An Observational Study on Drug Utilization Pattern in Asthma and Chronic Obstructive Pulmonary Disease in Tertiary Care Teaching Hospital

Rajesh Hadia[1*], Priyesha Bhatt[1], Anadisharan Panchal[1], Anjali Gandhi[1], Trupal Rathod[2], Dhaval Joshi[2], Sunil Baile[1], Rajesh Maheshwari[1], Stani Ajay[3] and Hemraj Singh Rajput[1]

[1]*Department of Pharmacy, Sumandeep Vidyapeeth Deemed to be University, Vadodara-391760, Gujarat, India.*
[2]*Department of Pharmacy Practice, Maliba Pharmacy College, Mahuva-Bardoli Road, Bardoli-394350, Gujarat, India.*
[3]*Department of Respiratory, SBKS Medical Institute and Research Center, Sumandeep Vidyapeeth Deemed to be University, Vadodara-391760, Gujarat, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

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ABSTRACT

Background: Obstructive airway diseases such as asthma and COPD are defined as a decreased capacity to get air through the conducting airways and out of the lungs.
Objective: To study the drug utilization pattern in asthma and chronic obstructive pulmonary disease, determine irrationally (does not comply with prescription) drug usage, and whether they were prescribed following the standard treatment guidelines.
Methodology: A total of 150 patients of either sex aged 18 years and above having asthma and/or COPD were included in the study. The medical records of patients were checked and information was recorded. The prescriptions were analyzed for drug utilization patterns. The newly diagnosed patients were followed up and medication adherence was determined after 1 month.

*Corresponding author: E-mail: docrajesh.hadia@gmail.com;

Results: Out of all 150 patients there were 103 male and 47 female patients. 54 patients were having asthma, 89 patients COPD, and 7 patients asthma COPD overlap. The majority of the patient were prescribed 1 to 3 drugs per prescription. Inhaled corticosteroids were the highest prescribed drug class. The most commonly prescribed drug combination was budesonide + formoterol. The majority of the patients have poorly adhered to the treatment.
Conclusion: Study data highlights that very few drug interactions were identified between prescribed medications. The drugs and their combinations were prescribed according to the standard guidelines GOLD (Global Initiative for Chronic Obstructive Lung Disease) and GINA (Global Initiative for Asthma).

1. INTRODUCTION

Chronic lung diseases are divided into two categories (1) obstructive and (2) restrictive. The symptoms of obstructive and restrictive lung disease might be similar but they affect the lungs in different ways. For example, asthma, chronic obstructive pulmonary disease (COPD) are obstructive lung diseases [1,2]. Obstructive airway disease can be diagnosed by spirometry and other type of lung function test. Spirometry and the calculation of FEV1/FVC allow the identification of obstructive or restrictive ventilatory defects [3]. Annually there are approximately 489,000 deaths due to asthma. The majority of deaths occur in low and middle-income countries like Oceania, South Asia, Middle East, and Africa. As per a recent study in India on the epidemiology of asthma, the prevalence of asthma in India is 2.05% among those aged > 15 years. The estimated national burden is 18 million asthmatics [4]. General goals for asthma management are achieving symptom control, maintaining normal physical performance, minimizing the risk of exacerbations, fixed airway obstructions, and side effects of the therapy. Inhalation therapy is preferred in asthma as it provides high local concentrations, fewer side effects, and good tolerance [5]. Many epidemiological studies have shown that asthma and COPD may coexist, or at least one condition may evolve into the other making a condition known as Asthma and COPD Overlap Syndrome (ACOS). It is a syndrome in which older adults with a significant smoking history have features of asthma along with their COPD [6]. COPD is responsible for early mortality, high death rates, and significant cost to the health care system. COPD is estimated to be the third leading cause of death in the world by 2020 [7]. India contributes very significantly to mortality from COPD 102.3/100,000 and 6,740,000 disability-adjusted life years out of a world total of 27,756,000 disability-adjusted life years; thus, significantly affecting health-related quality of life in the country. Multiple studies from 1994 to 2010 show an increasing number of COPD morbidity and mortality [8]. Drug Utilization Evaluation (DUE), also known as Drug Utilization Review (DUR) and Medication Utilization Review (MUR) is an ongoing, systematic, criteria-based program of medical evaluation that will help ensure appropriate medicine use. The DUE will help to define appropriate medicine use, auditing criteria against what is being prescribed, providing feedback to prescribers on all identified problems, monitoring to see if criteria are followed, and prescribing is improved. There are many medicine use problems such as, polypharmacy, choosing incorrect medicines, prescribing the incorrect dose, prescribing medicines that cause adverse drug reactions (ADRs) or medicine interactions, and using more expensive medicines when less expensive medicines would be equally or more effective. The DUE is needed to control this irrational medicine use [9]. Medication adherence is a key factor in determining the therapeutic outcomes of medications, especially in patients suffering from chronic illness. Whatever the efficacy of a drug, it cannot act unless the patient takes as prescribed. Low medication adherence is an important factor as it seriously undermines the benefits of current medical care and imposes a significant financial burden on individual patients and the whole health care system [10]. As per a study by Gillissen A. nonadherence in asthma treatment results in an increased rate of mortality and morbidity. It is also associated with increased costs of treatment. Nonadherence might be either intentional or unintentional. The reasons for intentional non-adherence might be anxiety (regarding side-effects, dependence, or overdose), the awkwardness of taking medication, an embarrassment of having diseases especially in children, youth, and young adults, inconvenience of treatment (higher with

inhalation therapy), forgetfulness, laziness, and unwillingness to change lifestyle (e.g., many patients continue smoking regardless of their asthma or COPD). Some unintentional reasons for nonadherence are complicated or time-consuming treatment, inadequate training in the inhalation technique, and lack of understanding about the disease and the need of continuing the treatment [11]. Medication adherence can be improved by providing the patients with adequate knowledge about the disease, the need for continuing the therapy even in a symptoms-free period, and techniques of using inhaler devices. Various methods of improving adherence should be used by health care practitioners. We aimed to study the drug utilization pattern in asthma and chronic obstructive pulmonary disease, determine irrationally (does not comply with prescription) drug usage, and whether they were prescribed following the standard treatment guidelines.

