



A STUDY ON DRUG PRESCRIBING PATTERN, DRUG INTERACTION AND EVALUATION OF MEDICATION ADHERENCE AMONG SMOKING AND NON-SMOKING CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS IN TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

The aim of the study is to assess the Drug Prescribing Pattern, Drug Interaction and Evaluation of Medication Adherence among Smoking and Non-smoking Chronic Obstructive Pulmonary Disease Patients in Tertiary Care Teaching Hospital. The primary objectives of the study is to access the drug prescribing pattern, and to determine various etiologies in non-smoker COPD patients. This study identifies drug interactions based on their severity and medication adherence in smoker and non-smoker patients. A Prospective, Observational and Hospital based study was conducted on patients admitted in a tertiary care teaching hospital for a period of 6 months. Data regarding patient's demographic details, the prescription of the patient who are treated during the course of the study are audited prospectively using a specifically predesigned proforma. The study reveals that males (51.33%) were more likely to have COPD in which majority of patients were nonsmoker (68%) above 60 years of age. Among all medications the major class of drugs prescribed were Antibiotics, Bronchodilator, Corticosteroids and least were Antitussives. The present study concluded that proportion of nonsmoker COPD patients are higher than smokers due to multiple risk factor in which outdoor air pollution was the most leading factor. Most of the patients have low motivation and low knowledge. The major reasons for medication non-compliance were felt better and stopped, forget to take and refill. The study also reveals improving medication adherence among individuals with COPD is critical to optimising patient outcomes. By providing effective counselling, medication adherence to the treatment can be achieved.

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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]. Tobacco smoking is the most important and dominant risk factor in the development of COPD. The risk factors of COPD in nonsmokers may include genetic factors, longstanding asthma, environmental outdoor air pollution, biomass smoke, occupational exposure, recurrent respiratory tract infection in early childhood, pulmonary tuberculosis and low socioeconomic status. Symptoms of COPD includes dyspnea, chronic cough and sputum production. Spirometry is used to make a clinical diagnosis of COPD^[2].

Types

There are two types of COPD.

1. Emphysema, a lung disease which results in shortness of breath due to destruction and dilatation of the alveoli. Emphysema causes damage to the alveoli and destroys the walls of the alveoli. There are 300 million alveoli in our lungs. This causes them to increase in size. The larger size makes it harder for lungs to move oxygen into the bloodstream^[2].
2. Chronic bronchitis is an inflammation of the lining of your bronchial tubes, which carry air to and from the lungs. Bronchitis affects the bronchial tubes in the lungs. It irritates them and then the tubes swell. The narrowing of these tubes leads to coughing and shortness of breath and also have mucus in cough. This condition makes it difficult for your lungs to bring air in and let it out^[2].

The purpose of the study is to assess the Drug Prescribing Pattern, Drug Interaction and Evaluation of Medication Adherence among Smoking and Non-smoking Chronic Obstructive Pulmonary Disease

Prescription Patterns explain the extent and profile of drug use, trends, quality of drugs, and compliance with regional, state or national guidelines like standard treatment guidelines, usage of drugs from essential medicine list and use of generic drugs. They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs. The aim of PPMS is to facilitate the rational use of drugs in a population. There is increasing importance of PPMS because of a boost in marketing of new drugs, variations in pattern of prescribing and consumption of drugs, growing concern about delayed adverse effects, cost of drugs and volume of prescription. There is a lack of studies on Drug interaction incidence in patients with Chronic obstructive pulmonary disease (COPD) and their clinical relevance. Polypharmacy is common in patients with these two conditions, but could be guideline-driven.

Adherence is one of the most important factors that determine therapeutic outcome, especially in patients suffering from chronic illness like COPD. It is extremely important for better therapeutic outcome in many situations like replacement therapy, maintenance of pharmacological effect, maintenance of serum drug concentrations to control.

Selection of the medication and the device typically depends on the efficacy of the different inhaled medications and the devices. Adherence to therapy in COPD is complex. Patients with COPD require adequate education on the disease different selection process, comorbidities, and also on the use of different medications and devices. Numerous factors predispose patients with COPD to poor adherence. Recognition of the type of nonadherence in patients with COPD must be the first step in this complicated process of improving adherence.

MATERIALS AND METHODS

A Prospective, Observational and Hospital based study was conducted in the inpatient ward of Medicine Department of Karnataka Institute of Medical Sciences (KIMS) Hospital, Hubli. Data regarding patients demographic details, diagnosis, complete prescription, medication adherence will be collected in a predesigned proforma. The collected data were assessed and analysed in depth.

