VOLUME-8, ISSUE-4, APRIL-2019 • PRINT ISSN No 2277 - 8160

Original Research Paper

Pulmonary Medicine

ASSESSMENT OF INHALATIONAL TECHNIQUES AND CHANGES OCCURS AFTER IMPARTING EDUCATION IN PATIENTS OF OBSTRUCTIVE AIRWAY DISEASES.

Bidyalakshmee Yumnam	Final year resident, MD Pulmonary Medicine, Department of Chest & Tuberculosis, SMS Medical College, Jaipur.
Rajawat Govind Singh*	MD. Assistant Professor, Department of Chest & Tuberculosis, SMS Medical College, Jaipur. *Corresponding Author
Koolwal Suresh	MD Senior Professor, Department of Chest & Tuberculosis, SMS Medical College, Jaipur.

ABSTRACT Prevalence of obstructive airway diseases is on the rise all over the world. Inhalation therapy is the most recommended and efficient therapy for these respiratory diseases, but incorrect inhalation technique can cause poor disease control. Aims: The aim was to evaluate the inhalation technique of obstructive airway diseases patients using dry powder inhaler and to investigate improvement in technique after imparting education. Settings and Design: Hospital-based observational type of descriptive study. Subjects and Methods: Consecutive nonrandom sampling method was used to enroll study subjects. Basic sociodemographic information of the study subjects was collected. The inhalation technique was visually observed and scored on checklist. Results: Correct technique was observed in only 9 (15%) patients. The step at which maximum number of patients committed mistake was step 5 (no or incomplete exhalation) (97.8%). Errors in technique were corrected more among non smokers, literate subjects, females patients, among patients with bronchial asthma. Conclusions: It was found that many errors were made in the inhalation technique hence proper training and follow-up at every visit of the patients is required to achieve the desired effects of the inhaled medications.

KEYWORDS : Obstructive airway diseases, inhalation technique, dry powder inhaler

INTRODUCTION

Obstructive airway diseases are the common respiratory conditions having a large burden on society in terms of mortality and morbidity. It mainly includes chronic obstructive pulmonary diseases, bronchial Asthma and in small percentages obstructive airway disease sequel to pulmonary tuberculosis and occupational diseases. The inhaled route is preferred for the delivery of the drugs in treating respiratory diseases because it provides small doses of drugs to delivered directly to the site of action, leading to a higher local concentration, rapid onset of action and a low incidence of systemic side effects.[1]

The development of devices (metered dose inhaler with and without spacer & Dry powder inhalers) made it possible to improve delivery of the drugs to the lungs as well as to decrease local and systemic side effects. Technical features of inhaler devices have improved constantly with time. Many inhalers, both MDIs and DPIs, are complicated to use, requiring many steps for a correctly performed inhalation maneuver.[2,3] The effectiveness of inhaled drugs depends on the patient's ability to use these devices correctly. Incorrect inhalation technique can cause poor disease control. Sub optimal techniques result in decrease drug delivery and inadequate therapeutic response. Most of the similar studies are from developed countries, however there is paucity of data regarding this in our country. So, we planned this study for evaluation of inhalation technique for using prescribed dry powder inhalation devices in patients of obstructive airway diseases and to assess the effect of education imparted for correct use of inhalational device.

METHODS AND METERIALS

This study was undertaken in Institute of Respiratory Diseases, SMS Medical College, Jaipur. It is a hospital based observational type of descriptive study on patients of obstructive airway diseases attending the OPD and IPD.

Sample size is calculated at 95% confidence level assuming error in 83.7% in patients of COPD and asthma using inhalational techniques as literature. Total 60 patients were included in the study.

The patient fulfilling the inclusion criteria, were interviewed and evaluated for the technique of using inhalation devices as given by the European Respiratory Society[4] of using the prescribed inhaler device. Inclusion criteria's were age group between 18 – 70 years, stable cases of patients using inhalational devices taking for > 1 month, patients giving written informed consent.

Exclusion criteria's were active tuberculosis infection, acute exacerbation of obstructive airway diseases, patients unwilling to participate or moribund patients.

The personal data which included name, age, sex, OPD/IPD registration number, education, smoking, history, type of device used, duration of device used, who imparted education about Inhaler technique were recorded and the inhalation technique was checked and interpretations were recorded.

