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ASSESSMENT AND EDUCATIONAL INTERVENTIONS IN INHALATION TECHNIQUE AMONG ASTHMA AND COPD PATIENTS AT A TERTIARY CARE HOSPITAL IN ERODE (Tamilnadu- India)

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ABSTRACT

The aim of this research was to assess the quality of inhalation technique in patients and to determine the effect of a single intervention by clinical pharmacist to improve knowledge of patient regarding the use of inhalers among asthma and Chronic Obstructive Pulmonary Disease (COPD) patients. A total of 223 patients with asthma or COPD using inhaler medication were randomly selected. During the first appointment, patients were interviewed and their inhalation technique was assessed with checklists. Errors were recorded and counselling with practical demonstration of proper inhalation technique was given. After 3 days, inhalation technique by the patients was reassessed and recorded using checklist. Pre and post comparison were performed to assess the impact of education by pharmacist about inhalation technique among asthma and COPD patients. All the patients committed at least single one error in their inhalation technique. There was a significant reduction in the number of patients who committed error in the first appointment to second appointment. Out of 223 patients, 162 patients (72.6%) committed error in the step 5 (exhale normally) in the first appointment. This number dropped to 21 (9.4%) in the second appointment after counselling with practical demonstration ($P < 0.015$). Correct inhalation technique is essential for effective drug delivery in COPD and asthma. The inhalation technique of asthma and COPD in patients is poor. Pharmacists can play a pivotal role in improving health outcomes for patients with asthma and COPD by providing knowledge on how to use their inhaler devices properly.

KEYWORDS: ***Inhalers, inhalation technique, Intervention, Patient Education, Aerosol Therapy***

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INTRODUCTION

Asthma and Chronic obstructive pulmonary disease (COPD), the most common chronic respiratory diseases, are found among the top 20 causes of global disability. According to the World Health Organization (WHO) estimation, 235 million people currently have asthma, and since asthma is under-diagnosed and under-treated, the worldwide prevalence is likely to be higher. The prevalence of asthma has increased over time and an additional 4.15 million disability-adjusted life years (DALYs) are caused by asthma.[1-3] In contrast, the change from moderate condition to severe COPD was observed in 65 million people in 2005. The mortality rate was increased due to COPD as more than 3 million people died, and it was the cause of 5% of all global deaths. Based on the new data, it is estimated that in 2030, COPD will become the third leading cause of death. Inhaled bronchodilators and steroids are required for the treatment of COPD and asthma because of their capacity to alleviate symptoms, improve airflow, decrease the rate of exacerbations and improve the quality of life.[4] A systematic review of studies observing patient's inhaler technique reported an overall prevalence of 31% of poor technique, 41% acceptable technique, and 31% correct usage in patients with asthma or COPD.[5] Lack of knowledge in inhalation technique is a major reason for treatment failure. Some studies suggest that using a clinical pharmacist in addition to a primary care provider and dietitian to monitor, manage, and provide education to diabetic patients starting insulin therapy will significantly improve clinical outcomes.[6] Pharmacist intervention can significantly increase disease-related knowledge, blood pressure control and medication adherence in patients with hypertension.[7,8] So there is a need to explore the impact of pharmacist intervention in inhalation technique. The objectives of the present study was to (a) assess the quality of inhalation technique (b) improve knowledge of patients regarding use of inhalers in asthma and COPD by patient counselling & practical demonstration (c) to find out the relationship between their educational status and type of instruction received with inhalation technique and (d) to find out the most commonly used inhaler device.

MATERIALS AND METHODS

A prospective observational study was conducted in a tertiary care hospital, Erode, Tamil Nadu for six months from March 2018 to September 2018. Ethical approval was obtained from the institutional review board (JKKNCP/ ETHICS_PRACTICE/ 018PDS15) and a written informed consent was taken from all the participants. A validated questionnaire and inhalation check list form developed by Hammerlein A .,[9] were used in this study to assess the knowledge of inhalation technique. We assessed the patients' knowledge on the inhaler use before intervention by interviewing the patients using questionnaire and asking them to demonstrate the steps in inhaler use. After that, counselling was given to the patients by practical demonstration on proper inhalation technique and pamphlets were distributed. To determine the impact of intervention, we assessed the patient's knowledge on the inhaler use after 3 days of intervention.