Ethical issues

The ethical clearance for the study was obtained from Institutional ethical committee of SET's College of Pharmacy

Study procedure

The study was carried out by regular visits to in-patient medicine department and case sheets of 150 patients were collected. The relevant data collected from case sheets were properly documented in a separate data collection form. The obtained data were then identified, evaluated and analyzed based on gender, age group, etiology, social history, drug interactions.

RESULTS

A total of 150 case sheets were reviewed, analyzed and categorized based on age, gender, comorbidities, past medical history, length of stay, no of drugs prescribed, drug interaction, risk factor, medication adherence.

Table:1.Gender wise distribution.

Gender	Smokers	Non smokers	Total No. of patients
Male	43(55.84%)	34(44.15%)	77(51.33%)
Female	5(6.84%)	68(93.15%)	73(48.66%)
Total	48(32%)	102(68%)	150(100%)

Out of 150 patients, 77(51.33%) were male and 73(48.66%) were female. Among 77 males, 43(55.84%) were smokers and 34(44.15%) were non smokers. Among 73 females, 5(6.84%) were smokers and 68(93.15%) were non smokers. As per data of the present study COPD is more common in male compared to female. Out of 150 patients, 48 were smokers and 102 were non smokers. (Table 1)

Table:2 Age wise distribution of smoker and nonsmoker.

Age Range	Smokers	Nonsmokers	Total No.of patients
18-25 years	0(0%)	0(0%)	0(0%)
26-40 years	0(0%)	11(100%)	11(7.33%)
41-60 years	17(29.82%)	40(70.17%)	57(38%)
>60 years	31(37.8%)	51(62.19%)	82(54.66%)
Total	48(32%)	102(68%)	150(100%)

Age wise distribution of COPD patients in which the maximum number of patients were under age group of above 60 years. Under 26-40 years age group 0 were smokers, 11(100%) were Non-smokers. In 41-60 years age group 17(29.82%) were Smokers and 40(70.17%) were non-smokers followed by more than 60 year age group 31(37.8%) were smokers and 51(62.19%) were Non-smokers. None of the patients were admitted under the age group of 18-25 years. (Table 2)

Table:3 Male age distribution.

Age group	Smokers	Nonsmokers	Total no. of patients
18-25 years	0(0%)	0(0%)	0(0%)
26-40 years	0(0%)	3(100%)	3(3.89%)
41-60 years	16(53.33%)	14(46.66%)	30(38.96%)
>60 years	27(61.36%)	17(38.63%)	44(57.14%)
Total	43(55.84%)	34(44.15%)	77(100%)

Out of 77 male patients, more than 60 year age group had highest number of Smokers 27(61.36%) and lowest number was 16(53.33%) under the age group of 41 to 60 years. Under the age group of 18-25 years and 26-40 years none of the male patient were smokers. (Table 3)

Table:4 Female age distribution.

Age group	Smokers	Non smokers	Total number of patients
18-25 years	0(0%)	0(0%)	0(0%)
26-40 years	0(0%)	8(100%)	8(10.95%)
41-60 years	1(3.7%)	26(96.29%)	27(36.98%)
>60 years	4(10.52%)	34(89.47%)	38(52.05%)
Total	5(6.84%)	68(93.15%)	73(100%)

More than 60 year age group had highest number of smokers 4(10.52%) and lowest number was 1(3.7%). Under the age group of 18-25 years and 26-40 years none of the female patients were smokers. (Table 4)

Table:5 Occupational status of smokers and nonsmokers.

Occupation	Smokers	Non smokers	Total
Employed	17(25%)	51(75%)	68(45.33%)
Unemployed	31(37.8%)	51(62.19%)	82(54.66%)
Total	48(32%)	102(68%)	150(100%)

Out of 68 employed COPD patients 17(25%) were smokers and 51(75%) were nonsmokers. Out of 82 unemployed COPD patients 31(37.8%) were smokers and 51(62.19%) were non-smokers. Out of 150 COPD patients majority of smokers were unemployed. (Table 5)

Table:6 Social history.

Social history	No.of patients (n=150)	Percentage
Smoker	37	24.66%
No habits	96	64%
Alcohol + smoking	17	11.33%

Out of 150 COPD patients, 37(24.66%) were pure smokers, 96(64%) were with no habits. 17(11.33%) patients had a history of alcohol + smoking. (Table 6)

Table: 7 Past medical history.

Diseases	No. of patients	Percentage(%)
COPD	45	36.88%
Asthma	14	11.47%
Hypertension	35	28.68%
Diabetes	22	18.03%
Tuberculosis	2	1.62%
Hypothyroidism	5	4.09%
Total	123	100%

The majority of patients had history of COPD (36.88%) and least number of patients had history of Tuberculosis(1.62%). The second most common is Hypertension constitutes about 28.68% .(Table 7)

Table: 8 Risk factors of Nonsmokers.

