

# Analysis of Prescribing Pattern of Drugs in Chronic Obstructive Pulmonary Disease Patients at a Tertiary Care Teaching Hospital

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## Abstract

Chronic Obstructive Pulmonary Disease (COPD) is a common, progressive lung condition which significantly impacts the quality of life. Despite the existence of clinical guidelines, irrational prescribing patterns, remain common. Analysing prescription patterns and evaluating drug use can identify issues with prescribing patterns and provide valuable guidance to medical professionals. This study thus aims to analyse the prescribing practices of patients with COPD in order to determine areas for improvement, rationality, and adherence to guidelines. A prospective observational study was conducted among 113 COPD patients. Data on demographics, clinical status, and treatment (drug type, dosage, frequency, duration, and route of administration) were collected. WHO core prescribing indicators were applied along with analysis of drug classes, fixed drug combinations, and rescue medications. Majority of patients were between the ages of 61 and 75. 46.8% of individuals had a history of smoking, and 67.2% of cases had comorbidities. Of the 608 medications provided, 43% dealt with comorbidities and 57% targeted COPD. The most commonly utilized medications were bronchodilators (38.8%), corticosteroids (16.45%), and antibiotics (18.75%). In 72.5% of cases, beta-2 agonists were prescribed. ICS and combination mucolytics were preferred. The prescribing pattern reflected rational COPD management. According to this study, the most commonly prescribed drug classes for the treatment of COPD are bronchodilators, corticosteroids, and antibiotics. There is a visible overuse of antibiotics and brand-name prescriptions, which deviates from WHO core prescribing indicators. Ongoing prescription audits and educational interventions can thus promote rational drug usage and improve patient outcomes in the treatment of COPD.

**Keywords:** Chronic Obstructive Pulmonary Disease (COPD), Prescribing pattern, Inhaled corticosteroids (ICS), World Health Organisation (WHO) core indicators.

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## INTRODUCTION

Chronic respiratory disease are a major public health concern both globally and in India, with an estimated 100 million people suffering from obstructive lung conditions. The World Health Organization (WHO) defines chronic obstructive pulmonary disease (COPD) as a long-term lung condition that causes airflow blockage, making breathing difficult. Often undiagnosed, COPD is a progressive and potentially fatal illness, particularly affecting individuals over 40 years of age. The disease has become so widespread that it now affects around 10% of this age group [1]. In fact, WHO ranks COPD among the top ten causes of death worldwide. In 2016 alone, 251 million people were reported to have COPD, according to the Global Burden of Disease (GBD) study. The condition carries a heavy toll due to its high treatment costs and serious impact on

patients' quality of life. Alarming, between 2009 and 2019, deaths from COPD rose by over 35%. Projections suggest that by 2030, COPD could become the third leading cause of death across the globe [2].

A significant portion of healthcare spending goes toward medications. Unfortunately, improper use of drugs is a widespread issue—more than half of all medications are used incorrectly, whether in prescribing, dispensing, or patient adherence. To address this, the WHO introduced the idea of “rational drug use,” where patients receive the right medications in the correct dosages and for appropriate durations, all while keeping costs manageable for individuals and communities. Drug utilization studies play a key role in evaluating how medications are being used, helping improve treatment guidelines and promote more efficient, evidence-based healthcare [3].

One specific type of study, Prescription Pattern Monitoring Studies (PPMS), focuses on how medications are prescribed, dispensed, and administered. These studies help ensure drugs are being used properly and help reduce misuse or overuse. They also support healthcare professionals and the public in understanding appropriate drug use, while also promoting collaboration among key healthcare organizations. PPMS can reveal trends in prescribing, adherence to standard treatment guidelines, use of essential and generic medicines, and overall quality of healthcare delivery [4].