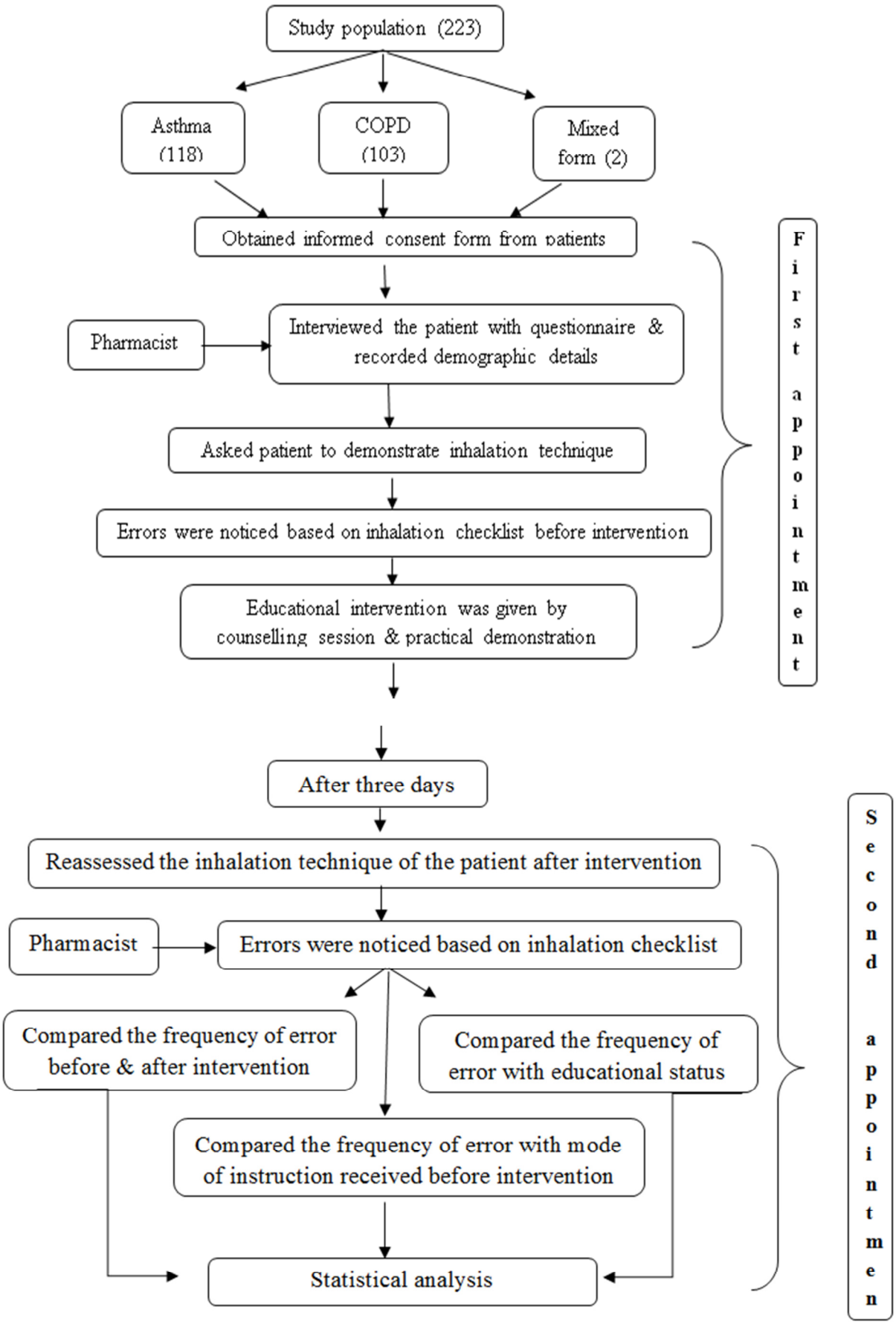
Study population

A total of 223 patients were randomly selected to assess their knowledge in inhalation technique. All inpatients were diagnosed with asthma & COPD. The age group above five years prescribed with an inhaler device outlined as the main criteria for the inclusion of the patient to the study sample. All outpatients and subjects who did not use inhaler device were excluded from the study.

STATISTICAL ANALYSIS

The primary effect variable was the number of patients who committed errors in the first appointment (before intervention). The secondary effect variable was the number of patients who made errors in second appointment (after intervention). Analysis of data was performed using SPSS version 23 (Statistical Package for the Social Sciences). The chi square test according to McNemar was performed to measure the effect variables. As a matter of principle, an error probability of less than 5% was demanded ($p<0.05$).[10]

STUDY PROCEDURE



RESULTS & DISCUSSIONS

Table 1
Basic characteristics of study population

Characteristics	Frequency	Percentage (%)
Sex		
Male	115	51.5
Female	108	48.4
Age(Years)		
5-19	16	7.17
20-34	41	18.38
35-49	95	42.6
>50	71	31.83
Diagnosis		
Asthma	118	52.9
COPD	103	46.1
Mixed form	2	0.9
Duration of disease (years)		
<1	15	6.7
1-5	72	32.2
6-10	90	40.4
11-15	16	7.2
>16	30	13.5
Mode of instruction received (before intervention)		
oral instruction	123	55.2
practical demonstration	48	21.5
oral instruction + practical demonstration	42	18.8
printed instruction	10	4.4