Risk factors	No.of Nonsmokers	Percentage
Exposure to biomass smoke	48	42.47%
Treated pulmonary tuberculosis	3	2.65%
Long standing asthma	19	16.81%
Occupational exposure	49	43.36%
Exposure to outdoor air pollution	74	65.48%
Passive smoking	43	38.05%

Most of the COPD patients had multiple risk factor. The major risk factor in nonsmokers was exposure to outdoor air pollution [(74)65.48%]. The least risk factor found was treated pulmonary tuberculosis [(3)2.65%] . The second most risk factor was occupational exposure [49(43.36%)]. Exposure to biomass smoke which contributes about [48(42.47%)], Long standing asthma about 19(16.81%), followed by passive smoking about 43(38.05%). Out of 113 nonsmoker patients, majority are females who are exposed to biomass smoke and passive smoking. Also occupational exposure were mostly seen in males. .(Table 8)

Table: 9 Comorbidities.

Comorbidities	Smokers	Nonsmokers	Total
Cor-pulmonale	1(4%)	8(10.25%)	9(8.7%)
Bronchopneumonia	4(16%)	11(14.10%)	15(14.56%)
Asthma	0(0%)	3(3.84%)	3(2.91%)
Hypertension	11(44%)	26(33.33%)	37(35.92%)
Diabetes	3(12%)	16(20.51%)	19(18.44%)
Ischemic Heart Disease	1(4%)	5(6.41%)	6(5.82%)
Chronic Kidney Disease	0(0%)	2(2.56%)	2(1.94%)
Anemia	1(4%)	1(1.28%)	2(1.94%)
Hepatitis	0(0%)	1(1.28%)	1(0.94%)
Hypothyroidism	0(0%)	2(2.56%)	2(1.94%)
Hyperthyroidism/ thyromegaly	1(4%)	1(1.28%)	2(1.94%)
Cardio vascular arrest	3(12%)	2(2.56%)	5(4.85%)
Total	25(100%)	78(100%)	103(100%)

Out of 12 comorbid condition, Hypertension[37(35.92%)] was highest in that 11(44%) were smokers and 26(33.33%) were non-smokers followed by diabetes [(19)18.44%]] in which 3(12%) were smokers and 16(20.51%) were non smokers. 15(14.56%) patients had bronchopneumonia with 4(16%) were smokers and 11(14.10%) were non-smokers.Corpulmonale [(8)10.25%] was more common in non smokers. .(Table 9).

Table:10 Length of hospital stay.

Hospital stay	Smokers	Nonsmokers	Total
0-3days	10(22.2%)	35(77.7%)	45(30%)
4-6days	29(44.61%)	36(55.38%)	65(43.33%)
>6days	13(32.5%)	27(67.5%)	40(26.66%)
Total	52(34.66%)	95(63.33%)	150(100%)

Length of the hospital stay of 150 patients and categorized into 3 groups at intervals of 3days. The maximum number of smokers [(29)44.61%] were admitted for 4-6 days followed by 36(55.38%) non smokers. The minimum number of smokers [10(22.2%)] were admitted for 0-3 days and 27(67.55%) nonsmoker were admitted for more than 6 days. .(Table 10)

Table: 11 Route of administration.

Route of administration	No.of drugs	Percentage(%)
Parentral	252	55.87
Oral	105	23.28
Inhalation	94	20.84
Topical	2	0.44

The route of administration of drugs of 150 patients in which parentral route [(252)55.87%] of administration was mostly used followed by oral route [(105)23.28%], Inhalation [94(20.84%)] and least used was topical [20(0.44%)]. (Table 11)

Table :12 Prescribing drugs.

S.No	Drugs	Number of patients	Percentage (%)
1	Salbutamol+Budesonide Nebulization	111	17.12
2	Ceftriaxone	111	17.12
3	Theophylline	100	15.43
4	Hydrocortisone	90	13.88
5	Azithromycin	68	10.49
6	Piperacillin	28	4.32
7	Levasalbutamol+ipratropium bromide(Duolin)	25	3.85
8	Doxycyclin	25	3.85
9	Dexamethasone	20	3.08
10	Formoterol	15	2.31
11	Montelukast	12	1.85
12	Ambroxol hydrochloride	7	1.23
13	Abphyllin	8	1.23
14	Methyl prednisone	8	1.23
15	Amoxicillin clavulonate	6	0.92
16	Chlorpheniramine	6	0.92
17	Dextromethorphan	4	0.61
18	Aminophylline	4	0.61

A total of 538 drugs were prescribed for the management of COPD. Among COPD class of drugs antibiotics were mostly prescribed 308 (47.53%). The commonly used antibiotics were Ceftriaxone, Azithromycin, Doxycyclin, Metronidazole, Piperacillin, Amoxicillin. Our study showed that ceftriaxone [(111)17.12%] was the mostly prescribed antibiotic and amoxicillin clavulonate [(6),0.92%] is the least prescribed. (Table 12)

Table:13 Classification of drugs.

