

A Prospective Observational Study on Prescribing Pattern of Inhalers and Evaluating the Adherence to Inhalational Technique in Patients with Obstructive Lung Disease – Pilot Study

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ABSTRACT

BACKGROUND

Obstructive Lung Diseases (OLD) mainly include Asthma and Chronic Obstructive Pulmonary Disease (COPD). They are characterized by decreased airflow out of the lungs as a result of narrowing of the airway lumen. Inhalers are the most preferred treatment as the medications are easily delivered to the respiratory tract. Inhalers help to prevent flares and keep symptoms from getting worse. But the inhalers should be used in a right way to get the proper therapeutic outcome. There is a chance for the patient to commit errors in the steps of inhalation technique which may be due to lack of information or counselling. Better outcome of Obstructive Pulmonary Disease (OPD) is associated with good adherence and usage of the drug therapy. Proper patient counselling can improve the adherence to inhalers and also minimizes the occurrence of errors in inhalational technique.

AIM

To study the prescribing pattern of inhalers and evaluating the adherence to inhalational technique in patients with obstructive lung disease.

OBJECTIVE

- To study the prescribing pattern of inhalers in obstructive lung disease.
- To assess the errors in inhalational techniques before and after patient counselling.
- To evaluate the adherence to inhalers in pulmonary patients before and after patient counselling.

MATERIALS AND METHODS

A prospective observational study was carried out in 31 patients diagnosed with COPD or asthma. Patient informations will be collected using proforma from the outpatient record and direct interview with the patient. Patient will be asked to use their inhaler and the errors in inhalation technique will be assessed by using a standard checklist.

Adherence to inhalers will be assessed by Evaluation of Adherence to Inhalers (EAI) -12 item questionnaire. Adherence will be calculated on the basis of total score of questionnaire. After the evaluation, training and counselling on proper inhalation techniques will be provided to each participants. Assessment of errors in inhalation techniques and test for adherence will be repeated one month after the patient counselling.

RESULT

The study showed that 42 % of the sample were above the age of 60. Majority of them were females (54.8%). About 54.8% were asthmatic patients. 77.4 % of patients use only one inhaler. Mostly used inhaler was MDI (58.1%) followed by DPI (32.2%) and then MDI with spacer (9.7%). Mostly used inhalational medication is Formoterol fumarate + Budesonide. Occurance of error is high in case of patients above 60 years of age, followed by 41 -60 years of age (p value <0.05). Adherence to inhalers in both asthma and COPD patients have been increased after patient counselling (P value= 0.003).

CONCLUSION

Most of the patients were unable to use the MDI with spacer correctly, whereas correct handling of DPI devices are variable. But MDI with spacer continues to be the most commonly prescribed. There is a need of increased awareness among all health care personnel, especially the pharmacist should ensure they know the correct inhaler technique whereas the most patients enrolled in our study were actually taught by nurses on the use of inhalers. Both COPD and asthma patients are more prescribed with formoterol + Budesonide inhalers. Pharmacist counselling can improve adherence to inhalers in obstructive lung disease patients since there were an significant improvement in adherence to inhalers after pharmacist intervention in our study

KEY WORDS

Obstructive Lung Disease (OLD), Chronic Obstructive Pulmonary Disease (COPD), Asthma, Inhalers, Errors, Adherence, Patient counselling.

INTRODUCTION

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Chronic Obstructive Pulmonary Disease (COPD) is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases. The most common conditions comprising COPD are chronic bronchitis and emphysema^[1,2,3,4,5].

Chronic bronchitis is associated with chronic or recurrent excess mucus secretion into the bronchial tree with cough that occurs on most days for at least 3 months of the year for at least 2 consecutive years when other causes of cough have been excluded^[6,7,8,9,10]. Emphysema is defined as abnormal, permanent

enlargement of the airspaces distal to the terminal bronchioles, accompanied by destruction of their walls, but without obvious fibrosis^[11,12,13]

The most common etiology is exposure to environmental tobacco smoke, but other chronic inhalational exposures can also lead to COPD^[3,4,14,15,16]. Inhalation of noxious particles and gases stimulates the activation of neutrophils, macrophages, and CD8+ lymphocytes, which release a variety of chemical mediators, including tumor necrosis factor- α , interleukin-8 and leukotriene B₄^[17,18]. These inflammatory cells and mediators lead to widespread destructive changes in the airways, pulmonary vasculature, and lung parenchyma^[5,9,12].

Other pathophysiologic processes may include oxidative stress and an imbalance between aggressive and protective defense systems in the lungs (proteases and antiproteases)^[19,20]. Increased oxidants generated by cigarette smoke react with and damage various proteins and lipids, leading to cell and tissue damage^[6,8,13]. Oxidants also promote inflammation directly and exacerbate the protease-antiprotease imbalance by inhibiting antiprotease activity^[21,22].

SIGN AND SYMPTOMS OF COPD

- Shortness of breath, especially during physical activities
- Wheezing
- Chest tightness
- A chronic cough that may produce mucus (sputum) that may be clear, white, yellow or greenish^[5,7,23]
- Frequent respiratory infections
- Lack of energy
- Unintended weight loss (in later stages)
- Swelling in ankles, feet or legs^[24]

ASTHMA

Asthma is defined as a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. In susceptible individuals, inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. These episodes are usually associated with airflow obstruction^[25,26,27].

CAUSES OF ASTHMA

- **Allergies:** Having allergies can raise your risk of developing asthma.
- **Environmental factors:** People can develop asthma after exposure to things that irritate the airways. These substances include allergens, toxins, fumes and second- or third-hand smoke. These can be especially harmful to infants and young children whose immune systems haven't finished developing^[20,28,29].
- **Genetics:** If your family has a history of asthma or allergic diseases, you have a higher risk of developing the disease.
- **Respiratory infections:** Certain respiratory infections, such as respiratory syncytial virus (RSV), can damage young children's developing lungs^[30].
- Physical activity
- Cold air

- Air pollutants and irritants, such as smoke
- Strong emotions and stress
- Gastroesophageal reflux disease (GERD), a condition in which stomach acids back up into your throat^[31,32]

SIGN AND SYMPTOMS OF ASTHMA

- Shortness of breath
- Chest tightness or pain
- Wheezing when exhaling, which is a common sign of asthma in children
- Trouble sleeping caused by shortness of breath, coughing or wheezing
- Coughing or wheezing attacks that are worsened by a respiratory virus, such as a cold or the flu^[25,33,34].

Inhaled therapy is a mainstay in the management of asthma and COPD. Metered dose inhalers (MDIs), dry powder inhalers (DPIs), and nebulizers are the most common inhaler devices used to administer aerosolized medication in routine respiratory practice^[15,20,28]. Optimal inhaler technique depends on correct preparation and handling of the device before inhalation and an optimal inhalation technique^[35]. Although MDIs are considered to be more difficult to use than DPIs, errors in inhaler technique are very common among COPD and asthma patients in daily real-life practice^[13,18]. Poor inhaler technique has been associated with inadequate drug delivery to the lungs and thus with poor disease control and worse disease outcomes^[36].

A metered-dose inhaler (MDI) is a handheld device that delivers asthma medicine to your lungs in aerosol form. The canister is attached to a mouthpiece. When you press on the canister, a chemical propellant pushes a puff of medicine into your lungs^[22,27]. With an MDI, you have to time your breathing with the release of the medicine^[19,23].