Education		
Illiterate	106	47.5
Lower primary	64	28.7
Higher secondary	32	14.3
Degree	21	9.4

Table 2
Distribution of patients using various inhalation devices

Sl. No	Type of device	Frequency (n=223)	Percentage (%)
1.	MDI	107	47.9
2.	MDI-breath actuated	22	9.8
3.	MDI+Spacer	34	15.3
4.	DPI	60	26.9

Table 3
Frequency of individual errors in inhalation technique before & after intervention

Sl. No	Possible sources of error	Before Intervention		After Intervention	
		n	%	n	%
1.	Cleanliness satisfactory	22	9.8	4	1.7
2.	Shake well before use (for MDI, MDI-b, MDI+S)	128	77.1	12	7.2
3.	Perform steps correctly to make the device ready to use (pull lever attach spacer) (MDI-b, MDI+S, DPI)	11	4.9	1	0.4
4.	Hold device correctly (MDI, MDI-breath, MDI+S: hold mouthpiece down, DPI: horizontally)	9	4.0	0	0
5.	Exhale (normally)	162	72.6	21	9.4
6.	Close lips (tightly for MDI- breath & DPI)	52	23.3	8	3.5
7.	Lean head slightly back (MDI)	107	81.06	36	27.2
8.	MDI: Spray & inhale at the same time	24	22.4	5	4.6
9.	MDI-breath & DPI: Inhale with forceful breath	18	21.9	6	7.3
10.	MDI+S: Release in spacer & inhale directly	15	44.1	2	5.8
11.	Inhale slowly & deeply (MDI, MDI-breath, MDI+S) or quickly & deeply(DPI)	69	30.9	19	8.5
12.	Hold breath after inhaling (5-10 seconds)	159	71.3	32	14.3
13.	Exhale through pursed lips or nose	68	30.4	21	9.4
14.	Avoid exhaling into device	42	18.8	6	2.6
15.	Wipe saliva of mouth piece (DPI)	19	31.6	2	3.3
16.	Release the device (MDI-breath)	2	9	0	0
17.	Rinse out mouth/eat something after use of inhaler	93	41.7	9	4.0