Even though COPD cannot be cured, medications can ease symptoms, reduce the frequency and severity of flare-ups, and improve a patient's stamina and quality of life [5]. Bronchodilators are central to treatment—short-acting versions provide quick symptom relief, while long-acting bronchodilators, like LABAs and LAMAs, are used for ongoing symptom control in more advanced cases. Inhaled corticosteroids (ICS), though commonly used in asthma, are used more selectively in COPD, primarily for preventing exacerbations [6].

However, ICS use must be carefully considered due to potential side effects, such as oral thrush, bruising, bone loss, pneumonia risk, and even tuberculosis. According to the 2014 GOLD guidelines, patients with persistent symptoms and moderate disease should be given a second bronchodilator, and ICS should only be used in severe cases or frequent exacerbations—ideally alongside LABAs or LABA-LAMA combinations. National guidelines, such as those from NICE, also support the cautious use of ICS in patients with poor lung function and repeated flare-ups. Despite these recommendations, ICS are still widely overprescribed, exposing many patients to unnecessary risks [7].

Reviewing prescription habits and assessing drug usage can pinpoint problems in prescribing practices and offer valuable feedback to healthcare providers. These insights help raise awareness about irrational drug use and promote more rational, effective treatment strategies. With this understanding, the current study aims to assess the prescribing patterns among COPD patients.

## METHODOLOGY

A prospective, observational study was carried out over a period of one year at Karuna Medical College Hospital with the aim of assessing prescribing patterns in individuals diagnosed with Chronic Obstructive Pulmonary Disease (COPD). Patients were enrolled from the Department of General Medicine along with other clinical units involved in managing COPD cases. The study protocol was reviewed and approved by the Institutional Human Ethics Committee of Karuna Medical College Hospital (Approval No.

KMC/IHEC/01/2025). Adults aged 18 years and above, actively undergoing treatment for COPD during the study period, were included in the study. Patients were excluded if their medical records were incomplete, if they had serious coexisting illnesses (such as advanced malignancies or conditions requiring intensive care), or if they declined to provide consent for participation.

Data collection was performed using a structured proforma designed to gather a broad range of information. This included demographic details (age, gender, occupation, smoking history), clinical characteristics (COPD severity, associated comorbidities, history of exacerbations, spirometry values), and detailed treatment data (drug type, dosage, frequency, duration, and route of administration). All data were collected only after obtaining informed consent from patients.

To assess the prescribing pattern, the study utilized the WHO core prescribing indicators: The average number of drugs per encounter assesses the extent of polypharmacy, with combination drugs counted as a single item and clear guidelines required for complex prescriptions. The percentage of drugs prescribed by generic name reflects the prescribers' preference for generics, emphasizing the need for access to the actual names written in prescriptions rather than just dispensed products. To monitor the use of high-cost and often overused therapies, indicators such as the percentage of encounters with an antibiotic or an injection prescribed are used. Accurate identification of antibiotics and clarity on which injections, such as immunizations, should be excluded is essential. Lastly, the percentage of drugs prescribed from an essential drugs list or formulary gauges adherence to national or institutional drug policies, requiring a current list and methods to compare branded drugs with their generic equivalents. Together, these measures provide a comprehensive picture of prescribing practices and help identify areas for improvement in medication use [8].

Additional parameters evaluated such as Classification and names of prescribed medications (e.g., bronchodilators, corticosteroids, antibiotics), Dosage and administration details, Use of fixed-dose combination therapies such as LABA + LAMA and ICS + LABA, Prescribing of rescue medications for acute symptom management. Data analysis was conducted using IBM SPSS version 29, Descriptive statistics were used.

