



## DRUG UTILIZATION PATTERN OF ASTHMA, CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN AN OUTPATIENT PHARMACY AT TERTIARY CARE HOSPITAL

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### Abstract

Chronic obstructive lung diseases like asthma and chronic obstructive pulmonary disease (COPD) are accompanied by a major burden of symptoms, health care utilization, loss of productivity and cost of medications on the individual and society.

India has approximately 15 to 20 million asthmatics patient. Rough estimates indicate a prevalence of between 10% and 15% in children in the age range of five to eleven years. In India, about 3% of all death in 1990 was due to COPD and it gets raised to 6.5% deaths in 2020.

Inhalation therapy is a cornerstone of treatment for Asthma and COPD. Delivery of the drugs directly into the airways is the major advantage of inhalation therapy as it results in achieving higher concentrations locally with significantly less risk of systemic side effects. Improper inhaler technique results in reduction in drug concentration in body and getting weak to symptom control. Adherence to regimen in asthma and COPD is important for getting appropriate clinical outcomes and non adherence results in a significant health and economic burden. Adherence may get improved by using simple and easy regimens, teaching patient about self-management, communication, and counseling. Important challenge of adherence is providing a device for measuring the level of it and its acceptance. Current study as a prospective observational study was conducted in the Pulmonology Department of Bangalore tertiary care hospital; aimed to assess the frequency of errors during using inhalers and association between type of devices and patient preferences.

**Keywords:** Asthma, COPD, Inhalation therapy, MDI, DPI

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## INTRODUCTION:

Chronic obstructive lung diseases like asthma and chronic obstructive pulmonary disease (COPD) are accompanied by a major burden of symptoms, health care utilization, loss of productivity and cost of medications on the individual and society [1].

Asthma is an inflammatory condition which leads to occlusion and obstruction of respiratory airway and mostly associated with hyper-responsiveness. COPD, on the other hand, is a chronic obstructive disorder that is treatable and preventable in which airflow remain persistently decreased [2].

India has approximately 15 to 20 million asthmatics patient. In India, about 3% of all death in 1990 was due to COPD and it gets raised to 6.5% deaths in 2020. Huge number of death from asthma is thought to be due to factors such as the rejection of having a disease, improper understanding about the condition and drug use, inappropriate knowledge about the way of use of inhalers. Patient beliefs about drugs and medications and illness affect their decision about adherence to therapy[3].

Inhalation therapy is a cornerstone of treatment for Asthma and COPD. Delivery of the drugs directly into the airways is the major advantage of inhalation therapy as it results in achieving higher concentrations locally with significantly less risk of systemic side effects. [4]

Inhaler device use is a complex technique. Failure to follow its procedure properly affects on drug efficacy and reduces its benefits. Inhalers also have different instructions based on types which may lead to confusion and errors. [1]

Two types of inhalers are there. Metered dose inhalers (MDI) and dry powder inhalers (DPI) are two classes of devices. [1] Inappropriate use of inhalers affects on drug therapeutic level and won't be beneficial. [5] Efficacy of drug which inhaled depends on correct inhalation technique, use of inhalers and adherence to therapy. [3]

As a vital member of the health care team, clinical pharmacists can play an important role in educating patients with Asthma and COPD, helping them comply with their medication therapy regimens, and improve their health outcomes. Skilled use of inhalers is an important factor in determining treatment outcome. [4]

In this study, we aimed to assess the frequency of errors during using inhalers and association between type of devices and patient preferences.

## MATERIALS AND METHODS:

This study was conducted at department of Bangalore Baptist Hospital (BBH) Hebbal. It is a prospective observational study conducted in outpatient department of Bangalore Baptist Hospital (BBH) Hebbal. Inclusion Criteria includes all outpatients who suffering from asthma and COPD while exclusion Criteria includes pregnant women suffering from asthma and COPD, patients not receiving inhalers, age below 18 years old.

### Study procedure:

A hospital based prospective observational study was conducted in the Pulmonology department of Bangalore tertiary care hospital. Patients diagnosed with COPD/Asthma. The patient demographics and all medically relevant information were noted in a predefined data collection form. Alternatively, these case charts were reviewed for prescription of inhalers. The detailed information such as brand name, dose, frequency, route, indication and any other relevant information was retrieved and entered into the data collection form. The prescriptions were analyzed for determining various inhalers used. The medication adherence and knowledge of patients towards the use of inhalers were assessed by the set of suitably questionnaires. The cost involved in the use of inhalers is also studied. All data was timely updated and analyzed by using suitable software. Duration of study was 6 months. Sample size was approximately 500 patients.