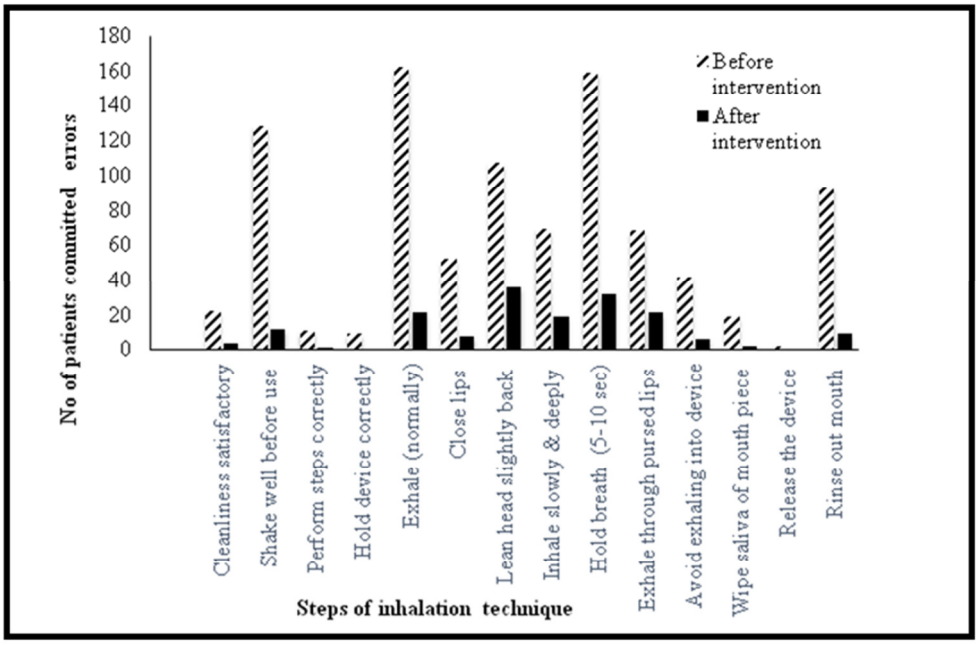


Figure 1
Frequency of individual errors in inhalation technique before & after intervention

Table 4
Distribution of patients who made error in major 5 steps of inhalation technique based on instructions received before intervention

Sl. No	Major step at which patient made error	No:of patients who received oral instruction	No:of patients who received practical demonstration	No:of patients who received practical + oral instructions
1.	Shake well before use (128)	81	33	14
2.	Exhale normally (162)	112	38	12
3.	Lean head slightly back-MDI (107)	69	28	10
4.	Hold breath after inhaling upto 5-10 seconds (159)	98	41	20
5.	Rinse out mouth after use of inhaler (93)	64	16	13