## RESULTS

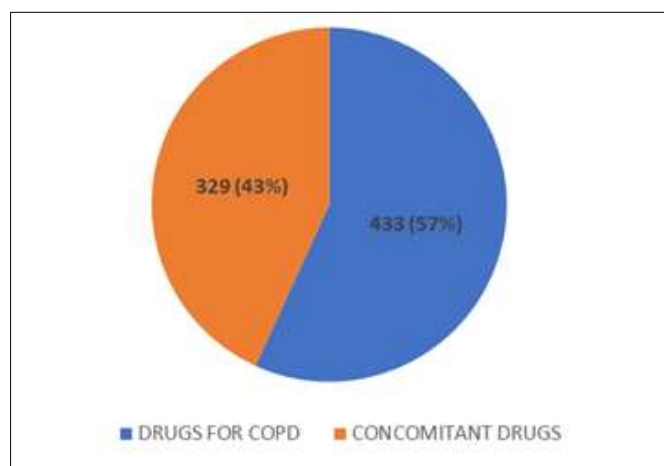
A total of 113 participants were included in the study for the analysis of prescribing pattern in chronic pulmonary obstructive disease at a tertiary care teaching hospital.

**Table No: 01: Socio Demographic Parameters**

Variables	Categories	No of Patients (%)
Patient type	IP	49 (43.3)
	OP	64 (56.6)
Gender	Male	89 (78.7)
	Female	24 (21.2)
Age	45-60	19 (16.8)
	61-75	73 (64.6)
	76-90	21 (18.5)
Smoking status	Smoker	15 (13.2)
	Nonsmoker	60 (53.1)
	Ex smoker	38 (33.6)
Co morbidity	Without Co morbidity	37 (32.7)
	With Comorbidity	76 (67.2)

Out of 113 patients, the patients were categorized into different variables based on their socio demographics parameters as shown in Table No: 01. 64 out of 113 patients are from the OP department, while 49 patients are included from the inpatient admission sector. Out of 113 patients, the male patients were seemed to be in higher number of 89 (78.7%) when compared with female patients (21.2%), with age group of 61 to 75 was found to be predominantly high (73 patients) with mean

age of 67 years. Among the study population 60 patients has no habit of smoking while 38 (33.6%) patients have the smoking history in their past along with 15 (13.2%) patients who are still smokers. The participant with at least one comorbidity was in higher level (67.2%) when compared with patients doesn't have any comorbid condition which may indirectly indicate the complication in the management of COPD and its comorbid condition

**Figure No. 1: Distribution of Prescribed COPD Medications with Concomitant Drugs**

In 113 prescriptions, about 57% of drugs were used for the treatment of COPD, while 43% of drugs were used for the treatment of comorbid conditions present in the study population as shown in Figure No: 01

In 113 patients, about 608 drugs have been prescribed for the management of chronic obstructive pulmonary disease.

**Table No: 02: Different class of drugs used in the management of COPD**

Class of Drug	No of drugs	%	No of Prescription	%
<b>Bronchodilator</b>				
Beta 2 agonist	94	15.46	82	72.57
Methyl xanthine	70	11.51	56	49.56
Anti-cholinergic	72	11.83	65	57.53
Antibiotic	114	18.75	72	63.73
Corticosteroids	100	16.45	69	61.06
Mucolytics	57	9.38	43	38.06
Anti-histamines	62	10.20	40	35.40
Leukotriene antagonist	36	5.92	34	30.09
Anti tussives	3	0.5	1	0.9

	608	100	Out of 113 Prescriptions	
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Upon categorizing these drugs based on their pharmacological classification as shown in Table No: 2 it is found that bronchodilators (38.8%) are the predominantly used drugs in management of the COPD followed by antibiotics (18.75%) which provides support for the treatment of chronic obstructive pulmonary disease by preventing further exacerbation or chances of infection

Corticosteroids (16.45%) are the 3rd most prescribed and 2nd most prescribed COPD drugs in the management of COPD, followed with antihistamines, mucolytics and leukotriene antagonist i.e. 10.20%, 9.38% and 5.92% respectively, which are used for the symptomatic treatment for the chronic obstructive pulmonary disease.