Technique for using Dry Powder Inhalers[4]

Remove cover (device specific), Load dose (device specific), Pierce/break capsule, Breathe out, Place mouthpiece between lips, Inhale deeply and quickly, Hold breath (10 seconds).

Errors in technique of DPI

1. Not cleansing the device timely and properly and using before air dry
2. Failure to remove cover
3. Incorrect dose loading
4. Failure to pierce/break the capsule
5. No exhalation/incomplete exhalation
6. Breathing out into the device
7. Poor seal around the mouth
8. Not inhaling quickly enough
9. Insufficient acceleration
10. No /short breadth hold
11. Inappropriate storage
12. Failure to maintain oral hygiene after each dose (rinsing, gargles, and spit)
13. Taking the drug per orally.

STUDY PROTOCOL

Patients fit according to inclusion criteria were included. A thorough clinical examination was done. Routine investigations were sent along with chest x-ray and spirometry. Various steps of the

inhalational technique was evaluated and enquired about the educator of the technique as well. Those patients, who were using the devices correctly, were excluded and those who were using the devices incorrectly, they were taught about the correct technique.
These patients were followed after 1 month to assess the impact of education imparted, re-assessed the various steps of technique. Improvement in the errors were noted and co-relation was also done with the various factors like age, gender, literacy, smoking status, diagnosis, device used, duration of device used and educator and also found out the side effects related to the improper inhalational techniques and drugs used. Those patients who did not come back for follow up were excluded.

RESULTS

In present study 60 patients were evaluated regarding the inhalational technique and enquired about the educator of the technique as well. Out of these, only 9 patients were using the technique correctly and 5 patients were lost to follow up and 46 patients had error in technique while using the prescribed inhalation devices. So total 14 patients were excluded from the study, remaining 46 DPI users were taught about the correct technique and followed up after 1 month.

Maximum number of patients using DPI were mostly in 50 – 59 years age group, mean age was 54.9 ± 1.9 years, most patients were males (73.9%), 73.9% were illiterate and 56.5% were smokers. Most of the patients using inhaler devices were educated by physicians (50%), 19.6% by pharmacist, 10.9% by paramedical staff respectively. Most of the patients (54.3%) were using DPI for 12 – 36 months followed by >36 months (37.9%).

In DPI users, step 5 (**no or incomplete exhalation)** was the most common faulty step seen in almost all patients **(97.8%)** followed by step 10 (no or short breath hold - 82.6%). There was correction in all steps after imparting education, but significant correction was seen in step 1 (not cleansing the device timely and properly and using before air dry, **p=0.002**), step 5 (no or incomplete exhalation, **p=0.001**), step 7 (poor seal around mouth), 8 (not inhaling quickly), 9 (insufficient acceleration, **p<0.001**), step 10 (no or short breath hold, **p=0.002**), step 11 (inappropriate storage, **p=0.014**) and step 12 (failure to maintain oral hygiene, **p<0.001**). After instruction the most common faulty step was **step 5 (47.8%)** and step 10 (39.1%). Other common faulty steps even after intervention were step 12 (23.9%) and step 9 (19.6%).

The most common errors while using DPI were no or incomplete exhalation followed by no or short breath holding which was seen in almost all patients, which is statistically significant **(p<0.001)**. Errors were corrected maximally in patients aged 30 -39 years (66.7%), and 20 – 29 years (50%). Persistence of error was maximum in older patients' age 60 – 69 years (92.3%) and 50 – 59 years (87.5%) **(p<0.001)**. Correction of errors in technique were more among literate subjects (54.3%) as compared to illiterate subjects (17.2%) and the difference was found to be statistically significant **(p<0.001).**

Errors in technique were corrected more among non smokers (48.8%) as compared to smokers (23%), **(p<0.05).** Correction of errors in technique were maximum among patients with bronchial asthma (57.1%) as compared to COPD (28.3%) and other diagnosis (27%) and this difference was found to be statistically significant **(p<0.05)** . Errors in technique were corrected maximum among patients educated initially by physician (63%), then paramedical staff (25%) and pharmacist (4.5%). Less improvement was seen in patients educated by fellow patient or literature study. The difference was found to be statistically significant **(p<0.001)** .

Correction of errors in technique were more among subjects using device for 12 – 36 months (43.5%) followed by >36 months of use (24.3%) as compared to subjects using device for <12 months (16.7%) and this difference was found to be statistically significant **(p<0.001)** i.e correction in faulty use was significantly more among subjects with longer duration of use of device for 12 - 36 months as compared to < 12 months but the correction rate is less than the subjects using the device for > 36 months.