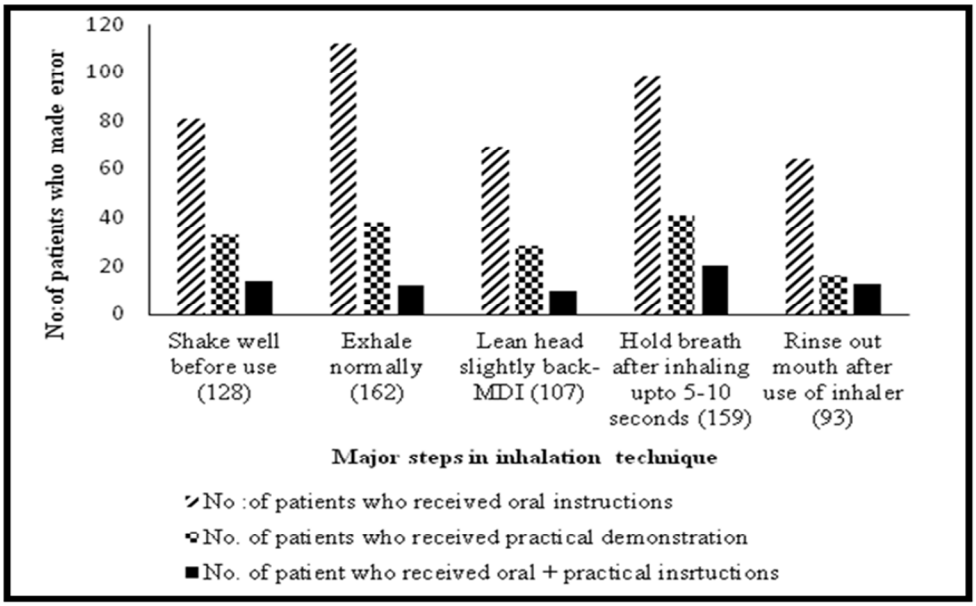


Figure 2
Distribution of patients who made error in major 5 steps of inhalation technique based on instructions received before intervention

Table 5
Distribution of patients who made error in major 5 steps of inhalation technique based on their education level before intervention

Sl. No	Major step at which patient made error	Education level of patients			
		Illiterate	Lower primary education	Higher secondary education	Degree education
2.	Shake well before use (128)	75	39	11	3
3.	Exhale normally (162)	106	34	21	2
4.	Lean head slightly back-MDI (107)	52	35	13	7
5.	Hold breath after inhaling upto 5-10 seconds (159)	97	38	20	4
6.	Rinse out mouth after use of inhaler (93)	52	29	11	1

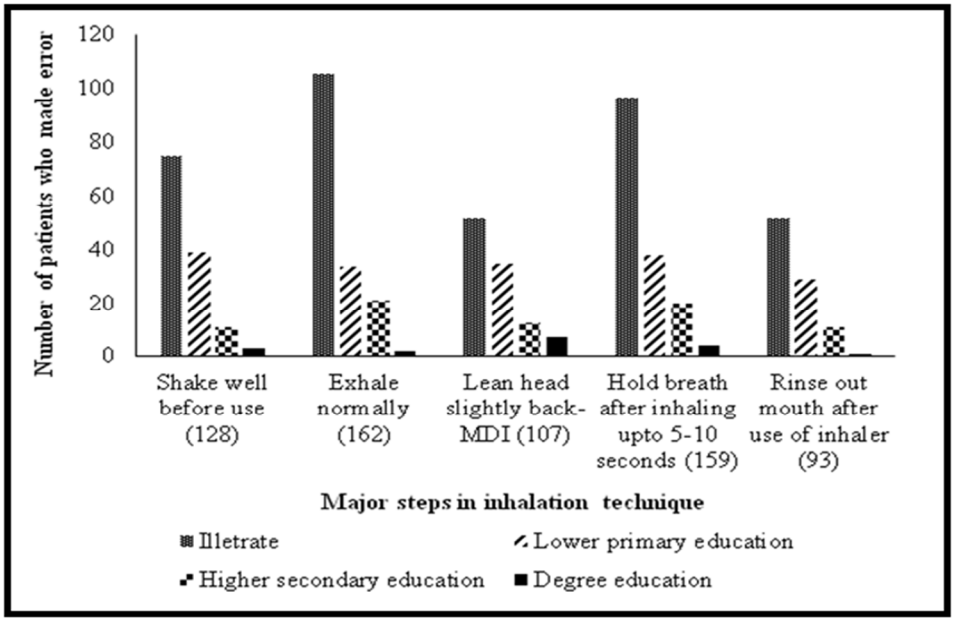


Figure 3
Distribution of patients who made error based on their education level before intervention