This table also provides information about the number of patients who are using with specific classes of drugs. It is clearly shown that beta-2 agonists have been prescribed to 82 patients out of the total population of

113 patients who diagnosed with COPD, which indicates that 72.51% of people are taking with beta-2 agonists which act as a primary bronchodilator to relieve bronchoconstriction and airway limitations and also for the symptomatic management of COPD, followed with antibiotics i.e. 68.53% of patients are taken with antibiotics which used to reduce the occurrence and recurrence of respiratory infection as well as exacerbation in the patients, followed with corticosteroids (61.06%) for their anti-inflammatory effect to reduce the inflamed airway and anticholinergics (57.53%) which considered for the maintenance therapy in COPD to improve lung function.

In Bronchodilator, Beta-2-agonist was the first choice of class when compared with other two categories of Bronchodilator. About 82 (40.39%) drugs out of 203 are of Beta-2-agonist, followed by 65 (32.02 %) drugs of Anticholinergics and 56 (27.59%) Methylxanthine were being prescribed to the patients, shown in Table No:03

**Table No. 03: Distribution of prescribed Bronchodilators among COPD drugs**

Category	No of Drugs	Percentage
<b>BETA 2 AGONIST (n=82)</b>		
SABA	50	60.98
LABA	20	24.39
SABA + LABA	12	14.63
<b>METHYL XANTHINES (n=56)</b>		
Doxofylline	32	57.14
Etofylline + Theophylline	20	35.72
Theophylline	4	7.14
<b>ANTICHOLINERGICS (n=65)</b>		
Ipratropium bromide	33	50.77
Glycopyrrolate	25	38.46
Ipratropium bromide + Glycopyrrolate	6	9.23
Ipratropium bromide + Tiotropium bromide	1	1.54
<b>Total</b>	<b>203</b>	

**Table No. 04: Distribution of prescribed Antibiotics among COPD drugs**

Antibiotic	No. of. Drug (n=114)	Mono therapy	Combinational therapy	Percentage (100%)
Cephalosporins	28	12	16	24.56
Macrolides	24	24	0	21.05
Quinolones	20	20	0	17.54
Penicillin	13	0	13	11.40
Carbapenem	8	08	0	7.02
Aminoglycosides	7	07	0	6.14
Tetracyclines	6	0	06	5.26
Lincosamide	5	05	0	4.39
Oxazolidinone	3	03	0	2.63

The use of antibiotics was classified according to their class of drug was represented in Table No: 04. It was observed that Cephalosporins class of antibiotics were mostly used in COPD patients (24.56%) followed

by Macrolides (21.05%) which is prescribed as a mono drug, Quinolones (17.54%) and Penicillins (11.40%) given as both single and combinational option to the patients

**Table No. 05: Distribution of prescribed Corticosteroids among COPD drugs**

Category	No. of Drug	Percentage (%)
<b>INHALED CORTICOSTEROIDS (n=55)</b>		
Budesonide	55	55
<b>SYSTEMIC CORTICOSTEROIDS (n=45)</b>		
Methylprednisolone	19	19
Hydrocortisone	10	10
Dexamethasone	10	10
Deflazacort	4	4
Prednisolone	2	2

The use of inhaled corticosteroids was higher when compared to the systemic corticosteroids which are shown in Table No: 05. In inhaled corticosteroids, budesonide was the drug of choice used in the treatment of COPD, while in systemic corticosteroids, Methylprednisolone was considered in higher number, followed by Hydrocortisone and Dexamethasone. Only in 4% and 2% of cases, deflazacort and prednisolone was preferred.

Acetyl cysteine and acebrophylline combination (39.53%) was the most preferred mucolytic agents among the study population followed by acetyl cysteine and ambroxol combination (20.93%). The use of single mucolytics was preferred in lesser number of study populations that is about 18.60% (Acebrophylline), 13.96% (Ambroxol) and 16.98% (Acetyl cysteine) when compared with the combination use of mucolytic agents as mentioned in Table No: 06.