2. METHODOLOGY

It was a prospective observational cross-sectional and cohort study conducted for 6 months at the Department of Respiratory Medicine, Dhiraj General Hospital, Vadodara, Gujarat, India. All patients of either sex aged 18 years and above diagnosed as suffering from asthma and/or COPD with or without co-morbidities who were included in a study after explaining to the patients, the details of the study, the Informed consent form was taken. The patient's medical records were checked and the following information was noted in the Patient Medical Record sheet: Patient's demographic details, Patient Medical History, Diagnosis and duration, family history, presence of other co-morbidities, Past Medication history, Prescribed drugs including (Frequency, Dose, Route of administration and Duration) was also collected, Drug interaction, Cost of drugs, Lab investigations reports (which are already mentioned inpatient medical records). All the relevant data was obtained from the patients' medical records and through counseling the patients who visited the Out- Patient Department (OPD) or In-Patient Department (IPD). Morisky's adherence scale was used to assess the adherence of patients to prescribed drugs. Drug interactions between prescribed medications were determined using a Micromedex drug interaction checker. After the data collection, all the data were exported to statistical software for statistical analysis. All the quantitative data were represented in percentage (%) and mean ± standard deviation. Comparative statistical differences were calculated using appropriate parametric tests. The categorical data were represented in the median and comparative statistical differences were calculated by using appropriate non-parametric statistical tests (Chi-square test and independent t-test). The graphical representative was used for a better understanding of the data. A p-value of ≤0.05 was considered significant.

3. RESULTS

A total of 150 prescriptions of asthma and/or COPD were collected from the department of respiratory medicine. Out of all 150 patients, 103 (68.67%) patients were males and 47 (38.33%) patients were females. Among asthma patients there were 44% (N=24) male (mean age±SD 36.17±13.46) and 56% (N=30) female patients (mean age±SD 39.07±13.3). In COPD patients there were 82% (N=73) male (mean age±SD 58.78±15.18) and 18% (N=16) female patients (mean age±SD 55.15±14.06). 86% (N=6) (mean age±SD 53.83±15.65) male and 14% (N=1) female patients were having asthma COPD overlap syndrome (ACOS). In the age group 18-40 years, there were 69.57% (N=32) patients of asthma (mean age±SD 29±6.44) followed by 26.09% (N=12) patients of COPD (mean age±SD 34.42±4.99) and 4% (N=2) patients with both diseases (mean age±SD 28.5±6.36). In the age group 41-60 years, there were more patients with COPD (64.41%) (N=38) (mean age±SD 51.92±5.61) compared to asthma (32.2%) (N=19) (mean age±SD 48.11±4.48). This pattern was followed by the age group 61-90 years with 86.67% (N=39) (mean age±SD 70.28±6.44) patients of COPD and 6.67% (N=3) patients of asthma (mean age±SD 70±7).

The most common comorbid condition among all patients was hypertension in a total of 33 patients (22%), followed by type 2 Diabetes in 13 patients (9%). Allergic rhinitis, bronchiectasis, and lower respiratory tract infections were present in 5% (N=7), 2% (N=3), and 3% (N=4) patients respectively. Other cardiovascular conditions such as ischemic heart disease, myocardial infarction, rheumatic heart disease, cardiovascular accident, coronary artery disease was also seen as a comorbidity in 9 patients (6%). There were other comorbid conditions present including UTI, hyperthyroidism, deficiency dermatosis, psoriasis Vulgaris, neuralgia, haemorrhoids, chronic lung disease, etc. in 10 patients (7%) [as shown in Fig. 1].

Table 1. Patient distribution based on gender and disease

Disease	Asthma (N=54)	COPD (N=89)	Asthma + COPD (N=7)
Male	24 (44%)	73 (82%)	6 (86%)
Mean age±SD	(36.17±13.46)	(58.78±15.18)	(53.83±15.65)
Female	30 (56%)	16 (18%)	
Mean age±SD	(39.07±13.3)	(55.15±14.06)	1 (14%)