Table 6
Assessment of questionnaire values in study population

Sl. No	Possible sources of error	Before intervention	After intervention	Chi-square value	P-value
1.	Cleanliness satisfactory	22	4	37.213	0.000
2.	Shake well before use (usually for MDI, MDI-breath, MDI+S)	128	12	6.090	0.014
3.	Perform steps correctly to make the device ready to use (pull lever attach spacer) (MDI-breath, MDI+S, DPI)	11	1	19.360	0.000
4.	Hold device correctly (MDI, MDI-breath, MDI+S: hold mouthpiece down, DPI: horizontally)	9	0	a	a
5.	Exhale (normally)	162	21	5.955	0.015
6.	Close lips (tightly for MDI- breath & DPI)	52	8	27.287	0.000
7.	Lean head slightly back (MDI)	107	36	46.541	0.000
8.	MDI: Spray & inhale at the same time	24	5	25.530	0.000
9.	MDI-breath & DPI: Inhale with forceful breath	18	6	47.068	0.000
10.	MDI+S: Release in spacer & inhale directly	15	2	6.023	0.014
11.	Inhale slowly & deeply (MDI, MDI-breath, MDI+S) or quickly & deeply(DPI)	69	19	46.355	0.000
12.	Hold breath after inhaling (5-10 seconds)	159	32	11.942	0.001
13.	Exhale through pursed lips or nose	68	21	52.844	0.000
14.	Avoid exhaling into device	42	6	26.572	0.000
15.	Wipe saliva of mouth piece (DPI)	19	2	4.455	0.035
16.	Release the device (MDI-breath)	2	0	a	a
17.	Rinse out mouth/eat something after use of glucocorticoid	93	9	13.110	0.000

a- no statistics are computed because post-test is a constant,
According to Chi-square test result is significant at P<0.05

The study was conducted to assess the impact of pharmacist intervention in improving patients' knowledge about proper inhaler usage technique. A total of 223 patients were recruited for the study. Among them 115 were male (51.5%) and 108 were female (48.4%). Out of 115 male patients, 70 were diagnosed with COPD, 44 were diagnosed with asthma and 1 was diagnosed with mixed form. Out of 108 female patients, 74 were diagnosed with asthma, 33 were diagnosed with COPD and 1 diagnosed with mixed form. Majority of male patients were diagnosed with COPD and this may be due to the fact that smoking is a trigger factor to develop COPD. Likewise higher number of asthma patients were females which may be due to the fact that the majority of females in our study population are working in weaving industries. Of the 223 patients, majority (52.9%) were asthma patients. This is in accordance with the reports given by Hammerlein A. .,[9] in which the study stated a higher incidence of asthma (52%) than COPD. Among 223 patients, 95 patients were under the age group of 35-49 (42.6%), 71 patients were under the age category greater than 60 (31.83%), 41 patients were under the age group of 20-34 (18.38%) and 16 patients were under the age group of 5-19 (7.17%). Among 223 patients, , 90 patients suffer from the disease for 6 to 10 years (40.4%), 72 suffer for 1 to 5 years (32.2%), 30 patients suffer for more than 16 years, 16 suffer for 11 to 15 years (7.2%) and 15 patients suffer for less than 1 year (6.7%) (Table 1). Out of 223 patients, 106 patients were illiterate (47.5%), 64 completed lower primary education (28.7%), 32 completed higher secondary education (14.3%) and 21 completed degree education (9.4%) (Table 1). In our study more number of patients come under the category of illiterate & lower primary. The results of our study suggested that patients with higher education were found to have more knowledge about the disease, triggering factors and medication usage technique. A study done by Anjan DS .,[11] also reported similar results that education has a positive influence on inhaler usage technique among asthma and COPD patients. (Table 1) Among 223 patients, 123 patients received oral instruction about inhalation technique (55.2%), 48 patients received practical demonstration (21.5%), 42 patients received both oral instruction & practical demonstration (18.8%) and 10 patients received printed instruction (4.4%) (). Majority of patients had received oral instructions. In case of errors, patients are to be educated on the correct demonstration of inhalation technique, verbal instructions as well as practical exercises. These methods in educating patients have shown to be effective, leading to an improved inhalation technique[12] (Table 1). Among 223 patients, 107 were using MDI (47.9%), 60 were using DPI (26.9%), 34 were using MDI+Spacer (15.3%) and 22 were using MDI-Breath actuated (9.8%). The most commonly used inhaler device was found to be MDI (Table 7). Our study results differ from the research study conducted by Pedro C .,[13] that Turbohaler and Diskus were the most widely used devices, accounting for 27% and 19%, respectively. Of all the inhalers, Autohaler, Breezehaler, Miathaler, Novolizer and Respimat represented less than 5% of the devices in current use (Table 2). Out of 223 patients, 162 patients have committed error in step 5 (Exhale normally) in the first appointment but after giving counselling and practical demonstration the number of patients who committed error reduced to 21. All patients committed at least one error in the inhalation technique. In another study by Souza ML .,[8] it was concluded that the majority of the patients claimed to know how to use inhalation devices. The fact that 94.2% committed at least one error shows that their technique was inappropriate and reveals a discrepancy between understanding and practice. When Hammerlein A.,[9] conducted an interventional study to improve inhalation technique in 757 COPD and asthma patients, it was concluded that a total of 597 patients (78.9%) made at least one mistake in performing the inhalation technique at baseline. This number dropped to 214 (28.3%) from the first to the second appointment (Table 3). The most common errors detected in the study were similar to those found in other studies, for example, failure to hold the breath after inhalation, failure to shake the canister before use, failure to lean head slightly back (MDI), failure to wipe saliva off mouthpiece (DPI) and failure to rinse out the mouth after using inhaler.[9] A total of 162 patients made error in exhale normally; out of that, 112 patients had received oral instruction, 38 patients had received practical demonstration and 12 patients had received oral + practical instruction before intervention. Patients who received oral instructions committed majority of error in inhalation technique before intervention (Table 4).