S.No	Class of drug	No.of drugs	Percentage(%)
1	Bronchodilators		21.29
	1. Methyl xanthines	102	
	2. Anticholinergic	25	
	3. Sympathomimetics	11	
2	Inhaled corticosteroid	14	2.16
3	Systemic corticosteroid	118	18.20
4	SABA +Inhaled corticosteroids	111	17.12
5	Antibiotics	238	36.72
6	Mucolytics	7	1.08
7	Antitussives	4	0.61
8	Antihistamines	6	0.92
9	Leukotriene antagonist	12	1.85

Bronchodilators are second most prescribed for COPD which constitutes about 138(21.29%) and categorized into 3 groups. Systemic corticosteroids are preferred over inhaled corticosteroids. Systemic steroids such as hydrocortisone were prescribed to 90(13.88%), followed by dexamethasone 20(3.08%). In the assessment of combination therapy, we found that salbutamol + budesonide [(111)17.12%] was mostly prescribed drugs. (Table 13).

Table: 14 Drug interactions based on Severity.

Interaction	No. of interactions (n=316)	Percentage(%)
Major	34	10.75%
Moderate	145	45.88%
Minor	137	43.35%

Based on our study Moderate (45.88%) interactions were more than Minor (43.35%) and Major (10.75%). .(Table 14).

Table: 15 Drug interactions based on Pharmacology.

Types of interaction	Total	Percentage (%)
Pharmacokinetics	18	52.94%
Pharmacodynamics	16	47.05%
Total	34	100%

Out of 150 patients 34 had major interactions in which include pharmacodynamic and pharmacokinetic interactions. Pharmacokinetic interactions [18(52.94%)] were higher than pharmacodynamic interactions[16(47.05%)].(Table 15).

Table: 16 Medication Adherence using Morisky Scale.

Adherence scale	Score	Smokers	Nonsmokers	Total no. of patients
MOTIVATION	0-1	6 (10.71%)	50 (89.28%)	56(37.33%)
	2-3	10(38.46%)	16 (61.53%)	26(17.33%)
KNOWLEDGE	0-1	7 (18.91%)	30 (81.08%)	37(24.66%)
	2-3	9 (29.03%)	22 (70.96%)	31(20.66%)
	Total	32(21.33%)	118 (78.66%)	150(100%)

Most of the cases have less motivation (56) and low knowledge (37). Smokers had low motivation and knowledge compared to non smokers. .(Table 16)

DISCUSSION

A Prospective, Observational and Hospital based study was carried out by analysing the prescription of 150 patients in KIMS Hospital, Hubli. Out of 150 patients,77(51.33%) were male and 73(48.66%) were female. Among 77 males, 43(55.84%) were smokers and 34(44.15%) were non smokers. As per data of the present study COPD is more common in male compared to female. Among 73 females, 5(6.84%) were Smokers and 68(93.15%) were non smokers. Out of 150 patients, 48(32%) were smokers and 102(68%) were non smokers.This finding is in accordance with results of the previous studies conducted by Kumar *et al* and Amrutha et al ^[4]. In Age wise distribution of COPD patients in which the maximum number of patients were under age group of above 60 years. The result representing major age distribution above 60years had similarity with previous studies conducted by Mahadeo P *et al* ^[4]and Faheemuddin *et al* ^[5].

Out of150 COPD patients in which 37(24.66%) were smokers. Out of 150, 96(64%) were with no habits. The result obtained for social history, nonsmokers predominate smokers is similar with previous studies conducted by Tariq mohammed *et al*.^[6]

Most of the COPD patients had multiple risk factor. The major risk factor in nonsmokers was exposure to outdoor air pollution [(74)65.48%]. The least risk factor found was treated pulmonary tuberculosis [(3)2.65%] . The second most risk factor was Occupational exposure [49(43.36%)]. Exposure to biomass smoke which contributes about [48(42.47%)], Long standing asthma about 19(16.81%), followed by passive smoking about 43(38.05%). Out of 113 nonsmoker patients, majority are females who are exposed to biomass smoke and passive smoking. Also occupational exposure were mostly seen in males.