Table 2. Patient distribution based on age

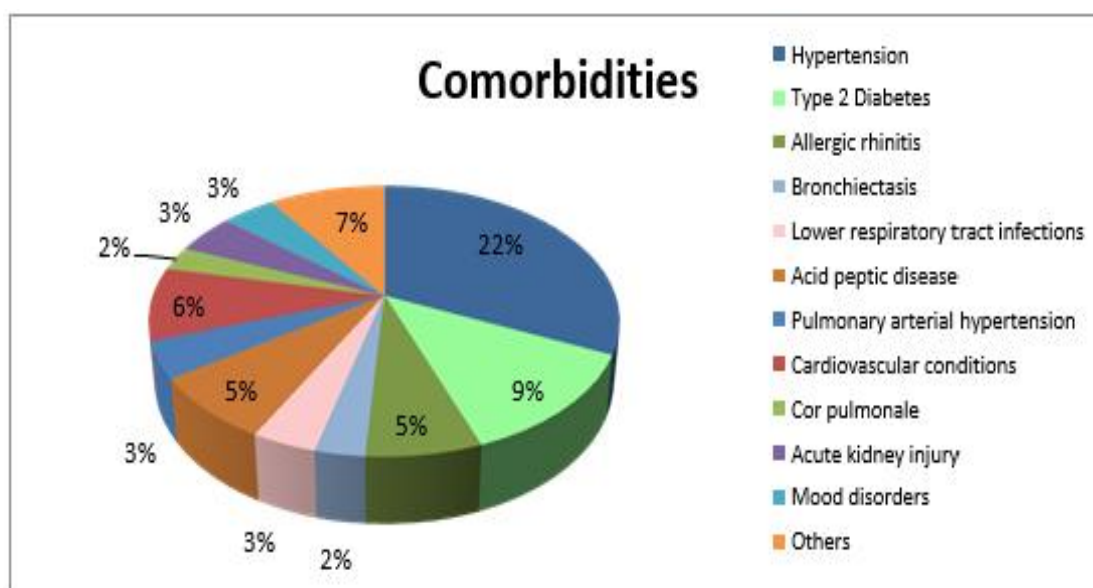| Age (years)	Asthma	COPD	Asthma + COPD
18-40	32 (70%)	12 (26%)	2 (4%)
Mean age±SD	(29±6.44)	(34.42±4.99)	(28.5±6.36)
41-60	19 (32%)	38 (65%)	2 (3%)
Mean age±SD	(48.11±4.48)	(51.92±5.61)	(44±2.83)
61-90	3 (6.67%)	39 (86.67%)	3 (7%)
Mean age±SD	(70±7)	(70.28±6.44)	(67.33±4.62)

Fig. 1. Percentage of comorbid conditions

A total of 54 patients were either homemakers or students or not working at all. They all fall in the unemployed category. In the group of working people, 72% (N=71)patients were working as occupation class 3 (persons engaged in occupations requiring manual labour or heavy machinery or exposure to certain hazardous conditions) which includes farmers, construction site workers, factory workers, sweeper, labours, drivers, carpenters, cooks, etc. 15% patients (N=14) were working as occupation class 2 (persons engaged in skilled and semi-skilled work and not exposed to hazardous conditions) such as barber, tailor, salesman, etc. 10% patients (N=10) were working as occupation class 1 (professionals and persons engaged in executive, administrative or clerical duties) such as teachers, company employees, etc. Among asthma patients, the majority of the patients (88.89%) (N=48) were non-smokers, whereas very few patients (5.56%) (N=3) were current smokers and an equal number of patients left smoking in past. Out of all the COPD patients, the count of current smokers (40.44%) (N=36) and non-smokers (38.2%) (N=34) was almost equal. 21.34% (N=19) of COPD patients were ex-smokers. Among the patients having both asthma and COPD 14.28% (N= 1) patients never smoked in their lifetime, whereas the ratio of

current smokers and ex-smokers was exactly similar with 42.85% (N=3).

Inhaled corticosteroids (25.19%) (N=129) were prescribed the highest out of all the drug classes. This was followed by long-acting beta-2 agonists (LABA) (17.77%) (N=91) and antibiotics (16.6%) (N=85). Anticholinergics were prescribed in 14.06% (N=72) patients. Anticholinergics were followed by short-acting beta-2 agonists (SABA) (11.32%) (N=58) and methylxanthines (8.2%) (N=42). Systemic corticosteroids (3.51%) (N=17) and leukotriene modifiers (3.32%) (N=17) were prescribed in very few patients. Among asthma patients' corticosteroids (42%) (N=52) were the highest prescribed drugs followed by LABA (37%) (N=46), anticholinergics (8%) (N=10), SABA (7%) (N=9), and methylxanthines (6%) (N=8). In COPD patients' corticosteroids (34%) (N=89) were again the highest prescribed drugs among all followed by anticholinergics (21%) (N=55), LABA (17%) (N=44), SABA (16%) (N=42), and methylxanthines (13%) (N=33). In patients having both asthma and COPD SABA (33%) (N=7) and anticholinergics (33%) were the highest prescribed drugs with the p-value <0.05. This is statistically significant.

Drugs prescribed in different dosage forms: Out of all the drugs prescribed for asthma and COPD, the majority of the drugs (55.73%) (N=204) were prescribed in the inhalation dosage form. 36.61% (N=134) drugs were prescribed in oral dosage form and only 7.65%

(N=28) drugs were prescribed parenteral dosage form. Among asthma patients, 39% (N=39) of drugs were prescribed in oral dosage form and 61% (N=61) drugs were prescribed in the inhalation dosage form. In COPD patients 53% (N= 132) drugs were prescribed in inhalation dosage form followed by oral (36%) (N=91) and parenteral (11%) (N=27) dosage form [Figs. 2 and 3].

Antibiotics prescribed: Among antibiotics Doxycycline was the choice of drug in the majority of the patients (33%) (N=27) followed by amoxicillin and potassium clavulanate (25%) (N=20). Azithromycin (22%) (N=18) stands next in the line. Azithromycin is followed by cephalosporins (ceftriaxone, cefadroxil, and cefoperazone) (14%) (N=11), clarithromycin (4%) (N=3), and levofloxacin (2%) (N=2). Azithromycin (47.37%) (N=9) was the most preferred antibiotic in asthma patients followed by amoxicillin and potassium clavulanate (26.32%) (N=5), doxycycline (21.05%) (N=4), and levofloxacin (5.26%) (N=1), whereas in COPD patient's doxycycline (37.93%) (N=22) was the highest prescribed antibiotic followed by amoxicillin and potassium clavulanate (25.86%) (N=15), cephalosporins (15.52%) (N=9), azithromycin (13.79%) (N=8), clarithromycin (5.17%) (N=3), and levofloxacin (1.72%) (N=1). Among patients with both diseases cephalosporins (50%) (N=2), doxycycline (25%) (N=1), and azithromycin (25%) (N=1) were the choice of antibiotics.