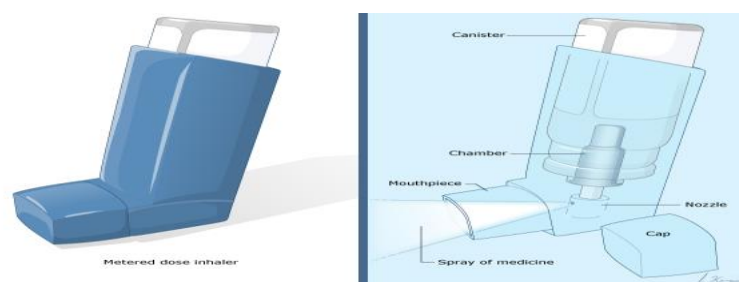


Fig 1 : Metered dose inhaler

If you have trouble doing this, you can use a device called a spacer. A spacer can help coordinate your inhaled breath with the release of the medicine.

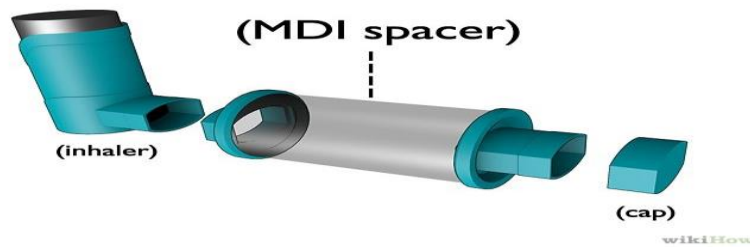


Fig 2 : Metered dose inhaler with spacer

- A dry powder inhaler (DPI) delivers medicine to your lungs when you breathe in through the device. Unlike an MDI, a DPI doesn't use a propellant to push medicine into your lungs. Instead, your inward breath activates the medicine^[9,13].
- DPIs come in single-dose and multiple-dose devices. Multiple-dose devices contain up to 200 doses. COPD dry powders that can be used with a DPI include steroids such as Pulmicort and bronchodilators such as Spiriva^[29,31].



Fig 3 : Dry powder inhaler

- Better outcome of Obstructive Pulmonary Disease (OPD) is associated with proper adherence and usage of the drug therapy. Inhalers are the most preferred treatment as the medications are easily delivered to the airway tract^[36].
- Inhalers help to prevent flares and keep symptoms from getting worse. But the inhalers should be used in a right way to get the proper therapeutic outcome.
- There is a chance for the patient to commit errors in the steps of inhalation technique which may be due to lack of information or counseling^[34,35].

ADHERENCE TO INHALERS

Adherence is defined as “the extent to which a person’s behaviour (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice’ .Poor adherence to inhalational therapy will often result in the exacerbation of the disease^[10,17]. The reasons for the non compliance to inhalers include patient’s belief that medications are not needed during symptom free period, fear of side effects, difficulty in using inhalers and a false belief that inhaler usage may be habit forming. So proper counselling is necessary to improve the adherence^[37,38].

MATERIALS AND METHODS

STUDY POPULATION

A total of 31 adult patients with COPD (n= 14) or asthma (n= 17) who were currently using atleast one inhaler device were included in this prospective observational study conducted in the out patients from Pulmonology department of Cosmopolitan hospital Thiruvananthapuram, Kerala. Patients aged >

18 years diagnosed with either COPD or asthma were included in the study. Pediatric patients, Patients with psychiatric illness and Patients who were newly prescribed with inhalers were the exclusion criteria of the study.

Written informed consent was obtained from each subject following a detailed explanation of the objectives and protocol of the study .

DATA SOURCE

All the relevant information regarding the study was collected from case records and direct interview with patients. Datas were collected by using suitably designed proforma. The study was approved by Research and Ethical Committee of Cosmopolitan hospital ,Thiruvananthapuram, Kerala,India.

The errors in inhalational techniques were assessed through direct observation of patient's performance using standard checklist. The patients were asked to use their inhalers for assessing the errors and the score 0 and 1 were given for correct and incorrect steps respectively.

The patient's adherence to inhalers were assessed by using Evaluation of Adherence to Inhalers (EAI) questionnaire. There are 12 questions in the questionnaire. The first 2 questions have 2 possible answers. Scores for each responses were assigned as 1 and 2 which were answered by checking medical records and inhalation technique. For the last 10 questions there are five responses. Scores were assigned as 1 ,2,3,4 and 5, which were answered by direct interview with the patient.

Adherence were calculated on the basis of total score of questionnaire.

≥50 points - Good adherence

46 – 49 points - Intermediate adherence

≤ 45 points - Poor adherence

After the evaluation, training and counselling on proper inhalation techniques were provided to each participants.Assessment of errors in inhalation techniques and test for adherence were repeated one month after the patient counselling.

STATISTICAL ANALYSIS

Statistical analysis was performed using Microsoft Excel.Paired t-test was used to analyse the statistical difference in the occurrence of errors between before and after counselling . Occurance of errors in different age groups were analysed by Single factor anova and chi-square test was used to find out the improvement in adherence to inhalers before and after patient counselling . The Pvalue < 0.05 was considered as statistically significant.

RESULT

In the six month study, 31 patients were enrolled as per the inclusion exclusion criteria. The results are as follows