Our study includes 6 risk factors namely, Exposure to biomass smoke which contributes about 48(42.77%), long standing asthma about 19(16.81%), followed by passive smoking about 43(38.05%). Out of 113 nonsmoker patients , majority were females who are exposed to biomass smoke and passive smoking. Also occupational exposure were mostly seen in males.

A total of 538 drugs were prescribed for the management of COPD. Among COPD class of drugs antibiotics were mostly prescribed 308(47.53%). The commonly used antibiotics were Ceftriaxone, Azithromycin, Doxycillin, Metronidazole, Piperacillin ,Amoxicillin. Our study showed that ceftriaxone [(111)17.72%] was the mostly prescribed antibiotic and amoxicillin clavulonate [(6)0.92%] is the least prescribed. The result representing antibiotics as the mostly prescribed class of drug had similarity with previous studies conducted by Mahadeo P *et al*^[4] and Singh S *et al* ^[7].

Bronchodilators are central to the treatment of COPD because they reduce bronchial constriction, airflow limitation , reduce hyperinflation and improve emptying of the lung . Bronchodilators are second most prescribed for COPD which constitutes about 138(21.29%) and categorized into 3 groups . Methylxanthines (102) was mostly prescribed , among them theophylline was most commonly prescribed (15.43%). Anticholinergics (25) and sympathomimetics (11) were the least prescribed.These drugs are crucial for symptomatic management in COPD and its acute exacerbation.

Systemic corticosteroids are preferred over inhaled corticosteroids. Systemic steroids such as hydrocortisone were prescribed to 90(13.88%), followed by dexamethasone 20(3.08%).

In the assessment of combination therapy, we found that salbutamol + budesonide [(111)7.12%] was mostly prescribed drugs. Montelukast [12(1.85%)] was the mostly prescribed drug among leukotriene antagonist. Mucolytics such as ambroxol were prescribed to 7(1.23%) patients. Antitussives (0.61%) and antihistamines (0.92%) class of drugs were least prescribed among all.

Route of administration of drugs in which parenteral route [(252)55.87%] of administration was mostly used followed by oral route [(105)23.28%], inhalation [94(20.84%)] and least used was topical [20(0.44%)]. The result representing route of administration of drugs is similar with previous studies conducted by Mahadeo P *et al*^[4].

Drug interactions are the common drug related problem. Based on our study Moderate (45.88%) interactions were more than Minor (43.35%) and Major (10.75%). Out of 150 patients 34(34%) had major in that [18(52.94%)] where Pharmacokinetic interactions and pharmacodynamic interactions were [16(47.05%)].

In our study most of the cases have low motivation (26) and low knowledge (31). Smokers had high motivation and knowledge compared to non smokers. Adherence mainly depends on the clinical efficacy and patient medication taking behaviour. In our study most of cases have high motivation and low knowledge. The major reasons for medication non-compliance were felt better and stopped, forget to take and refill. The above findings are similar to previous studies conducted by Ajay R Fugale *et al*^[8].

LIMITATIONS OF THE STUDY

Random selection of patients was done in our study. So, the results cannot be generalized to all the patients admitted in the Hospital, as many cases might have been missed during night shifts and public holidays.

CONCLUSION

The present study concluded that non smokers contribute a significant proportion of COPD patients. Monotherapy was preferred over combinational therapy. Antibiotics were the mostly prescribed class of drugs followed by bronchodilators. Majority of the prescriptions contains one or more antibiotics indicating polypharmacy. COPD patients are under increased risk of DDI due to comorbidities. Multiple risk factors other than smoking plays a major role in development of COPD, mainly exposure to outdoor air pollution, occupational exposure, passive smoking, exposure to biomass smoke. Analysis of medication adherence suggests that most of the patients does not had adequate knowledge on prescription taking behaviour. Drug interaction analysis indicates that moderate drug interactions are seen more than major and minor interactions. The role of clinical pharmacist is necessary in explaining the involved risk factors and their contributions to the disease to achieve reduction of the burden of COPD in nonsmokers. Clinical pharmacist should recognize the complexity of prescribed treatments and routinely utilize strategies to promote patient adherence. The study also reveals improving medication adherence among individuals with COPD is critical to optimising patient outcomes. By providing effective counselling, medication adherence to the treatment can be achieved. Therefore it is important to closely monitor and identify risk factors, drug interactions, thus to improve quality of life and treatment.

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CONFLICT OF INTEREST

The authors have no conflict of interests to declare pertaining to this article.

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