## RESULTS

In this study out of 500 patients 53.3% were diagnosed with COPD and 46.7% were asthmatic, out of which 31.6% were males and 15% were females with asthma and 48.3% males and 5% female were diagnosed with COPD. 14.1% males and 7.5% females' asthmatics were of the age group 46-64 years. 19.1% males and 0.8% females of COPD were of the age group 46-64 years. Highest number of patients i.e. 18.3% males, 9.1% female asthmatics, 23.3% males and 3.3% female asthmatics had the disease ranging from 1-10 years. Among asthmatic patients 7.5% men were smokers and 3.3% men were alcoholic. Among COPD patients 26.6% men were smokers and 5.8% men were alcoholics.

In current research, budesonide MDI was given to 10.8% asthmatics and 20% COPD patients. About

10% asthmatics and 9.1 %COPD patients were prescribed withbudesonide MDI+spacer. About 4.1% asthmatics and 2.5% COPD patients were prescribed withsalbutamol MDI. About 14.1%

asthmatics and 10% COPD patients were prescribed withipratropium MDI and 6.6% asthmatics and 12.5% COPD patient'prescribed withipratropium MDI+spacer.

**Medication adherence:**

Table 1 summarized medication adherence in our sample.

Type of inhalers	Dose recommended per day	Asthma (adherence %)		COPD(Adherence %)	
		Male (%)	Female(%)	Male%)	Female(%)
Budesonide MDI	0.5-1mg 2times	(80)	(80)	(86)	(55)
Ipratropium bromide MDI	34mcg 4 times	(52.9)	(26.4)	(58.6)	(56.1)
Salbutamol MDI	180-216mcg	(92.5)	(86.3)	(95)	(91.2)
Salmeterol MDI	50-250mg 2 times	(90)	(89.7)	(98.2)	(93.6)
BudesonideMDI+spacer	0.5mg 2 times	(76.7)	(83.4)	(86)	(84.9)
Ipratropium bromideMDI+spacer	34mcg 4 times	(54.8)	(56.1)	(48.3)	(33.6)
salbutamolMDI+spacer	180-216mcg	(95.6)	(93.8)	(91.6)	(96.1)

Table 1: Study of inhalers adherence among the study population

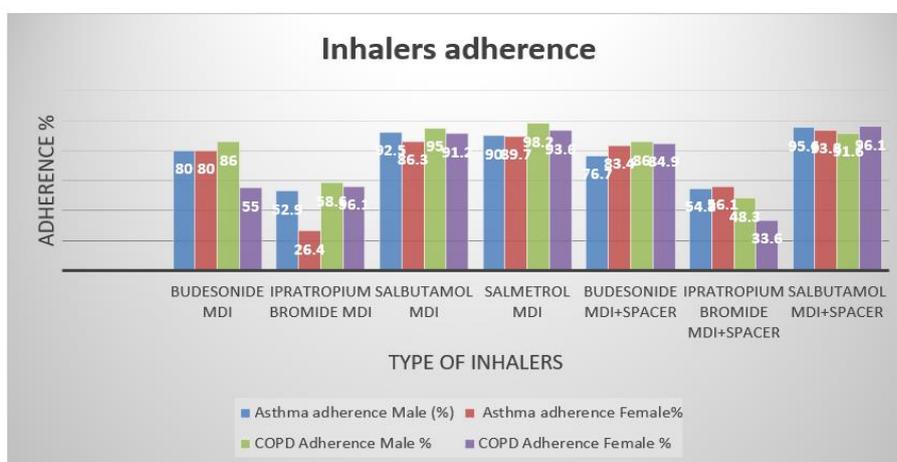


Fig 1: Bar chart representing adherence to inhalers among study population

In our study adherence to inhaler therapy was assessed by using the formula correct dose/incorrect dose\*100 and the following were the adherence % for the inhaler drugs budesonide MDI 80% among both male and asthmatic

females. 86% males and 55% females were adherent of budesonide MDI among COPD. 76.7% males and 83.4% asthmatic females were adherent of budesonide MDI+ spacer 86% males and 84.9% females.

COPD patients were adherent ofMDI+spacer.