AGE WISE DISTRIBUTION OF PATIENTS

AGE GROUP	NUMBER OF PATIENTS (N = 61)	PERCENTAGE (%)
20-40	11	35.4

41-60	7	22.6
Above 60	13	42
TOTAL	31	100

Table: 1 Age wise distribution of study population

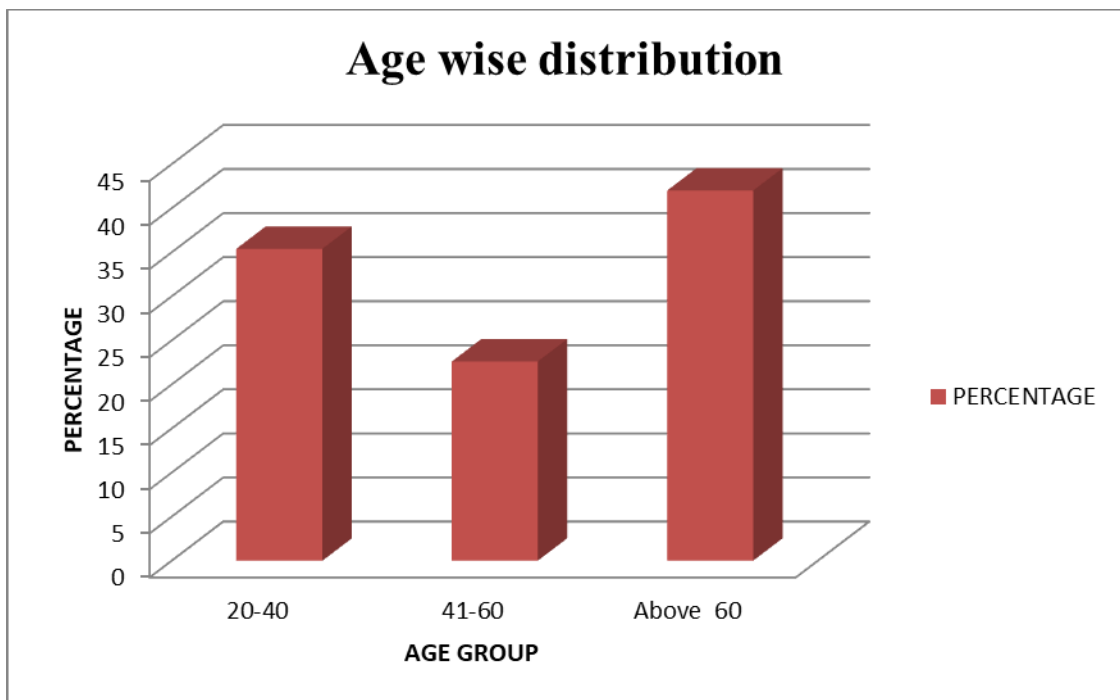


Fig 4 : Age wise distribution of study population

As per the demographic data of the study population, patients who were taking inhalers were found to be more in the age group above 60 with a percentage of 42% . Followed by which the age group of 20-40 with 35.4% and 22.6 % of patients were in the age group of 41-60.

GENDER WISE DISTRIBUTION

GENDER	NUMBER OF PATIENTS (N=61)	PERCENTAGE (%)
MALE	14	45.2
FEMALE	17	54.8
TOTAL	31	100

Table: 2 Gender wise Distribution of study population

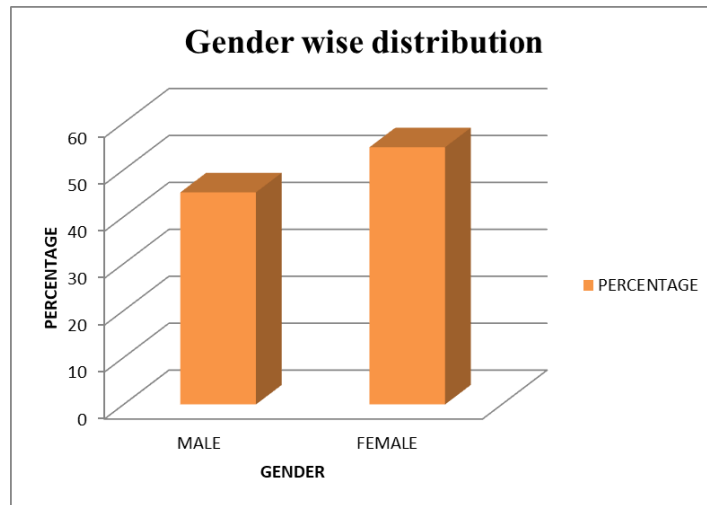


Fig: 5 Gender wise Distribution of study population

➤ Gender wise distribution of the over all study population indicate that female population overrides male population with 54.8 % dominance over 45.2%. The entire study population include 14 male patients and 17 female patients, which indicates that the incidence of obstructive lung disease in female is more than that of male population.

DISEASE WISE DISTRIBUTION

DISEASE	NUMBER OF PATIENTS (N=61)	PERCENTAGE (%)
COPD	14	45.2
ASTHMA	17	54.8
TOTAL	31	100

Table 3: Disease wise distribution of study population

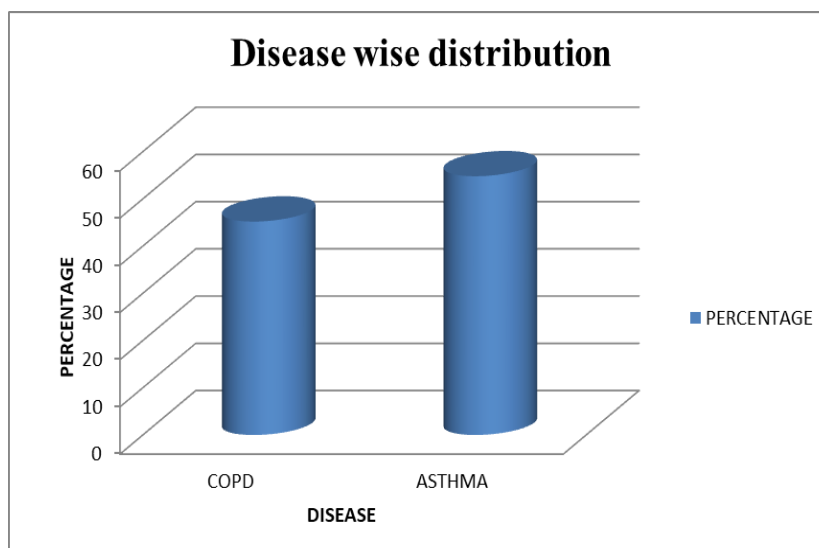


Fig 6: Disease wise distribution of study population

➤ Disease wise distribution of over all study population indicate that asthma patients with 54.8 % overrides COPD patients with 45.2 %. The entire study population include both COPD patients and asthma patients, which indicates that the incidence of getting COPD is less than that of asthma.

INHALER WISE DISTRIBUTION

INHALER	NUMBER OF PATIENTS	PERCENTAGE (%)
MDI	18	58.1
MDI with spacer	3	9.7
DPI	10	32.2
TOTAL	31	100

Table 4 : Inhaler wise distribution among study population

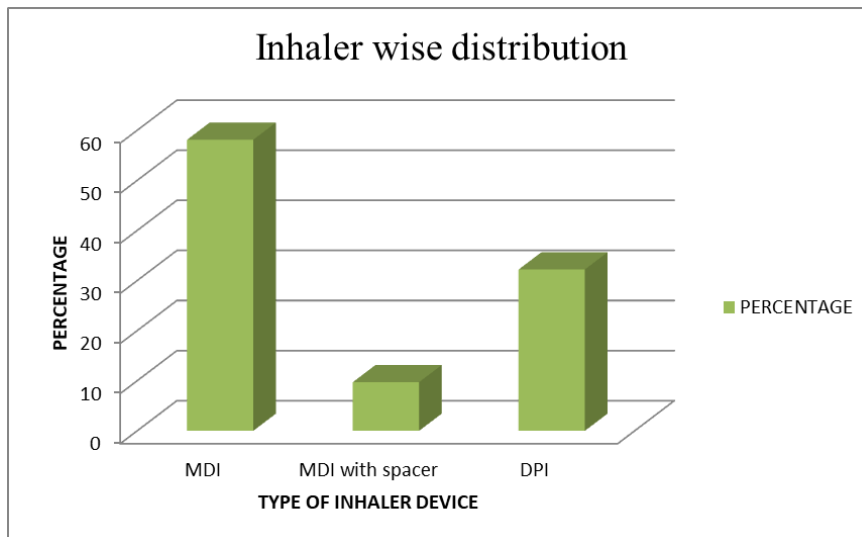


Fig 7: Inhaler wise distribution among study population

➤ As per the demographic data of the study population, majority of the patients are taking MDI with 58.1 % . Followed by DPI with 32.2 % and 9.7 % of patients were taking MDI with spacer.