**Table No: 06: Distribution of prescribed Mucolytics among COPD drugs**

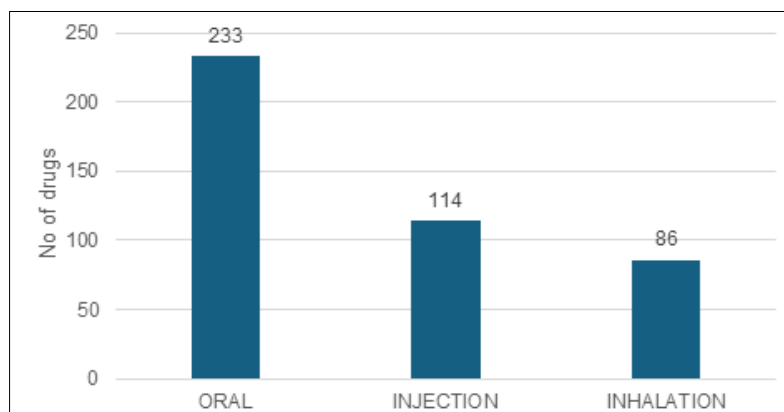
Mucolytic agents	No of prescriptions (n=43)	Percentage
Acetylcysteine + Acebrophylline	17	39.53
Acetylcysteine + Ambroxol	9	20.93
Acebrophylline	8	18.60
Ambroxol	6	13.96
Acetylcysteine	3	6.98

**Table No: 07: Distribution of prescribed Antihistamine among COPD drugs**

Antihistamine	No. of Drug (n=62)	Percentage (100%)
Levocetirizine	19	30.65
Fexofenadine	14	22.58
Ebastine	12	19.35
Bilastine	5	8.06
Hydroxyzine	5	8.06
Pheniramine	5	8.06
Desloratadine	2	3.24

The distribution of use of antihistamines in the treatment of COPD was shown in the Table No: 07. Levocetirizine (30.65%) was the most commonly used

antihistamine for the symptomatic relief of COPD. Fexofenadine (22.58%) was the second most used antihistamine, followed with Ebastine (19.35%).

**Figure No.2: Route of Administration of Drugs among COPD Patients**



Based on the route of administration as shown in the Figure No: 02 the oral route of administration was mostly preferred (53.81%) than injections (26.33%) and

inhalational route (19.86%) The distribution of use of concomitant drugs was represented in the Figure No: 03

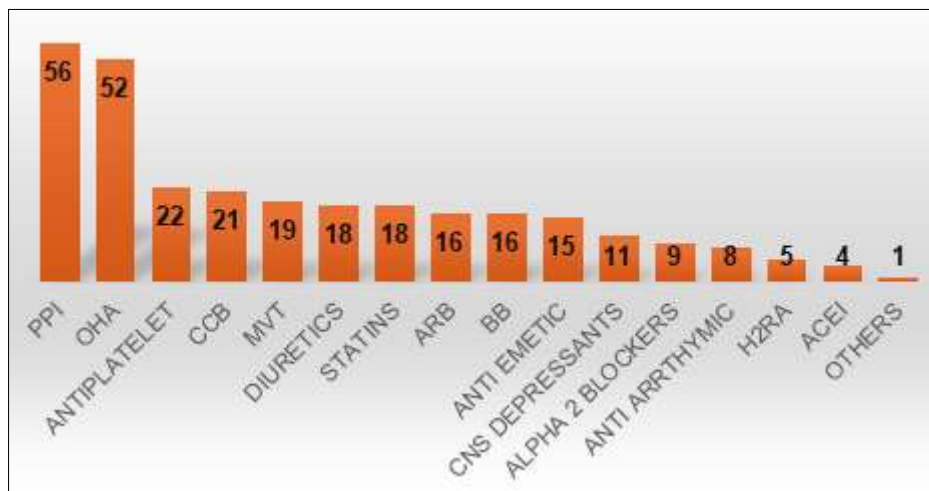


Figure No.3: Pattern of Concomitant Drug Administration

Table No: 08: Evaluation of Prescribing Pattern in COPD Patients According to WHO Core Drug Indicators