Highest adherence → salbutamol (95.6%) male } asthma  
 Highest adherence → salbutamol (93.8%) female }  
 Highest adherence → salmeterol (98.2%) male } COPD  
 Highest adherence → salbutamol (96.1%) female }

Table2: Self-reported reasons for non-adherence to inhalers

Reasons	Number of patients	(%)
High cost of medication	33	(6.6)
Lack of access to hospital drug store	4	(0.8)
Fear of side effects	21	(4.1)
Felt better and stopped	50	(10)
Non beneficial	0	
Forgotten/occupational problems	8	(1.6)
Lack of family support/motivation	17	(3.4)
Fear of becoming dependent on treatment	25	(5)

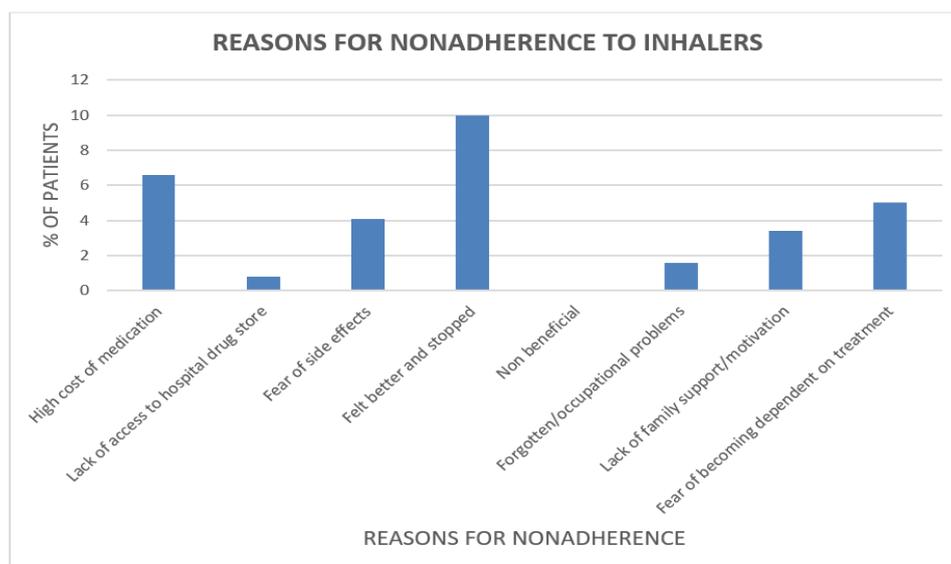


Fig 2: Bar chart representing self-reported reasons for non-adherence

Nonadherence had different causes which can be listed as high cost of medicine, lack of access to hospital drug store, fear of side effects, feeling

better, forgotten / occupational problems, lack of family support, fear of becoming addicted on treatment.

#### Knowledge assessment:

Table 3: Assessment of knowledge of inhaler usage in study asthma and COPD patients before pharmacist intervention

S. NO	Questionnaire	No. of patients preferred correctly					
		Male	(%)	Female	(%)	Total	(%)
1	Shake vigorously	367	(73.3)	71	(14.1)	438	(90.8)
2	Remove cap	383	(76.6)	79	(15.8)	463	(92.5)
3	Hold upright	396	(79.1)	71	(14.1)	467	(93.3)
4	Breathe out gently	358	(71.6)	67	(13.3)	425	(85)
5	Start breathing in slowly and deeply	321	(64.1)	67	(13.3)	388	(77.5)
6	Actuate during inspiration	371	(74.1)	83	(16.6)	454	(90.8)
7	Continue slow inhalation	371	(74.1)	79	(15.8)	450	(90)
8	Release in spacer and inhale	354	(70.8)	79	(15.8)	433	(86.6)
9	No aerosol loss is visible	342	(68.3)	79	(15.8)	421	(84.1)
10	Hold breath for 10 seconds	325	(65)	63	(12.5)	388	(77.5)
11	Next dose after 1 minute	371	(74.1)	71	(14.1)	442	(88.3)
12	^ Rinse out mouth after using	92	(18.3)	29	(5.8)	121	(24.1)

Table 4: Assessment of knowledge of inhaler usage in asthma and COPD patients after pharmacist intervention