DISTRIBUTION OF PATIENTS ACCORDING TO NUMBER OF INHALERS

NUMBER OF INHALERS	FREQUENCY (N=61)	PERCENTAGE (%)
ONE	24	77.4
TWO	7	22.6
TOTAL	31	100

Table 5: Number of inhalers wise distribution among study population

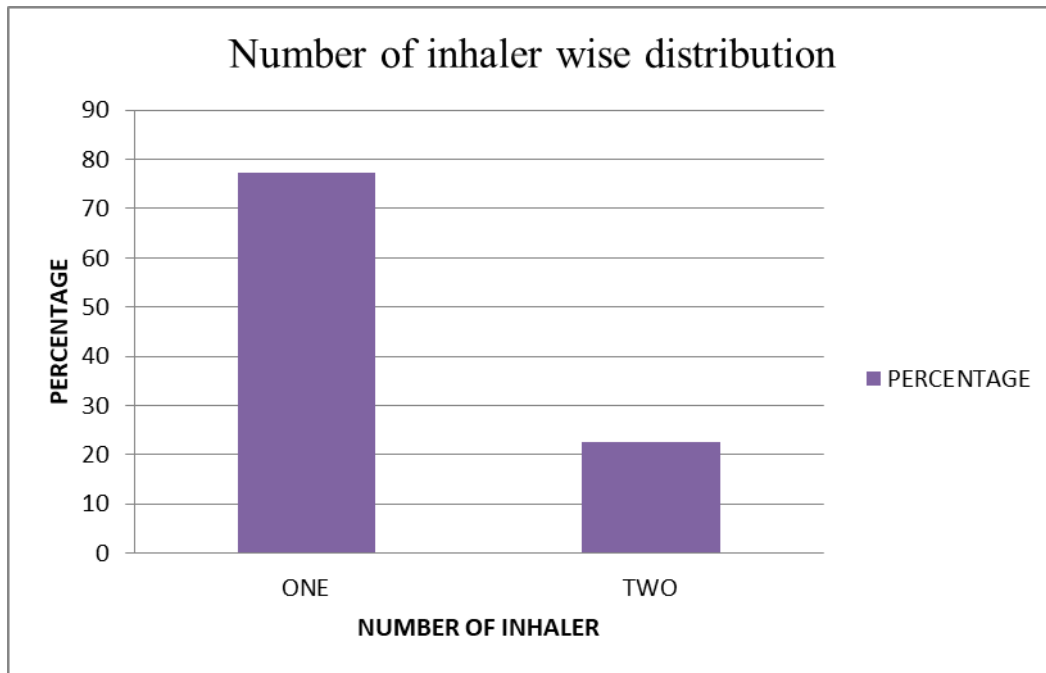


Fig 8 : Number of inhalers wise distribution among study population

- Majority of the study population were using single inhaler with a percentage of 77.4%. Only 7 people were given multiple (2) inhalers with a percentage of 22.6 %.

DISTRIBUTION OF PATIENTS ACCORDING TO MEDICATIONS PRESCRIBED

INHALERS PRESCRIBED	FREQUENCY	PERCENTAGE (%)
Fluticasone propionate + Formoterol Fumarate	4	10.5
Formoterol fumarate + Budesonide	14	36.8
Levosalbutamol	2	5.2
Fluticasone furoate + Vilanterol	4	10.5
Glycopyrronium powder	2	5.2
Salmeterol + Fluticasone propionate	5	13.1
Glycopyrronium + Formoterol fumarate + Budesonide	3	7.8
Tiotropium powder	3	7.8
Budesonide	1	2.6

Formoterol fumarate + Glycopyrronium powder	0	0
Formoterol fumarate + Mometasone	0	0
TOTAL	38	100

Table 6 : Prescribing pattern of inhaled medications among study population

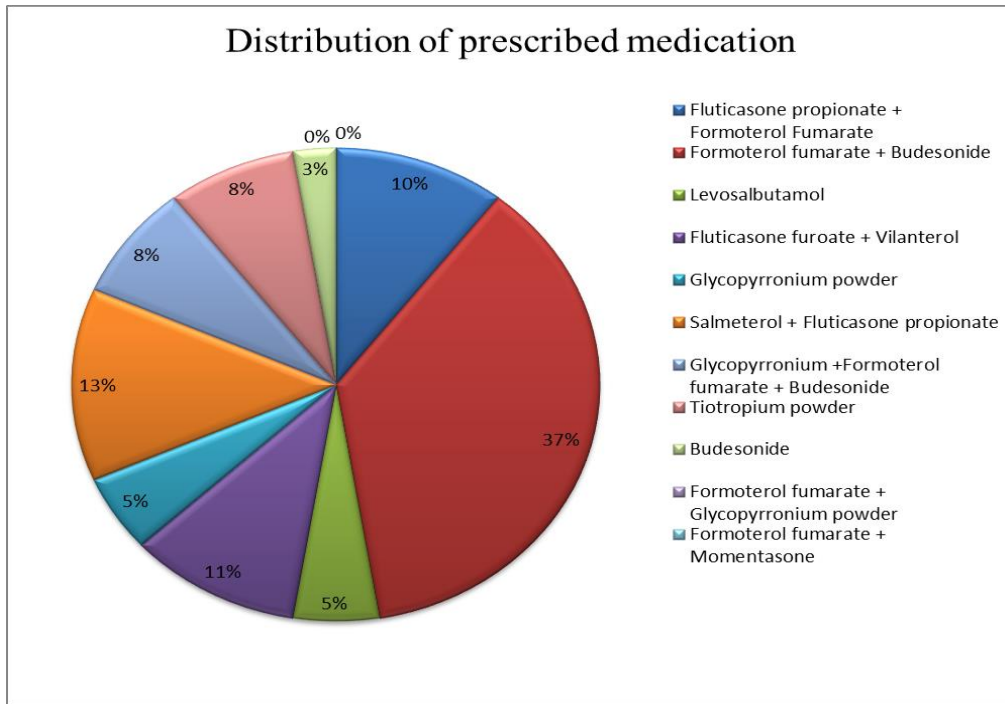


Fig 9: Prescribing pattern of inhaled medications among study population

➤ Formoterol + budesonide is more frequently prescribed in obstructive lung disease with a percentage of 36.8%.

DISTRIBUTION OF PATIENTS ACCORDING TO INHALERS PRESCRIBED AND DISEASE

INHALERS PRESCRIBED	ASTHMA	COPD
Fluticasone propionate + Formoterol Fumarate	4	0
Formoterol fumarate + Budesonide	8	6
Levosalbutamol	0	2
Fluticasone furoate + Vilanterol	3	1
Glycopyrronium powder	2	0
Salmeterol + Fluticasone propionate	3	2

Glycopyrronium +Formoterol fumarate + Budesonide	1	2
Tiotropium powder	2	1
Budesonide	0	1
Formoterol fumarate + Glycopyrronium powder	0	0
Formoterol + Momentasone	0	0