DISCUSSION

Inhaled medication has emerged as the main stay of treatment in the management of obstructive respiratory diseases. With proper education when prescribing the inhalational devices and with correct techniques, the deposition of drugs increases (12-20%) in the lung**.** This has been reported in a large percentage of cases in some Western studies by Omer et al[5] which concluded that the proper education program reduced the mean number of pitfalls among the patients using inhalers. De-Moraes et al[6] showed that although the majority of the patients claimed to know how to use inhalation devices, 94.2% patients committed at least one error, concluded that their technique was inappropriate and revealed a discrepancy between understanding and practice. Improper technique can lead to various side effects.

In present study according to age, patients were divided into five groups 20-29, 30-39, 40-49, 50-59 and 60-69 years. In this study, improvements were seen in all the patients in follow up after imparting education. This is supported by the studies done by Johnson and Robart (2000)[7], Golpe Gómez et al (2001)[8], Voshaar (2002)[9], Melani et al (2011)[10], Klijn S. L. (2017)[11] which revealed that giving education about inhalational technique improved inhaler technique but it is very important to check the technique in each and every visit so as to decrease the errors related with it.

For analysis, we divided the patients into two groups:

1. Error removed - means all steps were corrected.
2. Error not removed - means at least 1 step was still faulty at follow up.

In this study (DPI users) **step 5 (no or incomplete exhalation)** was the most common faulty step seen in almost all patients **(97.8%)** followed by step 10 (no or short breath hold -82.6%). There was correction in all steps after imparting education, but significant correction was seen in step 1 (not cleansing the device timely and properly and using before air dry, **p=0.002**), step 5 (no or incomplete exhalation, **p=0.001**), step 7 (poor seal around mouth), 8(not inhaling quickly), 9 (insufficient acceleration, **p<0.001**). After instruction the most common faulty step was **step 5 (47.8%)** and step 10 (39.1%). (table -11)

According to Alamoudi et al[12] in the dry powder inhaler group; failure to breath hold for 5-10 seconds (23.1%) and failure to twist the grip forward and backward before use (21.1%) were the most common pitfalls that were reduced after education (0%,0%), which is almost comparable to our study. In our study, the most common errors while using the inhaler devices were no or incomplete exhalation and no or short breath holding which was seen in almost all patients, which is supported by De-Moraes et al[13], Alamoudi et al[12], Molimard et al[14], and Lavorini et al[15] studies but not comparable with studies done by Henry & David[10], in which not holding the device properly was the most common error.

In present study, errors were corrected maximally in patients aged 30 -39 years (66.7%) and 20 – 29 years (50%). Persistence of error was maximum in older patients age 60 – 69 years (92.3%) and 50 – 59 years (87.5%). Significant association was found between error removal and age of study subjects i.e. error correction was significantly more in younger population (20 – 39 years) as compared to older population **(p<0.001)**.

Present study shows correction of errors in technique were more among literate subjects (54.3%) as compared to illiterate subjects (17.2%) and the difference was found to be statistically significant **(p<0.001)**. Similar results were observed by William et al (2004)[17] in their study. This study found that errors in technique were corrected

more among non smokers (48.8%) as compared to smokers (23%) **(p<0.05).**

In our study, maximum correction of errors in technique were seen among patients with bronchial asthma (57.1%) as compared to COPD (28.3%) then other diagnosis (27%) **(p<0.05).** In comparison to Rootsmen et al (2010)[18] in their study of 156 patients found that 40% of COPD and 41% of asthma patients did error in technique (p>0.05) and they concluded that the type of disease have no impact on error in technique.

Present study revealed that errors in technique were corrected maximum among patients educated initially by physician (63%), paramedical staff (25%) and pharmacist (4.5%). Less improvement was seen in patients educated by fellow patient or literature study. The difference was found to be statistically significant **(p<0.001).** This is supported by a similar study in Punjab by Vitull et al[19].

In present study, correction of errors in technique were more among subjects using device for 12 – 36 months (43.5%) followed by >36 months of use (24.3%) as compared to subjects using device for <12 months (16.7%) and this difference was found to be statistically significant **(p<0.001).** This may due to confounding factors like age, literacy and number of errors during first evaluation. The duration of use has no impact on error in handling the device.