S.NO	Questionnaire	No. of patients preferred correctly					
		Male	(%)	Female	(%)	Total	(%)
1	Shake vigorously	404	(80.8)	92	(18.3)	496	(99.1)
2	Remove cap	404	(80.8)	96	(19.1)	500	(100)
3	Hold upright	392	(78.3)	96	(19.1)	488	(97.5)
4	Breathe out gently	396	(79.1)	96	(19.1)	492	(98.3)
5	Start breathing in slowly and deeply	379	(75.8)	88	(17.5)	467	(93.3)
6	Actuate during inspiration	396	(79.1)	96	(15.8)	488	(95)
7	Continue slow inhalation	392	(78.3)	92	(19.1)	475	(97.5)
8	Release in spacer and inhale	383	(76.6)	83	(18.3)	450	( 95)
9	No aerosol loss is visible	367	(73.3)	88	(16.6)	463	(90)
10	Hold breath for 10 seconds	375	(75)	92	(17.5)	488	(92.5)
11	Next dose after 1 minute	396	(79.1)	46	(18.3)	208	(97.5)
12	^ Rinse out mouth after using	163	(32.5)	92	(9.1)	496	(41.6)

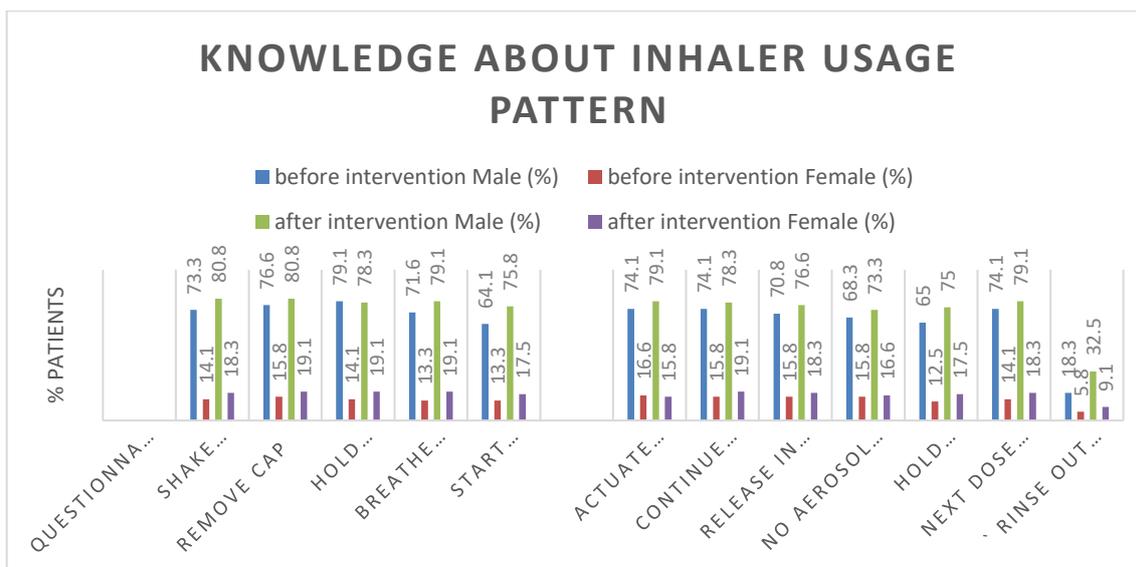


Fig 2: Bar chart representation to assess the knowledge of inhaler usage in study population before and after pharmacist intervention

### Pharmacoeconomics:

Pharmacoeconomics aspects of our study summarized as below.

Table 5: Pharmacoeconomics of inhalers

Type of inhalers	Total Cost of inhalers(INR/month)	Frequency prescribed
<b>MDI</b>		
Budesonide	350-450	Thrice daily
Ipratropium bromide	50-100	4 times daily
O2 inhaler	500-900	Thrice daily
Salbutamol+ipratropium bromide	200-300	Twice daily
Salmeterol	100-200	Twice daily
<b>MDI+SPACER</b>		
Budesonide	400-500	Twice daily
Ipratropium bromide	250-350	Thrice daily
salbutamol	250-350	Twice daily

### DISCUSSION

Asthma and chronic obstructive pulmonary disease (COPD) are current issue and problem in the health system. Improper inhaler technique results in reduction in drug concentration in body and getting weak to symptom control. [4]

We aimed to assess the frequency of errors during using inhalers and association between type of devices and patient preferences

Budesonide MDI was given to 10.8% asthmatics and 20% COPD patients. About 10% asthmatics and 9.1 %COPD patients were prescribed with budesonide MDI+ spacer. About 4.1% asthmatics and 2.5% COPD patients were prescribed with salbutamol MDI. About 14.1% asthmatics and 10% COPD patients were prescribed with ipratropium MDI and 6.6% asthmatics and 12.5% COPD patient's prescribed with ipratropium MDI+ spacer.