Table 7 : Distribution of patients according to inhales prescribed and disease

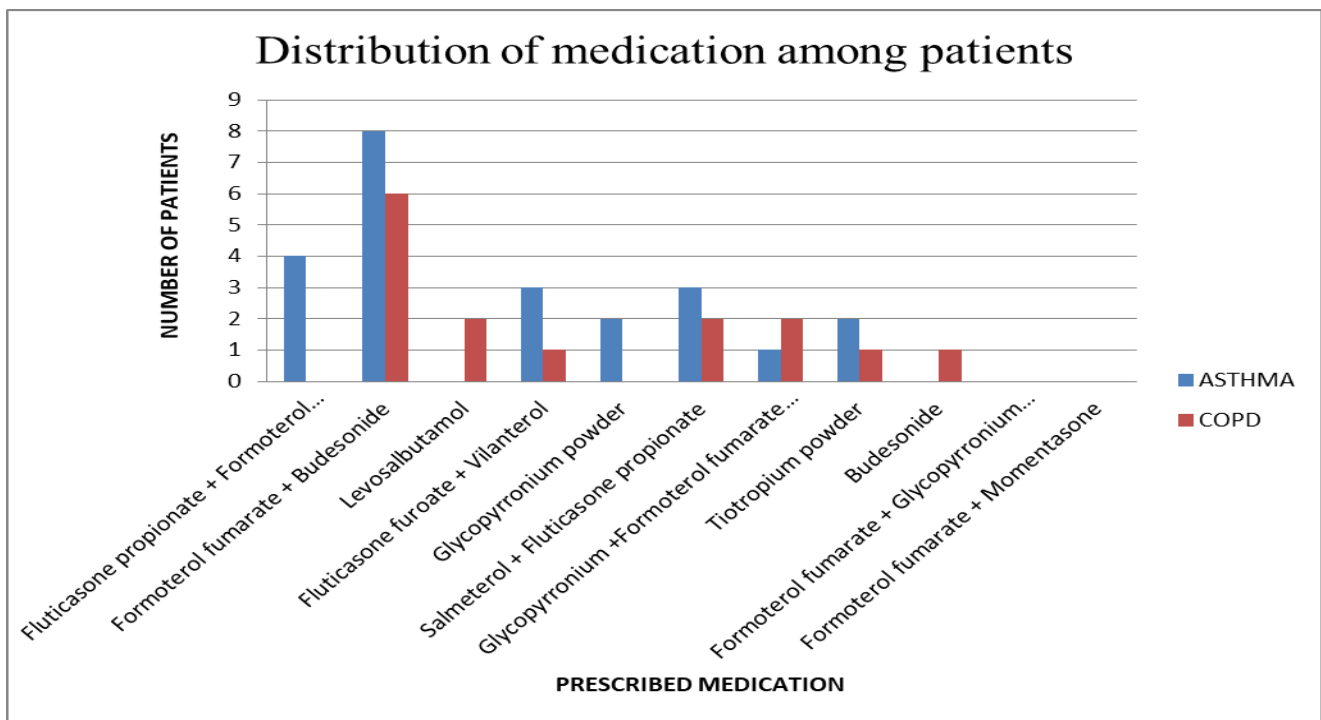


Fig 10: Distribution of patients according to inhales prescribed and disease

- For both asthma and COPD the most commonly prescribed inhaled medication were formoterol + budesonide.

DISTRIBUTION OF WRONGLY AND CORRECTLY DONE STEPS AMONG MDI USERS BEFORE AND AFTER COUNSELLING

STEPS	PRE COUNSELLING		POST COUNSELLING	
	INCORRECT	PERCENTAGE (%)	INCORRECT	PERCENTAGE (%)

STEP 1	0	0	0	0
STEP2	9	50	0	0
STEP3	5	27.7	1	5.5
STEP4	8	44.3	2	11.1
STEP5	0	0	0	0
STEP6	10	55.5	5	27.7
STEP7	10	55.5	5	27.7

Table 8 : Distribution of correct and incorrect steps among MDI users before and after counselling

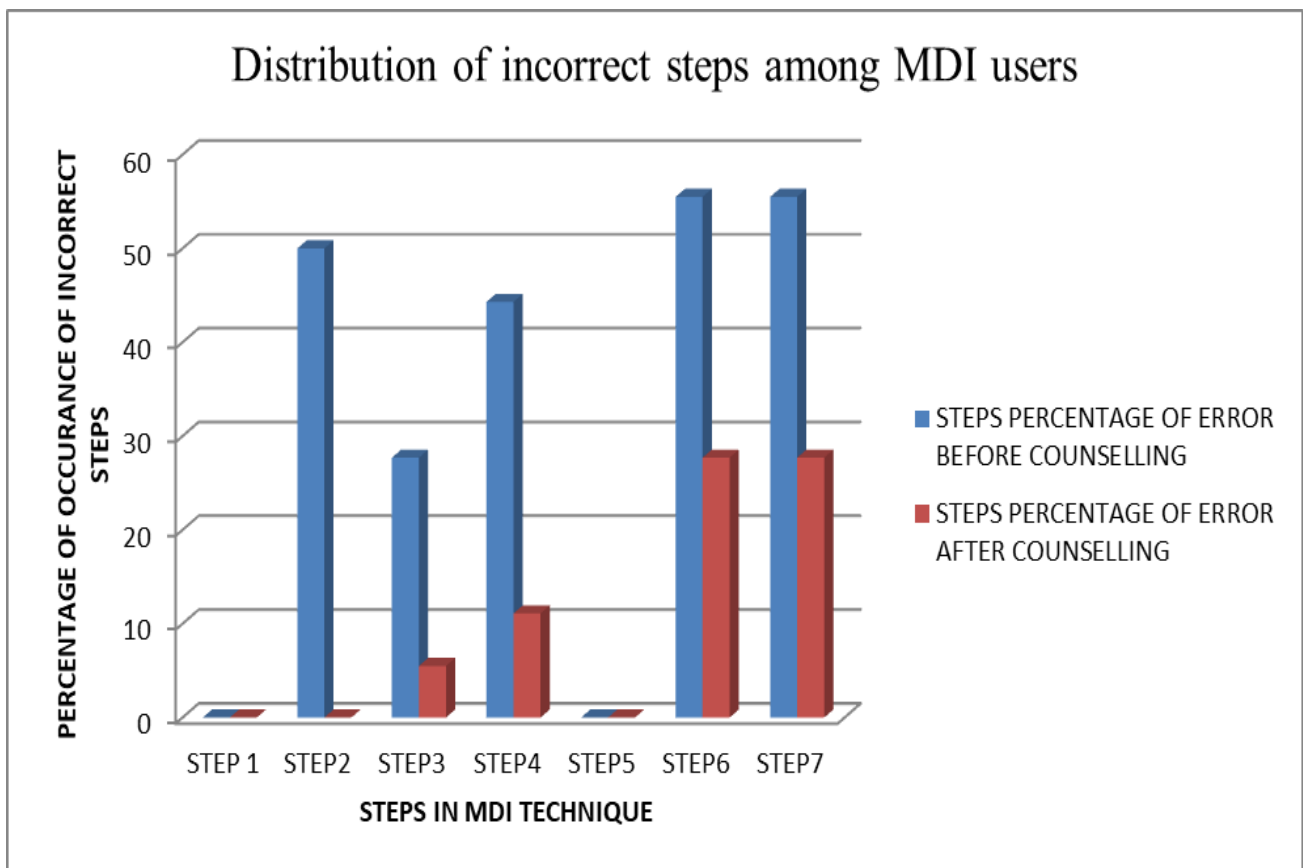


Fig 11: Distribution of correct and incorrect steps among MDI users before and after counselling
 ➤ By the study we were able to minimize the errors in inhalational technique via patient counselling.