Indicators	Over all	Admission Sector		Gender		Age			Co Morbidity	
		IP	OP	M	F	45-60	61-75	76-90	YES	NO
Average medicines per encounter (1.6–1.8)	5.34	8.65	5.28	6.65	7.08	5.68	6.68	7.90	8.14	4.30
Encounters with an antibiotic (%) (20–26.8%)	75.22	83.67	48.44	65.17	58.33	68.42	57.53	80.95	62.16	64.86
Encounters with an injection (%) (13.4–24.1%)	49.56	95.92	15.63	51.69	41.67	47.37	45.21	66.67	50	45.95
Medicines prescribed in generic name (%) (100%)	1	2.05	-	1.12	-	-	-	4.76	1.31	-
Medicines prescribed from EML (%) (100%)	100	100	100	100	100	100	100	100	100	100

Table No: 08 illustrates the prescribing pattern of the drugs according to WHO core prescribing indicator

- i. **Average medicines per encounter (1.6–1.8):** The mean number of medicines given for the 113 population was found to be 5.34 which indicate poly pharmacy. Upon categorizing the total study population into different variables such as admission sector, age, gender and disease conditions it is clearly seen that IP patients are receiving more number of drugs per prescription (8.65) when compared to OP patients (5.28) similarly females are receiving slightly higher number of drugs when compared to males (6.65) and older age group of 76–90 years of age are prescribed with more number of drugs (7.90) when compared to their younger age group of 61–75 years (6.68) and 45–60 years of age (5.68). There is a broad range of variation has seen in the patients who have co morbid condition (8.14) when compared with the patients those who doesn't have any comorbid condition
- ii. **Percentage of prescriptions encountered with antibiotic (20–26.8%):** From the table, it could understand that about 75.22 % of prescriptions were

given with antibiotic which is very high to standard range. The use of antibiotic was higher in IP patients (83.67) than the OP patients (48.44%) and the use of antibiotics was more in male gender (65.17) than females (58.33%). Similar to the average number of medicines, the amount of antibiotic use also seems to be high in elder patients of age group 75–90 years (80.95%) when compared to 45–60 and 61–75 years of age group (68.42% and 57.53%). The use of antibiotics was almost similar in all disease condition.

- iii. **Percentage of prescriptions encountered with antibiotic (13.4–24.1%):** Out of 113 prescriptions, 49.56 % of prescriptions are given with injections. In IP almost every patient (95.92%) received injection form of drug while in OP sector the use of injection is well within the normal range (15.63%). The use of injection was in similar range in younger and middle age group (47.37% & 45.21% respectively) while the elder age groups need a higher use (66.67%) of injection form for drug administration.

- iv. **Percentage of medicines prescribed in generic name (100%):** The percentage of drugs prescribed with generic name are very low (approx. 1%) according to the WHO core indicators.
- v. **All the medicines which are prescribed to the study population are from the Essential Medicine List (EML).**

## DISCUSSION

There were 113 prescriptions involved in the study, and on totalling it was bearing 762 drugs; among those, 433 drugs were prescribed for treating COPD, and 329 drugs were prescribed for concomitant diseases. On looking deeper into the COPD drugs, bronchodilators (n=236) were the most prescribed drugs, followed by antibiotics (n=114), and the third most commonly prescribed drug was corticosteroids (n=100). The study conducted by *Mary Afrane et al.* [9] enumerates that bronchodilators are the most commonly prescribed drug for COPD, followed by corticosteroids, where only 20% of prescriptions heard it as a treatment for COPD. As per GOLD guidelines, corticosteroids are often preferred in severe stages of COPD. The least commonly prescribed drug was antitussives, which are used for symptomatic treatment. While comparing this statement with the result of the study conducted by *Phillippa J. Poole et al.* [10], the result states that mucolytics are the least commonly prescribed because of their side effects, but here 38.06% of prescriptions were prescribed with mucolytics.