In a similar study conducted by Jahdali HA it is concluded that a majority (92%) of the patients were using metered-dose inhalers (MDI). This result is in accordance with Saudi Arabian practice for this disease. [6] choro P et al. In their research concluded from the 464 inhaler technique performances, Turbohaler® and Diskus® were selected as easiest. [2]

When the knowledge regarding the usage of inhalers was assessed using standard questionnaire which had 11 steps for MDI and 12 steps for MDI+spacer each questionnaire had scoring of 0 representing not performing the step, 1 representing following the step the scores were high after pharmacist intervention when compared to before pharmacist intervention.

In a similar study by Jolly GP et al., It was found that during assessment; only 1 of the 117 subjects could perform all the steps of inhaler usage

correctly. It means they not educated about inhalation techniques. The median score achieved by the entire group was 3 (range, 1-8), which increased to 6, 7 and 8, respectively in the subsequent three interventions. At the completion of three sessions of intervention, 97.4% of subjects were able to achieve a full score. Of these, 28 patients (24.1%) got full score after the first intervention itself. Most repetitive errors were “not breathing out of the mouth before inhaling” (step 3), and “not holding breath for 10 seconds or more” (step 7). In our population, only 58.8% had received education regarding use of inhaler technique, which is lower than that reported by Larsen et al. (63%), who conducted the study in a US population with 501 subjects. [7] In another study conducted by hammerleina on pharmacist-led intervention study on COPD and asthma patients concluded that a total of 597 patients (78.9%) made at least an error in inhalation technique. Errors reduced by 28% after first meeting and education. It means all patients got benefits from the pharmacists’ intervention. [8] In a study by Thomas RP et al it was found that there was a significant increase in mean inhalation technique evaluation score from baseline to last visit in Group I patients than Group II patients. A significant improvement in lung function test were observed from the beginning to the last visit in both the groups.[9] In another study by haider ZB it was found that only one fourth of patient could do all inhalation steps properly. Percentages of people that followed individual steps properly were: preparation (87.5%), exhalation (53.85%), lip closure (68.27%), inhalation (56.73%), breath-holding (27.88%) and puff interval (36.54%). [10]

Adherence to regimen in COPD is important for get proper outcomes, and nonadherence leads to health and economic burden. Adherence may get improved by using simple and easy regimens, teaching patient about self-management, communication, and counseling. Important challenge of adherence is providing a device for measuring the level of it and its acceptance. [11]

In our study adherence to inhaler therapy was assessed by using the formula  $\text{correct dose/incorrect dose} \times 100$  and it was found 80% adherence to budesonide MDI among asthmatic patients and 77% among COPD ones. In budesonide MDI+spacer adherence was about 87% for COPD patients. In a research on drug utilization in asthmatics it was seen that salbutamol, montelukast and prednidolone weremost commonly prescribed drugs. Symbicort,

seretide and Combivent are commonly used in combination therapy. Corticosteroids, beta-2 agonists, leukotriene and methylxanthines also are common classes. [12]

High cost of medicine (6.5%), lake of hospitaland drug store (0.8%) , fear of side effects (4.1%), forgotten (1.6%),lack of family support (3.3%), fear of addiction to drug (5%) are important reasons for non adherence. In a study by Fugate AR important reason for non adherence was patients felt better and so stopped taking medications (65%). forgetfulness (55.55%), cost (42.59%) and lack of access to pharmacy (31.48%) were other causes of non adherence. [13]

The cost burden of Asthma and COPD on patients is 350-400 INR for budesonide MDI and 50-100 INR for ipratropium bromide MDI, 200-300 INR for Salbutamol+ ipratropium MDI, 400-500 INR for MDI+ spacer budesonide .In a study by sakan S et al on inhaler used in hospitalized COPD and asthma patients it was found that the majority of patients were receiving a short-acting beta2 agonist inhaler, a long- acting beta2 agonist inhaler, and an ICS prior to admission. Also, 60% of participants were given an anticholinergic inhaler before hospitalization. About 35% of participants were current smokers. Average duration of hospitalization was about 5 days. According tohospital formulary, inhalers are available as MDI/DPI and can be listed as albuterol, ipratropium, tiotropium, formoterol, fluticasone,budesonide/formoterol, fluticasone/salmeterol. About 97% of participantswere given nebulized salbutamol, ipratropium. Based on our research wasted doses were significant (87% of MDI/DPI doses which cost around \$86,973). [14]

## CONCLUSION

In this research, we aimed to assess the frequency of errors during using inhalers and association between type of devices and patient preferences

Asthma and chronic obstructive pulmonary disease (COPD) are current issue and problem in the health system. Improper inhaler technique results in reduction in drug concentration in body and getting weak to symptom control.