➤ Among the study population of 31 patients, step 6 and 7 were the most commonly occurred incorrects steps (55.5%) .ie , the patients were unable to hold their breathe for a count of 15 seconds and they were breath out through the mouth itself .After counselling percentage of occurance of step 6 and 7 were decreased to 27.7%.

DISTRIBUTION OF CORRECT AND INCORRECT STEPS AMONG MDI WITH SPACER USERS BEFORE AND AFTER COUNSELLING

STEPS	PRE COUNSELLING		POST COUNSELLING	
	INCORRECT	PERCENTAGE (%)	INCORRECT	PERCENTAGE (%)
STEP 1	0	0	0	0
STEP2	2	66.6	0	0
STEP3	1	33.3	0	0
STEP4	3	100	1	33.3
STEP5	0	0	0	0
STEP6	3	100	1	33.3
STEP7	3	100	2	66.6

Table 9 : Distribution of correct and incorrect steps among MDI with spacer users before and after counselling

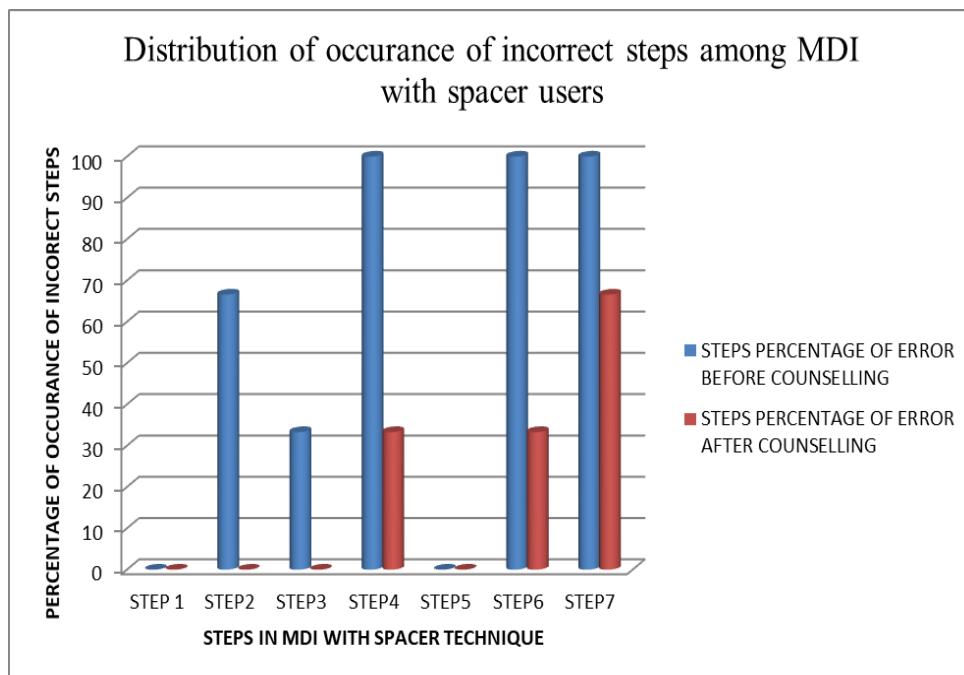


Fig 12: Distribution of correct and incorrect steps among MDI with spacer users before and after counselling

- Among the study population of 31 patients, step 4 , 6 and 7 were the most commonly occurred incorrect steps. ie ,all the patients were not closing their lips after the mouth piece has been put in to their mouth (100%) , they were unable to hold their breathe for a count of 15 seconds (100%) and they were breath out through their mouth itself (100%).
- After counselling percentage of occurance of step 4 ,6 and 7 were decreased to 33.3%, 33.3% and 66.6% respectively.

DISTRIBUTION OF CORRECT AND INCORRECT STEPS AMONG DPI USERS BEFORE AND AFTER COUNSELLING

STEPS	PRE COUNSELLING		POST COUNSELLING	
	INCORRECT	PERCENTAGE (%)	INCORRECT	PERCENTAGE (%)
STEP 1	0	0	0	0
STEP2	0	0	0	0
STEP3	6	60	2	20
STEP4	3	30	3	30
STEP5	9	90	6	60
STEP6	6	60	0	0
STEP7	0	0	0	0

Table 10 : Distribution of correct and incorrect steps among DPI users before and after patient counselling

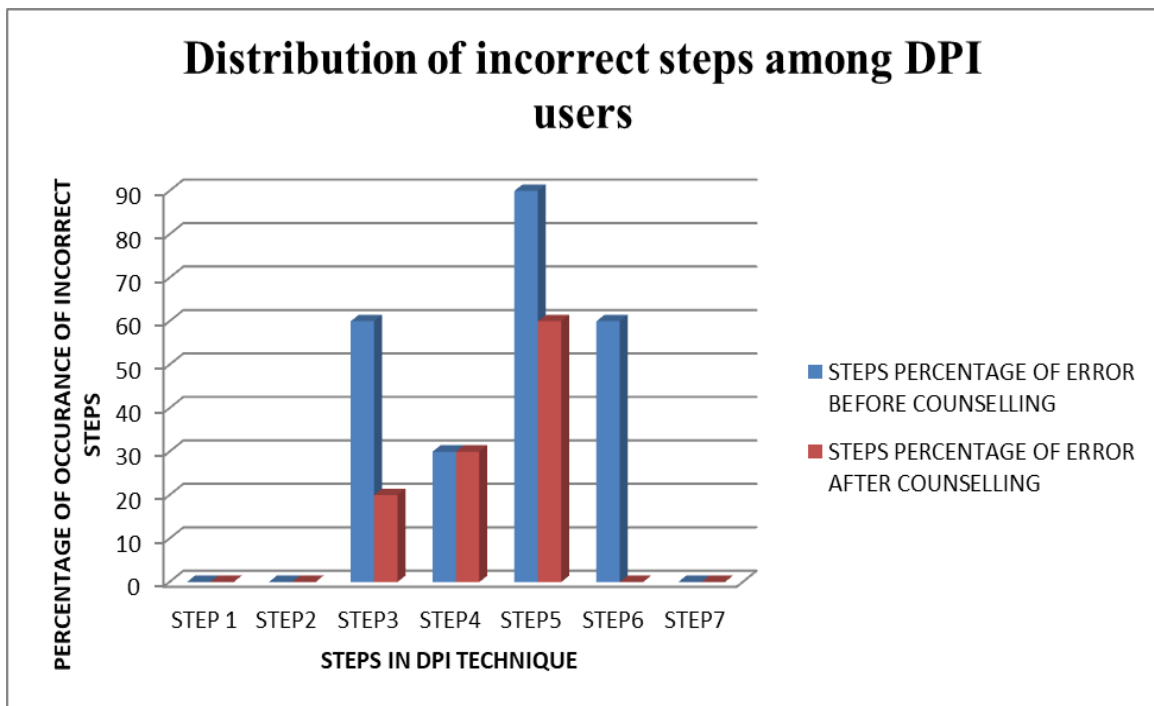


Fig 13: Distribution of correct and incorrect steps among DPI users before and after patient counselling

➤ Among the study population of 31 patients, step 5 was the most commonly occurred incorrect step, i.e., the patients were unable to hold their breathe for a count of 15 seconds (90 %). After counselling, the percentage of occurrence of step 6 was decreased to 60 %.