Among 329 drugs, 56 PPIs were prescribed as a preventive therapy to the patients. Then anti-hypertensive agents and oral hypoglycemic agents were prescribed the most because hypertension and diabetes mellitus were the most common co-morbidities. Likewise, the study carried out by *Wissam M. Chatila et al.* [11] provided the same information regarding the comorbidities and their respective drugs.

Among beta-2 agonists, SABAs were the most commonly prescribed in the initial stage of COPD and they were seen in maximum number of prescriptions, followed by LABA and SABA+LABA for the further stages of COPD. Among anticholinergic agents, ipratropium bromide was the most commonly prescribed. Similar results were found in the study conducted by *Vishnu Sharma M. et al.*, [12] and *Douglas C. McCrory et al.*, [13]. Considering methylxanthines, doxofylline was most commonly prescribed, and theophylline was least commonly prescribed among COPD patients. But contrasting results were found in the study conducted by *R. Graham Barr et al.* [14], i.e., theophylline and aminophylline were the most commonly prescribed methylxanthines among COPD patients.

Corticosteroids were found to be the third most prescribed drug among the COPD encounters; among those, inhaled corticosteroids, i.e., budesonide, are more common than systemic corticosteroids, i.e.,

methylprednisolone. The study conducted by *Walters JAE et al.* [15], explained that methylprednisolone, an systemic corticosteroid, was the most commonly prescribed. Antihistamines were used to manage COPD symptoms like cough or breathlessness. The study conducted by *Barbara Bonnesen et al.* [16], discussed that 2nd-generation antihistamines like levocetirizine and cetirizine are the commonly prescribed drugs; this same result has been found in this study.

Cephalosporins were found to be the most common antibiotic prescribed among COPD patients. But the studies carried out by *Poonam Salwan et al.* [17] and *Xin Yin et al.* [18] have shown that penicillins were the most commonly prescribed antibiotics among COPD patients.

Inhalations were more preferred than oral and intravenous routes of administration. Similar results were found in the study conducted by *Khizar S. Khan et al.* [19]. The study conducted by *Yazan Zayed et al.* [20] resulted in the finding that triple therapy (LAMA+LABA+ICS) is more commonly prescribed than dual therapy (LABA+ICS), the current study also resulted that triple therapy were more commonly prescribed than dual therapy.

Discussing the WHO core indicators, the prescriptions were holding 5-6 drugs for the treatment of COPD, 75.22% of antibiotics were prescribed, 49.56% of injections were prescribed, 99% of drugs were prescribed by their brand name, and 100% of drugs were prescribed from the essential medicine list, except the indication of essential medicine list, all other indicators were not prescribed as per WHO core indication norms. The study conducted by *Nikhil Verma et al.* [21] wrote that most of the COPD prescriptions analysed at the respective site were prescribed as per the WHO core indicators.

## CONCLUSION

Bronchodilators, corticosteroids, and antibiotics emerged as the most frequently prescribed drug classes for the management of COPD at the tertiary care teaching hospital. There is a visible overuse of antibiotics and brand-name prescriptions, which deviates from WHO core prescribing indicators, even though the overall prescribing pattern is in compliance with standard therapeutic guidelines. An attempt to maximize the management of COPD is evident in the sensible use of drugs, especially the preference for inhalation therapy and fixed-dose combinations. Better adherence to essential prescribing practices is thus required and this includes using generic names more frequently and administering antibiotics wisely. Ongoing prescription audits and educational interventions can thus promote rational drug usage and improve patient outcomes in the treatment of COPD.

## LIMITATIONS

It was limited to a single tertiary care teaching hospital, which may restrict the applicability of the findings to broader or varied healthcare settings and the sample size was also limited.

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