Adherence to medication in asthma and COPD is crucial for optimizing clinical outcomes, and non adherence results in a significant health and economic burden. Adherence could be improved

by using simplified treatment regimens, increasing patient knowledge about self-management, and enhancing provider skills in patient education, communication, and adherence counseling.

The reasons for non-adherence were noted high cost of medicine, lack of access to hospital drug store, fear of side effects, feeling better, forgotten / occupational problems, lack of family support, fear of becoming dependent on treatment. The cost burden of Asthma and COPD on patients is assessed and found that the percentage of wasted doses of medication taken by MDI and DPI were remarkable.

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#### REFERENCES:

1. Sazrina W Z W, Nurliyana H M A, Shairyzah AH, Mariani AN, Aslinda J. The Effect of Patients' Knowledge on Asthma and COPD Diseases to Salbutamol Metered Dose Inhaler (MDI) Technique. *International Journal for Pharmaceutical Research Scholars* 2014; V-3, I-3:138-145
2. Chorão P M A. Inhaler Devices in Asthma and COPD – An assessment of use and patient preferences. *FMUP* 2014; 3(2):1-45
3. Azouz W, Chetcuti P, Hosker H, Saralaya D and Chrystyn H. Inhalation characteristics of asthma patients, COPD patients and healthy volunteers with the Spiromax® and Turbuhaler® devices: a randomised, cross-over study. *BMC Pulmonary Medicine* 2015; 15:47-49
4. Bryant L, Bang C, Chew C, Baik S H, Wiseman D. Adequacy of inhaler technique used by people with asthma or chronic obstructive pulmonary disease. *Journal of primary health care* september 2013; number 3, volume 5:191-199
5. Braido F, Baiardini I, Sumberesi M, Blasi F and Giorgio Walter Canonica G W. Obstructive lung diseases and inhaler treatment: results from a national public pragmatics survey. *Respiratory Research* 2013; 14:94-98
6. AL-Jahdali H, Ahmed A, AL-Harbi A, Khan M, Salim Baharoon S, Salih S B. Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. *Allergy, Asthma & Clinical Immunology* 2013; 9(8):1-7
7. Jolly G P, Mohan A, Guleria R, Poulouse R and George J. Evaluation of Metered Dose Inhaler Use Technique and Response to Educational Training. *Indian J Chest Dis Allied Sci* 2015; 57:17-20
8. Hämmerlein A, Müller U and Schulz M. Pharmacist-led intervention study to improve inhalation technique in asthma and COPD patients. *JECPP* 2009; 1(1): 1-10
9. Thomas R P, Rani N V, Kannan G, Thennarasu P, Mohammed S. Impact of Pharmacist-Led Continuous Education on the Knowledge of Inhalation Technique in Asthma and COPD patients. *Int J Med Health Sci* 2015; 4(1): 40-46
10. Baqai H Z, Saleem M A, Abair-ul-Haq M. ASSESSMENT OF METERED DOSE INHALER TECHNIQUE IN PATIENTS WITH CHRONIC LUNG DISEASE AT GOVERNMENT HOSPITALS OF RAWALPINDI. *J Ayub Med Coll Abbottabad* 2011; 23(1):37-39.
11. Lareau S C, Yawn B P. Improving adherence with inhaler therapy in COPD. *International Journal of COPD* 2010; 5:401-406.
12. Thamby S A, Juling P, Wan Xin B T, Jing N C. Retrospective studies on drug utilization patterns of asthmatics in a Government hospital in Kedah, Malaysia. *International Current Pharmaceutical Journal* 2012; 1(11):353-360
13. Fugate A R, Kadam A M, and Ganachari M S. Prospective Study of Medication Adherence Pattern in Chronic Obstructive Pulmonary Disease and Asthma Patients in Tertiary Care teaching Hospital. *Indian Journal of Pharmacy Practice*. Apr-Jun, 2015; Vol 8, Issue 2:78-83
14. Sakaan S, Ulrich D, Luo J, Christopher K, Timothy H. Inhaler Use in Hospitalized Patients with Chronic Obstructive Pulmonary Disease or Asthma: Assessment of Wasted Doses. *Hosp Pharm* 2015; 50(5):386-390