DISTRIBUTION OF TOTAL NUMBER OF ERRORS IN INHALER TECHNIQUE AMONG STUDY POPULATION BEFORE AND AFTER PATIENT COUNSELLING

TYPE OF INHALER	TOTAL NUMBER OF ERRORS BEFORE COUNSELLING	TOTAL NUMBER OF ERRORS AFTER COUNSELLING
MDI	43	15
MDI with spacer	12	4
DPI	23	10

Table 11: Distribution of total number of errors in different inhaler technique before and after patient counselling

	Mean		Mean difference	P value
	PRE	POST		
MDI	2.4	0.8	1.6	7.98929E-07
MDI with spacer	4	1.3	2.7	0.007
DPI	2.3	1	1.3	0.0003

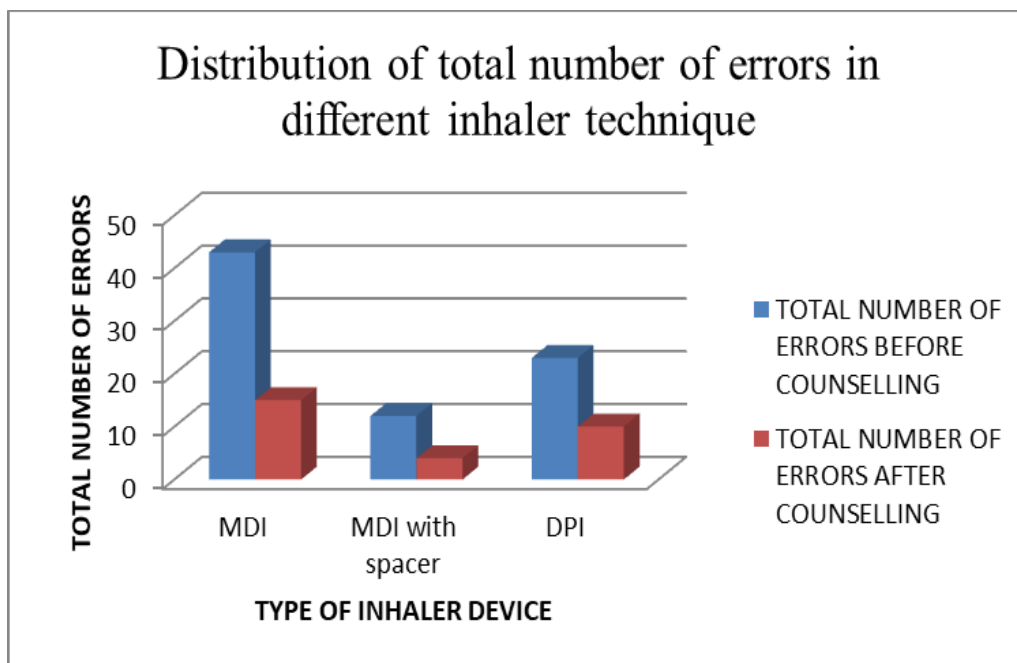


Fig 14 : Distribution of total number of errors in different inhaler technique before and after patient counselling

- In case of all the three types of inhalers the P value is less than 0.05, so post score value is significant.
- The rate of incidence of committing errors in the inhalation techniques have been significantly reduced.
- The mean difference of the occurrence of errors in MDI,MDI with spacer and DPI inhalers were found to be 1.6, 2.7 and 1.3 respectively.

DISTRIBUTION OF ERRORS IN INHALATION TECHNIQUE AMONG VARIOUS AGE GROUP

Age category	Total number patients (N=61)	Total number of errors before counselling	Mean error
20-40	11	12	1.09
41-60	7	20	2.8
Above 60	13	46	3.5

Table 12 : Occurance of errors in different age group before patient counselling

	Mean	P value
Category 1	1.09	2.85E-07
Category 2	2.8	
Category 3	3.5	

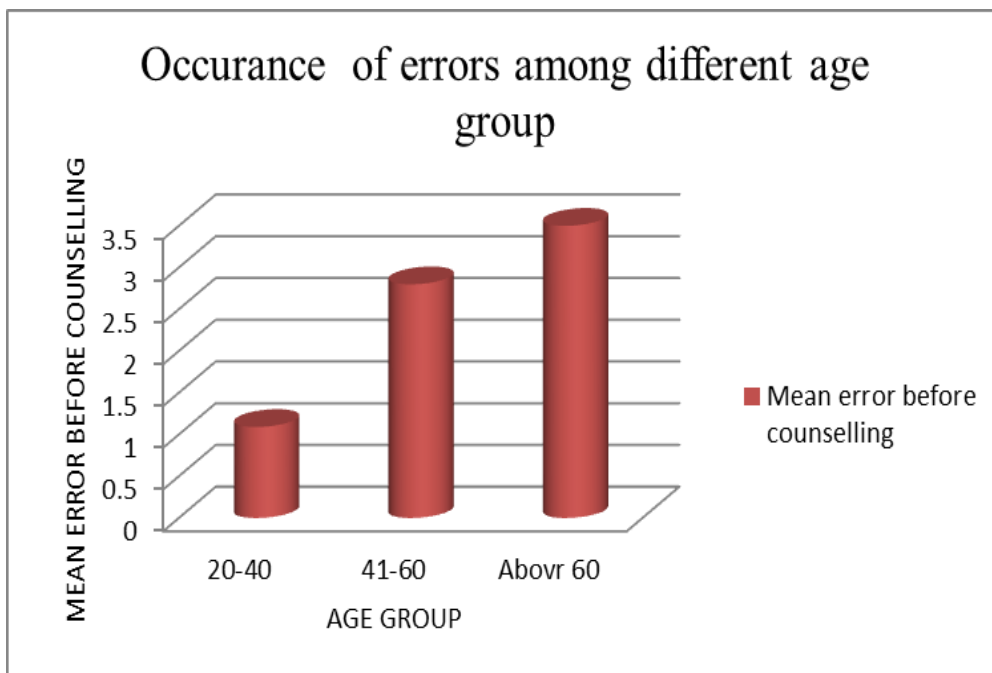


Fig 15: Occurance of errors in different age group before patient counseling

- P value less than 0.05 showed that ,occurance of error is high in case of patients above 60 years of age, followed by 41 -60 years of age .