Table 3. Drugs prescribed by class

Class of drugs	Number of patients	Percentage
Systemic corticosteroids	17	3.32%
Inhaled corticosteroids	129	25.19%
SABA (Short-Acting Beta Agonists)	58	11.32%
LABA (Long-Acting Beta Agonists)	91	17.77%
Antibiotics	85	16.6%
Anticholinergics	72	14.06%
Methylxanthines	42	8.2%
Leukotriene modifiers	17	3.32%

Table 4. Drugs prescribed by class

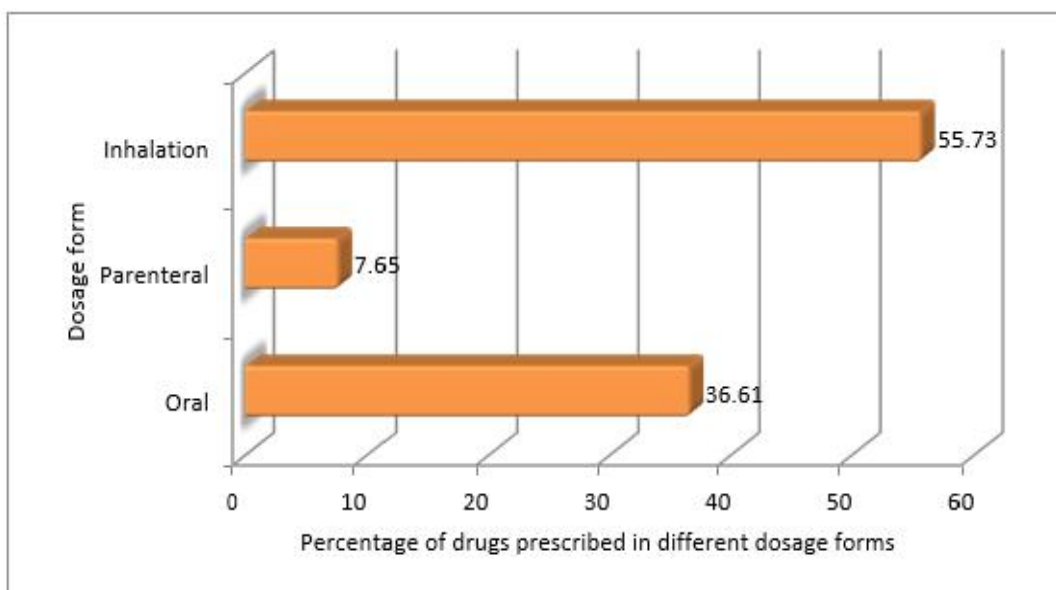| Class	Asthma	COPD	Asthma + COPD
Corticosteroids	52 (42%)	89(34%)	5(24%)
SABA (Short-Acting Beta Agonists)	9 (7%)	42(16%)	7(33%)
LABA (Long-Acting Beta Agonists)	46 (37%)	44(17%)	1(5%)
Methylxanthines	8 (6%)	33(13%)	1(5%)
Anticholinergics	10 (8%)	55(21%)	7(33%)
Total	125 (100%)	263 (100%)	21 (100%)

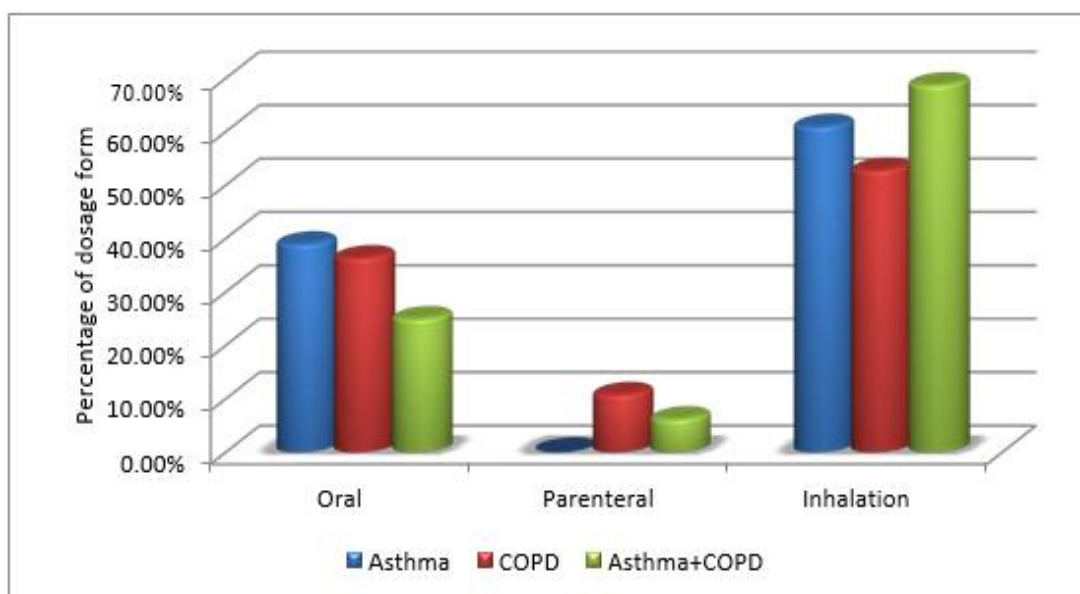**Fig. 2. Percentage of drugs prescribed in different dosage forms**