Similarly, Jolly GP.,[14] conducted a randomised controlled study on evaluation of metered dose inhaler(MDI) use technique and response to educational training. At baseline, only 1 of the 117 subjects could perform all the steps of inhaler usage correctly. Inhalation technique of patients improves after imparting systematic educational intervention. A practical demonstration of all the steps proved more effective than simple verbal/written advice.

Among 223 patients, 162 patients committed error in exhale normally step. Out of that 106 patients were illiterate, 34 had lower primary education, 21 with higher secondary education and 2 with degree education. Individuals who were illiterate or with lower primary education committed more errors in inhalation technique than higher secondary or degree individuals. A study by Al-Hassan MI. .,[15] showed that the most important factor that significantly affected proper use of inhalers was the level of education. Roy A. .,[16] found out that higher education and economic status were significantly associated with higher rates of adherence (Table 5). The number of errors decreased from first appointment to second appointment after counselling and practical demonstration of inhalation technique. So the statistical analysis shows that there is a significant difference in error before and after intervention given (Table 6). Out of 223 patients, 159 patients made error in the step 12 (hold breath after inhaling for 5-10 seconds) and the number of patients committed error has been reduced to 32 after giving intervention ($P > 0.001$, $\chi^2 = 11.942$).

LIMITATIONS

The study was conducted in a short time period and collected sample size was less. The time gap between the first appointment and second appointment was too short.

CONCLUSION

Correct inhalation technique is essential for effective drug delivery COPD and asthma patients. Patients on therapy with inhalation drugs should be educated thoroughly on the proper use of inhalers. Our study concluded that the inhalation technique of asthma and COPD in patients were poor. Patient counselling with practical demonstration have to be taken in order to minimize errors and optimize treatment. Pharmacists can play a pivotal role in improving health outcomes for patients with asthma and COPD by providing education on how to use their inhaler devices properly.

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AUTHORS CONTRIBUTION STATEMENT

Vidhya PV and Jeena S conceived of the presented idea, gathered data and performed the computations. Dr.N.Venkateshwaramurthy verified and investigated the research work. Dr.R.Sambathkumar encouraged and supervised the findings of the work. All authors discussed the results and contributed to the final manuscript.

CONFLICT OF INTEREST

Conflict of interest declare none.

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