DISTRIBUTION OF ADHERENCE AMONG STUDY POPULATION BEFORE AND AFTER PATIENT COUNSELLING

SCORE OF ADHERENCE	PRE COUNSELLING		POST COUNSELLING	
	Frequency	Percentage(%)	Frequency	Percentage(%)
≥ 50 – Good adherence	6	19.3	21	67.8
46-49 - Intermediate adherence	7	22.6	5	16.1
≤45 - Poor adherence	18	58.1	5	16.1

Table 13 : Distribution of adherence among patients before and after patient counseling

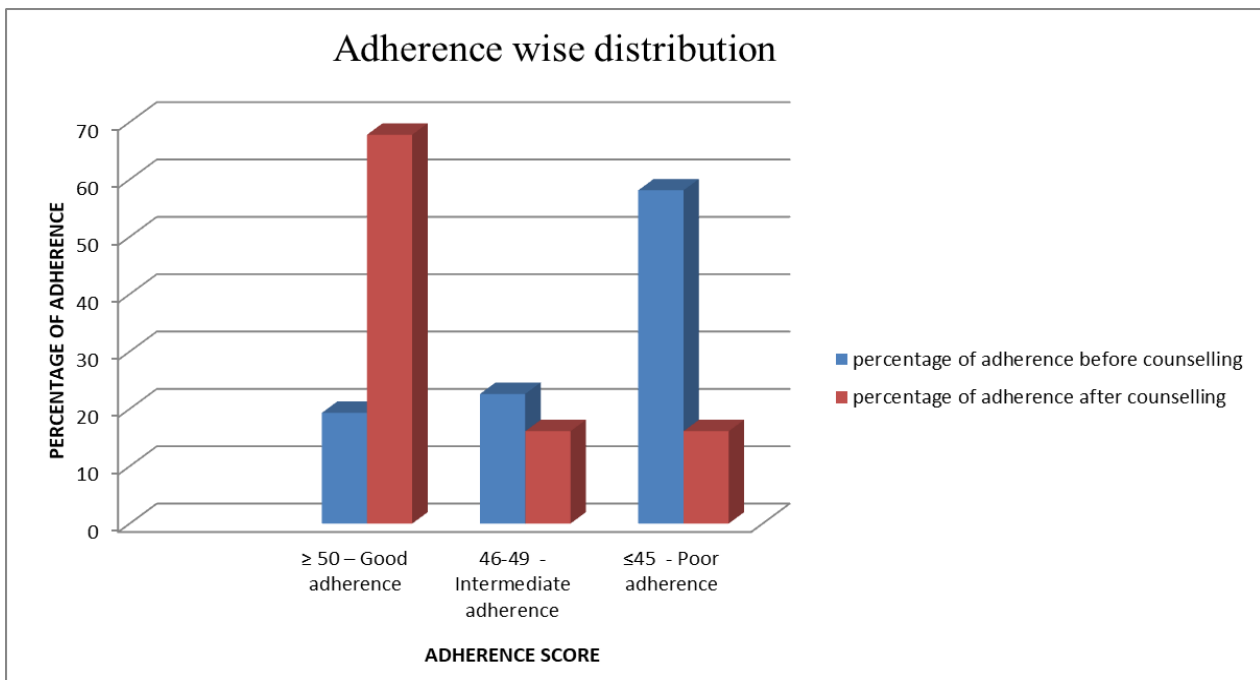


Fig 16 : Distribution of adherence among patients before and after patient counseling

P Value = 0.0031

- Since the P value is less than 0.05 the post score is significant. ie, adherence to inhalers in both asthma and COPD patients have been increased after patient counselling.
- During pre counselling phase it showed that among the study population of 31 patients, 58.1% patients were with poor adherence , followed by 22.6 % with intermediate adherence and 19.3 % of patients were having good adherence.
- After counselling good adherence was improved to 67.8 % and poor adherence has been decreased to 16.1% .

DISCUSSION

- Obstructive Pulmonary Diseases is a spectrum of pulmonary diseases which affects the airways, including Chronic obstructive pulmonary disease (COPD), chronic bronchitis, asthma, bronchiectasis, bronchiolitis, cystic fibrosis . In obstructive pulmonary diseases, inhalational drugs are the cornerstone of the therapy . Inhaled medications aids in achieving higher local concentration of the drug at a lower dose than other routes and results in better therapeutic ratio. However improper administration of inhalers and lack of adherence is a common barrier to adequate control of these patients to prevent exacerbations.
- The primary objective of the study was to determine the prescribing pattern of inhalers and to assess the errors and adherence to inhaler before and after patient counselling. In this study we considered a total of 31 patients who were using inhalers for more than 2 weeks and satisfied the inclusion criteria. The errors in the inhalational technique were analyzed using a standard checklist. The adherence to inhalers of the patients were determined by a questionnaire..
- In our study 42 % of the sample were above the age of 60. Majority of them were females (54.8%). About 54.8% were asthmatic patients. 77.4 % of patients use only one inhaler. Mostly used inhaler was MDI (58.1%) followed by DPI (32.2%) and then MDI with spacer (9.7%). Mostly used inhalational medication is Formoterol fumarate + Budesonide.
- The observations of our study is similar to that of the study conducted by **Susmera Varghese et al;** in which of “**Assessment of common errors in inhalational technique**” shows 59% of females use inhalers compared to that of males 43% also shows that more than 30% of them use formoterol + Budesonide inhalation. About 85% of patients were prescribed with single inhalers, 12% with two inhalers and 3% with three inhalers. From their study adherence score to all inhalers were found to be increased after counselling. All these observations were similar to us except that none of our study population were prescribed with three inhalers.
- A study conducted by **Maher R Khdour et al;** on “**Assessment of the inhalational technique and adherence to therapy**” concludes that most of the enrolled patients were females (59.1%) and that was similar to our study result.
- In a study conducted by **Andrea Hammerlein et al;** “**Pharmacist-led intervention study to improve inhalation technique in asthma and COPD patients.** This study was conducted in 597 patients and observed that 78.9% made at least one mistake in performing the inhalation technique at baseline and after pharmacist intervention it was found to drop to 28.3% . All the observations were similar except mean age which was 61.0 and range was 18-94.
- A study conducted by **Sonia Santhakumar et al;** on “**Assessment to adherence to inhalers in asthmatics**” concludes that out of 111 enrolled patients 67.6% were females .In our study also majority of the patients were females.
- The EAI questionnaire was used to assess the patients adherence to inhalers. The EAI questionnaire was performed to each patient before and after counselling. EAI is assessed in the beginning of study and followed up after one month when the patients comes for review. It is a 12 item questionnaire which has a total score of 54. Greater than 50 points indicate good adherence.
- Medication error assessment is done to assess the inhalational errors of patients using a standard checklist. Checklist is used to assess the patients errors to inhalational technique before counselling and after counselling, when the patients comes for follow-up after a month. There are 7 steps to assess the errors in inhalational technique. Every incorrect step is given a score of 1.

- Proper demonstration of inhalational techniques and importance of adherence to inhalers in preventing the exacerbation of disease were included in patient counselling.

CONCLUSION

Our study showed that majority of the patients using inhalers, used their inhaler inaccurately. Most of the patients were unable to use the MDI with spacer correctly, whereas correct handling of DPI devices are variable. But MDI with spacer continues to be the most commonly prescribed. There is a need of increased awareness among all health care personnel, especially the pharmacist should ensure they know the correct inhaler technique whereas the most patients enrolled in our study were actually taught by nurses on the use of inhalers.

Routine checkup of inhaler technique should be done during subsequent patient visits. From our study, we understood that both COPD and asthma patients are more prescribed with formoterol + Budesonide inhalers.

The present results shows that pharmacist counselling can improve adherence to inhalers in obstructive lung disease patients since there were an significant improvement in adherence to inhalers after pharmacist intervention in our study.

The major reasons for poor adherence to inhalers were forgetfulness, felt better and cessation of administration due to improvement of symptoms, fear of side effects, false beliefs, interruption for their daily activities and cost of inhaler devices and medications.

Study concluded that effective counselling by pharmacist improved the patient inhalation technique and adherence to inhalers. Improvement in inhalation technique plays a great role in improvement in disease.

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