Fig. 3. Percentage of drugs prescribed in different dosage forms by disease

Table 5. Antibiotics prescribed by disease

Antibiotics	Asthma	COPD	Asthma + COPD
Amoxicillin +Potassium clavulanate	5 (26.32%)	15 (25.86%)	0 (0%)
Cephalosporins	0 (0%)	9 (15.52%)	2 (50%)
Clarithromycin	0 (0%)	3 (5.17%)	0 (0%)
Doxycycline	4 (21.05%)	22 (37.93%)	1 (25%)
Levofloxacin	1 (5.26%)	1 (1.72%)	0 (0%)
Azithromycin	9 (47.37%)	8 (13.79%)	1 (25%)

Table 6. Drugs prescribed as adjuvant therapy

Drugs	Percentage
Multivitamins	34 (19.10%)
Calcium + Vitamin D3	13 (7.30%)
Calcium	16 (8.99%)
Pantoprazole	42 (23.60%)
Famotidine	16 (8.99%)
Domperidone + Esomeprazole	30 (16.85%)
Acetylcysteine	19 (10.67%)
Diclofenac + Paracetamol	3 (1.68%)
Paracetamol	3 (1.68%)
Dexchlorpheniramine	2 (1.12%)

Drugs prescribed as Inhalation: Budesonide and formoterol were given in the majority of the patient (44.12%) (N=90) as inhalation therapy followed by salbutamol + ipratropium bromide (26.96%) (N=55). Other drugs prescribed as inhalation were budesonide (18.13%) (N=37), ipratropium bromide (4.41%) (N=9), tiotropium bromide (3.92%) (N=8), salbutamol (1.47%) (N=3), and fluticasone (0.98%) (N=2).

Drugs used as fixed drug combinations: Majority of patients were prescribed with fixed drug combinations. Budesonide + formoterol (39.47%) (N=90), salbutamol+ ipratropium bromide (24.12%) (N=55), domperidone + esomeprazole (13.16%) (N=30), levocetirizine + montelukast (7.02%) (N=16), acebrophylline + acetylcysteine (6.14%) (N=14), bromhexine + guaifenesin + terbutaline (1.75%) (N=4), and etophylline + theophylline (8.33%) (N=19). The drug combination of budesonide + formoterol (62%) (N=46) was prescribed the highest times in asthma patients followed by the combination of levocetrizine + montelukast (16%) (N=12), salbutamol + ipratropium bromide (11%) (N=8), acebrophylline + acetylcysteine (9%) (N=7) and etophylline + theophylline (1%) (N=1). In COPD patients the drug combinations of budesonide + formoterol (39%) (N=43) and salbutamol + ipratropium bromide (36%) (N=40) were prescribed in almost similar number of patients followed by etophylline + theophylline (16%) (N=18), acebrophylline + acetylcysteine (6%) (N=7), levocetrizine + montelukast (3%) (N=3). Drugs prescribed as adjuvant therapy: Many drugs were prescribed as adjuvant therapy including multivitamins, antacids, calcium, antihistamines, analgesics etc. Pantoprazole (23.60%), multivitamins (19.10%), domperidone and esomeprazole (16.85%), acetylcysteine (10.67%), famotidine (8.99%), calcium (8.99%), calcium and vitamin D3 (7.30%), diclofenac and paracetamol (1.68%), dexchlorpheniramine

(1.12%). Drugs prescribed in brand name or generic name: Out of 150 prescriptions 45% (N=168) drugs were prescribed in brand name and 55% (N=202) drugs were prescribed in Generic name.

Drug interactions: There were 14 drug interactions found between medications prescribed for asthma and COPD. The highest number of drug interactions were between the drugs theophylline + Azithromycin (N=5), followed by budesonide + diclofenac (N=3), budesonide + clarithromycin (N=2), doxofylline + formoterol (N=1), doxofylline + furosemide (N=1), doxofylline + ranitidine (N=1), levofloxacin + theophylline (N=1).

Inhaler device technique: Out of 150 patients 64 % (N=96) of patients used the proper technique of using the inhaler device properly and 36% (N=54) patients were not using inhaler devices properly [as shown in figure 5.18]. This was recorded from the patient's medical data. Medication adherence: Out of 150 patients, 53 patients were newly diagnosed with either asthma or COPD. The medication adherence was checked in newly diagnosed patients. Medication adherence was determined by the Morisky medication adherence scale (MMAS-8). There was 15.09% (N=8) high adherence, 37.74% (N=20) medium adherence, and 47.16% (N=25) low adherence among newly diagnosed patients prescribed with the medications for asthma and COPD with the p-value <0.05 which is statistically significant.

4. DISCUSSION

In our study, it was observed that there were a greater number of male patients (68.67%) than female patients (38.33%). This is similar to a previous study by Niffy et al. in which male patients (75.2%) were more compared to female

