications than the doctor prescribed because you felt you were having more breathing problems?	82(90.1)	0.90 \pm 0.30
Adherent (sum score range of 1-6)	75(81.2)	4.92 \pm 2.12

The adherent sum score ranged between 1-6, 43 (47%) participants who had a sum score of 6 were fully adherent to prescribed medications, 27 (30%) participants had a sum score of 5 and others had a sum score of 1-4 were partially adherent to prescribed

medications. The overall medication adherence (range 1-6) among the participants was 81%.

Inhalational medications were used only by 43 (47.3%) patients. Responses to adherence to inhaled medications were summarized in Table 4.

Table 4. Responses to inhalational medication adherence.

Inhaler adherence scale item	Mean \pm S.D	Median (range) n=43
I forget to take my inhalation medication	4.67 \pm 0.94	5(1-5)
I alter the dose of my inhalation medication	4.88 \pm 0.62	5(1-5)
I stop taking my inhalation medication for a while	4.65 \pm 1.06	5(1-5)
I decide to skip one of my inhalation medication dosages	4.53 \pm 1.20	5(1-5)
I use my inhalation medicines less than prescribed.	4.81 \pm 0.85	5(1-5)
Sum Score*	23.55 \pm 3.95	5(5-25)

MARS sum score was 23.55 \pm 3.95. Higher score indicates higher self-reported adherence. MARS sum score ranged between 5-25. Out of 43 patients, 39 (91%) had the sum score in the range of 21-25.

The common reasons for medication non-adherence were forgetfulness (82.5%), symptomatic relief of illness (12.5%), 10% responded that medicines got exhausted and 2.5% reported that it was socially inconvenient to take the medications.

CAT score of the patients and grading were summarized in Tables 5 and 6.

Table 5. COPD Assessment Test (CAT) – Individual item responses.

CAT item	Mean \pm S.D	Median (range)
Cough	2.01 \pm 1.21	2(0-5)
Phlegm	1.98 \pm 1.21	2(0-5)
Chest tightness	1.48 \pm 1.47	1(0-5)
Breathless while walking uphill	2.57 \pm 1.08	3(0-5)
Not limited doing any activities at home	2.46 \pm 1.18	2(0-5)
Confident of leaving home	1.69 \pm 1.47	1(0-5)
Sleep soundly	2.19 \pm 1.41	2(0-5)
Lots of energy	2.33 \pm 1.16	2(0-5)
CAT sum score*	16.71 \pm 6.64	17(1-32)

Table 6. Categorization of study participants based on CAT Score.

CAT grading	Disease burden	Number (%)
5	Upper limit of normal	7(7.7)
<10	Low burden of disease	9(9.9)
10-20	Medium burden of disease	47(51.6)
>20	High burden of disease	26(28.6)
>30	Very high burden of disease	2(2.2)

There was a statistically significant difference between adherent and partially adherent groups with respect to CAT score of the participants (Student's t test; p value=0.020). Highly adherent group was found to have high CAT score. (Table 7).

Table 7. Association between medication adherence score and CAT score.

	Medication adherence category	N	Mean \pm S.D
CAT score	Adherent (Score 6)	43	18.42 \pm 6.40
	Partially adherent (Score 1-5)	48	15.19 \pm 6.55

Student's t test; p value=0.020.

There was a statistically significant weak positive correlation ($r=0.246$) between medication adherence sum and CAT score.

Discussion

The patients in the present study had adherence to the medication at 47%. The percentage of adherence was less than the studies conducted in Hungary (58.2%) and Nepal (65%) (18,19). Although complete adherence was less than 50%, majority of the participants were partially adherent to the medications which was at 81% (Table-3). The most common cause for non-adherence was forgetfulness (82.5%). The percentage was very high when compared to other studies in which forgetfulness accounted for about 50% (15,19).

There was a statistically significant association between medication adherence score and the CAT score similar to the study done by Kocakaya *et.al.* (20). The study had revealed better the adherence, better the quality of life. Though there is weak positive spearman's correlation which was statistically significant, it may not be clinically significant. This can be overcome by increasing the sample size. Only 43 participants used inhalational medications and there was higher self-reported adherence to inhalational medications. That data is similar to a study done by Tommelein *et al.* (16).

In the tertiary care Institute where the study was conducted, patients with moderate and severe symptoms alone were advised to purchase inhaler and during inhaler introduction they were properly trained on how to use the inhaler. Further, compliance to the inhalational medications were checked during each follow-up. Since moderate to severe symptomatic patients were comfortable with inhalational medications, there was high degree of adherence to inhalational medications.

The patient's COPD knowledge score was 6.23 ± 1.57 . It was less when compared to the study done by Ray SM., *et al.* (7.6 ± 2.1) (14). Awareness of the patients on smoking and its association with COPD, reversal of COPD with quitting of smoking was only around 50% but comparable to prior studies (14). The percentage of COPD patients with smoking was only 22%. The results were similar to the study done by Mahmood T *et.al.*, in which the percentage of nonsmokers with COPD was higher when compared to smokers with COPD (21). It was interesting to note that 100% of the participants were not aware about the importance of flu and pneumonia vaccination. It may be because of poor literacy rate and lack of awareness among the participants.

The results of our study are not surprising and consistent with prior studies. However, sociodemographic factors affect compliance. To our knowledge this is the first study to show the association between adherence and quality of life in COPD in a unique Indian population.

Conclusion

The study showed a statistically significant association between medication adherence and quality of life. Further studies evaluating the impact of education on medication adherence and quality of life are needed.

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