patients (24.8%) [12]. Out of 150 patients, there were 54 patients with asthma, 89 patients with COPD, and 7 patients with asthma + COPD overlap syndrome. Among asthma patients, there were 44% male and 56% female patients. In COPD patients there were 82% male and 18% female patients. 86% male and 14% female patients were having ACOS. The patients were distributed into 3 age groups: 18-40 years, 41-60 years, and 61-90 years. Among asthma patient's majority of the patients (69.57%) were from the age group 18-40 years and very few patients (6.67%) from the age group 61-90 years. These results were nearly similar to the study by Laxminarayan Kamath et al. where the majority of asthma patients (50%) were between the age between 18 and 38 years and only a few patients (11.3%) of age above 59 years [13].
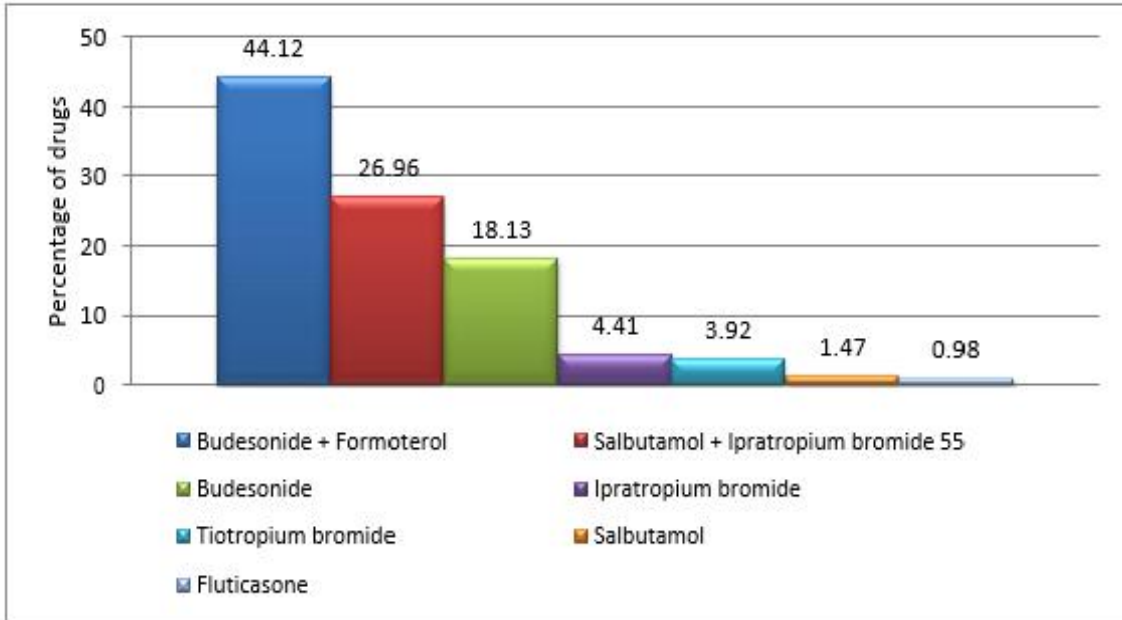

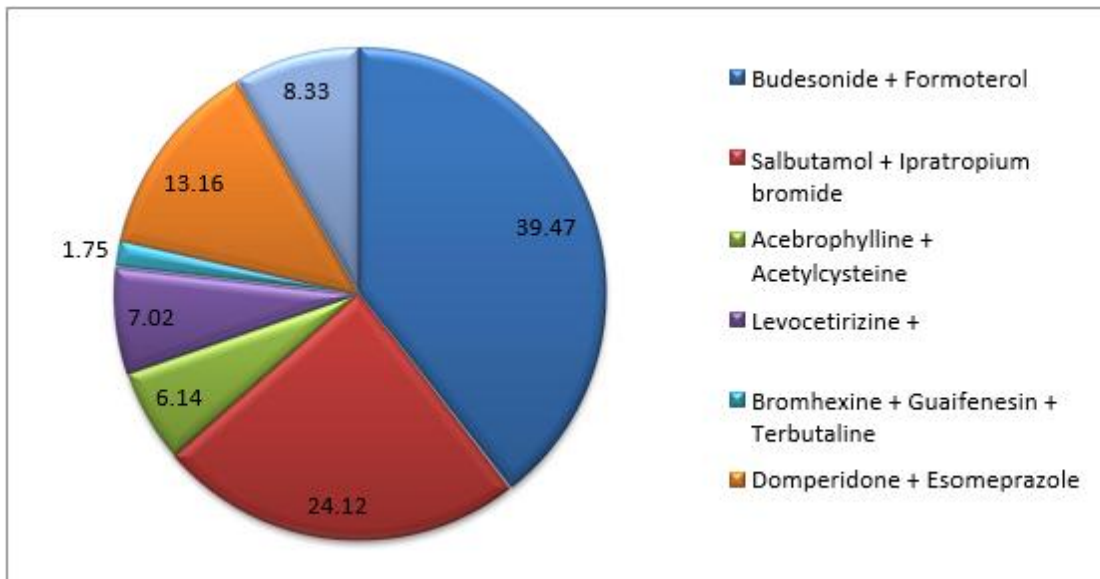**Fig. 4. Percentage of drugs prescribed as inhalation**
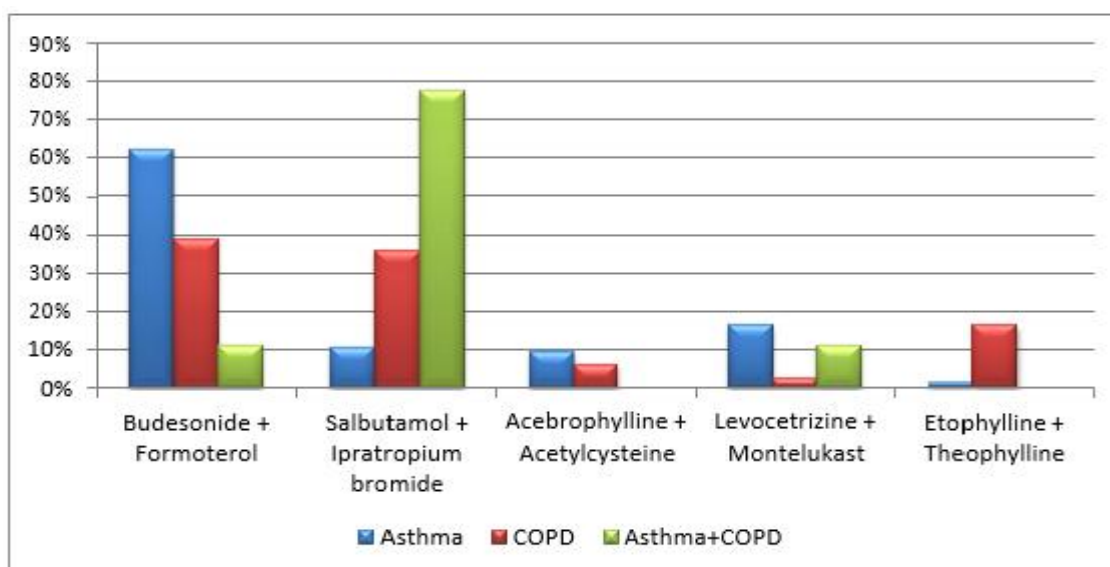

Fig. 5. Percentage of drugs used as fixed drug combinations

Fig. 6. Percentage of drugs used as fixed drug combinations

Table 7. Drug interactions

Drug interactions	Number of patients	Severity	Effect	Management
Budesonide+ Clarithromycin	2	Moderate	Clarithromycin inhibits the metabolism and increase the exposure of budesonide	Use with caution
Budesonide + Diclofenac	3	Major	May increase the risk of gastrointestinal ulcer and bleeding	Monitor for signs of bleeding
Doxofylline+ Formoterol	1	Moderate	May result in increased risk or severity of Adverse effects	Use with caution
Doxofylline + Furosemide	1	Minor	May result in hypokalemia	Use with caution
Doxofylline	1	Minor	May result in increased serum concentrations of doxofylline	Careful monitoring of serum doxofylline concentrations
Levofloxacin+ Theophylline	1	Major	May result in theophylline toxicity (nausea, vomiting, palpitations, seizures)	Monitor theophylline level closely and make appropriate dosage adjustments
Theophylline+ Azithromycin	5	Moderate	May result in increased serum concentrations	Careful monitoring of plasma theophylline concentrations

Among COPD patients a greater number of patients were from the age group 61-90 years, followed by the age group 41-60 years (64.41%) and 18-40 years (26.09%). These results were found to be quite similar to the study by Uma et al. where the majority of COPD patients (80.2%) were aged above 60 years. The mean age of males was found to be 50.22±16.33 years and the mean age of females was 50.35±16.31 years

[14]. In our study, the most common co-morbid conditions among all patients were hypertension in 22% followed by Type 2 Diabetes Mellitus in 9% of patients. Allergic rhinitis, bronchiectasis, and LRTI were present in 5%, 2%, and 3% of patients respectively in both cases. Other cardiovascular conditions were also seen as co-morbidity in 6% of patients. There were other co-morbid conditions present including UTI,

hyperthyroidism, deficiency dermatosis, psoriasis Vulgaris, neuralgia, haemorrhoids, chronic lung disease, etc in 7% of patients.

In our study, among asthma patients, the majority of the patients (88.89%) were non-smokers, whereas 5.56% of patients were current smokers and 5.56% of patients were ex-smokers. Out of all the COPD patients, the majority of patients (40.44%) were current smokers, 38.2% non-smokers, and 21.34% patients were ex-smokers. The results were in contrast with a study by Sunil et al. where more COPD patients (40%) were non-smokers followed by current smokers (33%) and ex-smokers (27%) [15]. There were 54 patients unemployed (36%). The majority of the patients were working as occupation class 1 (75%), followed by occupation class 2 (15%) and occupation class 3 (10%). We were unable to find any article with similar information.

Among all 150 patient's majority of the patients were prescribed 1 drug (31%) followed by 26% of patients prescribed 2 drugs, 25% patients 3 drugs, and 18% patients 4 drugs The result was not following the study by Niffy et al. where all the patients were prescribed with more than 3 drugs. [12] In our study Inhaled corticosteroids (25.19%) were prescribed the highest out of all the drug classes. This was followed by LABA (17.77%), antibiotics (16.6%). anticholinergics (14.06%), SABA (11.32%), methylxanthines (8.2%), systemic corticosteroids (3.51%) and leukotriene modifiers (3.32%). This was not following the study by Niffy et al. where antibiotics (19.2%) were the highest prescribed drugs, followed by LABA (4.10%), SABA (18.10%), anticholinergics (18.70%), inhaled corticosteroids (17.20%), systemic corticosteroids (6.90%) and methylxanthines (15.50%) [12]. Among drug classes prescribed for asthma corticosteroids (42%) were the highest prescribed drugs followed by LABA (37%), anticholinergics (8%), SABA (7%), and methylxanthines (6%). The results were not similar to the study by Michael et al. where methylxanthines were the highly prescribed (86.27%) drug class and anticholinergics were the least prescribed (2.61%) drugs [16]. In the drug class prescribed for COPD corticosteroids (34%) were again the highest prescribed drugs among all followed by anticholinergics (21%), LABA (17%), SABA (16%), and methylxanthines (13%). This was not similar to the study by Dr. T. Tamizh Mani et al. where anticholinergics (18.70%) were the highly prescribed drugs,

followed by Short-acting beta-2 agonists (18.10%), inhaled corticosteroids (17.20%), Methylxanthines (15.50%), systemic corticosteroids (6.90%), Long-acting beta-2 agonist (4.10%). In patients having both asthma and COPD SABA (33%) and anticholinergics (33%) were the highest prescribed drugs [17]. Out of all the drugs prescribed for asthma and COPD, the majority of the drugs (55.73%) were prescribed an inhalation dosage form. 36.61% of drugs were prescribed in oral dosage form and only 7.65% of drugs were prescribed parenteral dosage form. This was nearly similar to the study by Niffy et al. where the highest number of drugs were prescribed by inhalation (38.32%) dosage form, followed by parental and oral dosage form. Among asthma patients, 39% (N=39) of drugs were prescribed in oral dosage form and 61% of drugs were prescribed in the inhalation dosage form. In COPD patients 53% of drugs were prescribed in inhalation dosage form, 36% in oral dosage form, and 11% in the parenteral dosage form. The inhalation dosage form was more preferred in both diseases as compared to the oral and parenteral dosage form [12].

Among antibiotics, Doxycycline was prescribed in 33% of patients followed by amoxicillin and potassium clavulanate (25%), cephalosporins (14%), clarithromycin (3%), and levofloxacin (2%). These results were in contrast with the study by Niffy et al. were ceftriaxone (cephalosporins) was the highest prescribed drug 53.43%, followed by, levofloxacin (6.10%) and Azithromycin (3.70%) [14,15]. In our study azithromycin (47.37%) was the most preferred antibiotic in asthma patients followed by amoxicillin and potassium clavulanate (26.32%), doxycycline (21.05%), and levofloxacin (5.26%), whereas in COPD patients doxycycline (37.93%) was the highest prescribed antibiotic followed by amoxicillin and potassium clavulanate (25.86%), cephalosporins (15.52%), azithromycin (13.79%), clarithromycin (5.17%), and levofloxacin (1.72%). This was in contrast with the study by Sunil et al. where ceftriaxone (44%) was the highest prescribed drug followed by azithromycin (25%). In our study levofloxacin was the least prescribed antibiotic in COPD patients whereas in a study by Sunil et al. levofloxacin was prescribed in 9% of patients. Among patients with both diseases cephalosporins (50%), doxycycline (25%), and azithromycin (25%) were the choice of antibiotics [15].

In our study combination of budesonide + formoterol was given in the majority of the

patients as inhalation therapy followed by salbutamol + ipratropium bromide (26.96%), budesonide (18.13%), ipratropium bromide (4.41%), tiotropium bromide (3.92%), salbutamol (1.47%), and fluticasone (0.98%). These results were in contrast to the study by Niffy et al. where budesonide+formotetol was prescribed in 11.11% of patients whereas budesonide was highly prescribed (38.60%) as inhalation. In the study performed by Niffy et al., the combination of salbutamol+ ipratropium bromide (40.15%) was highly prescribed whereas in our study majority of patients were prescribed with a combination of Budesonide + formoterol (39.47%). This was followed by salbutamol + ipratropium bromide (24.12%), levocetirizine + montelukast (7.02%), acebrophylline + acetylcysteine (6.14%), bromhexine + guaifenesin + terbutaline (1.75%), domperidone + esomeprazole (13.16%), and etophylline + theophylline (8.33%) [12].

There were 14 drug interactions found between prescribed medication. The highest number of drug interactions were between the drugs theophylline + Azithromycin in 5 prescriptions, followed by budesonide + diclofenac in 3 prescriptions, budesonide + clarithromycin in 2 prescriptions, doxofylline + formoterol, doxofylline + furosemide, doxofylline + ranitidine, and levofloxacin + theophylline in 1 prescription. Out of 150 prescriptions, 45% of drugs were prescribed in brand name and 55% of drugs were prescribed in Generic name. These results were in contrast with the study by Sunil et al. where the majority of drugs were prescribed by brand name (89%) [15].

Adherence to the therapy was found to be high in 15.09% of patients, medium in 37.74% of patients, and low in 47.16% of patients among newly diagnosed patients prescribed the medications for asthma and COPD. We were unable to find any similar studies to compare these results with.

5. CONCLUSION

An observational study was conducted to study the drug utilization pattern of drugs prescribed in Asthma and COPD. In our study, we observed that there were a greater number of male patients than female patients. Incidence of asthma was observed more in female patients whereas the incidence of COPD was observed in male patients. The majority number of asthmatics were from the age group 18-40 years whereas a greater number of COPD patients were observed above age 40 years. Many of the patients had co-morbid conditions such as hypertension, diabetes, cor-pulmonale, allergic rhinitis, bronchiectasis, etc. along with their disease. The highest number of patients were working as class 3 occupation. The majority of the asthmatics were non-smokers whereas most of the COPD patients were smokers. The patients visiting the outpatient department were mostly prescribed with 1 or 2 drugs and 3 to 4 drugs were prescribed to admitted patients. The reason behind this might be the need to provide faster relief to the patients during exacerbation of the disease. Corticosteroids were the choice of drug among patients with asthma and COPD. Inhaled corticosteroids were the highest prescribed drugs. Doxycycline was the highest prescribed antibiotic. Among asthma patient's majority of the patients were prescribed Azithromycin whereas the majority of the COPD patients were prescribed Doxycycline. The antibiotics were prescribed to treat underlying bacterial infections that triggered asthma or COPD attacks. The inhalation route was the most preferred one. According to guidelines, inhalation therapy should be the first choice to treat obstructive lung diseases. The combination of budesonide and formoterol was the highest prescribed as inhalation therapy. Budesonide and formoterol and salbutamol and ipratropium bromide were the most commonly prescribed fixed drug combinations. All the drugs were prescribed following the GOLD and GINA guidelines. Multivitamin B- complex, calcium, and drugs to treat acidity were prescribed as adjuvant therapy. Drugs were prescribed in both brand and generic names. Few drug interactions were determined in few prescriptions. Though the majority of the patients knew the proper technique of using inhaler devices, the highest number of patients poorly adhered to their treatment.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The study obtained ethical approval from the Sumandeep Vidyapeeth Institutional Ethics Committee (Ref no: SVIEC/ON/Phar/BNPG16/D17002).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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