CONCLUSION

Inhalational therapy is the mainstay in the management of obstructive airway diseases and maximum patients did error in the technique of inhalation while using inhalation devices which results in no or poor deposition of drugs in the lungs leading to less or no therapeutic response and more local side effects. To avoid this physician himself should advice the correct technique of the inhalational devices use in every patient. At every visit, the technique of inhalation should be checked and practical demonstration is needed to improve the patients' ability to use the inhaler with correct technique and it should be corrected whenever required.

Table 1: Type of Error while using DPI inhaler*

Steps	Error type	No. of Cases				P value
		Baseline	%	Follow up	%	
1	Not cleansing the device timely and properly and using before air dry	14	30.4	02	4.3	0.002(S)
2	Failure to remove cover	00	0.0	00	0.0	-
3	Incorrect dose loading	04	8.7	00	0.0	0.121(NS)
4	Failure to pierce/break the capsule	05	10.9	00	0.0	0.060(NS)
5	No exhalation/incomplete exhalation	45	97.8	22	47.8	0.001(S)
6	Breathing out into the device	02	4.3	00	0.0	0.498(NS)
7	Poor seal around the mouth	31	67.4	04	8.7	<0.001(S)
8	Not inhaling quickly enough	28	60.9	01	2.2	<0.001(S)
9	Insufficient acceleration	36	78.3	09	19.6	<0.001(S)
10	No /short breadth hold	38	82.6	18	39.1	0.002(S)
11	Inappropriate storage	07	15.2	00	0.0	0.014(S)
12	Failure to maintain oral hygiene after each dose(rinsing, gargles and spit)	32	69.6	11	23.9	<0.001(S)
13	Taking the drug per orally	01	2.2	00	0.0	1.000(NS)

*Multiple response table

REFERENCES

1. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Bethesda (MD): Global Initiative for Chronic Obstructive Lung Disease, World Health Organization, National Heart, Lung and Blood Institute; 2007.
2. Laube BL. In vivo measurements of aerosol dose and distribution: clinical relevance. J Aerosol Med. 1996; 9 Suppl 1: S77-91.
3. Muchão FP, Perín SL, Rodrigues JC, Leone C, Silva Filho LV. Evaluation of the knowledge of health professionals at a pediatric hospital regarding the use of metered-dose inhalers. J Bras Pneumol. 2008; 34(1) : 4-12.
4. Newman SP. Inhaler treatment options in COPD. European Respiratory Review 2005; 14 : 102-108.
5. Omer AS. Pitfalls of inhalation technique in chronic asthmatics. Effect of education program and correlation with peak expiratory flow: Saudi Medical Journal 2003; 24(11) : 1205-1209.
6. De-Moraes SLM, Cristina MA, Erica E, Oliveira VE, Carvalho BM. Knowledge of and technique for using Inhalational devices among asthma patients and COPD patients. J Bras Pneumol 2009; 35(9) : 824-831.
7. Johnson DH, Robart P. Inhaler technique of outpatients in the home. Respir Care. 2000; 45(10) : 1182-7.
8. Golpe Gómez R, Mateos Colino A, Soto Franco I. Inadequate technique in the use of inhalers in patients seen at a pneumology clinic. An Med Interna. 2001; 18(2) : 69-73.
9. Voshaar T. Inhalation therapy: techniques and use of devices--main mistakes. Med Klin (Munich). 2002; 97 Suppl 2 : 2-6.
10. Melani AS, Bonavia M, Cilenti V, Cinti C, Lodi M, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. Respir Med. 2011; 105(6) : 930-8.
11. Sven L. Klijn, Mickaël Hiligsmann, Silvia M. A. A. Evers, Miguel Román-Rodríguez, Thys van der Molen and Job F. M. van Boven. Effectiveness and success factors of educational inhaler technique interventions in asthma and COPD patients: a systematic review. NPJ Prim Care Respir Med. 2017 Apr 13;27(1):24. doi: 10.1038/s41533-017-0022-1.
12. Omer AS. Pitfalls of inhalation technique in chronic asthmatics. Effect of education program and correlation with peak expiratory flow: Saudi Medical Journal 2003; 24(11) : 1205-1209.
13. De-Moraes SLM, Cristina MA, Erica E, Oliveira VE, Carvalho BM. Knowledge of and technique for using Inhalational devices among asthma patients and COPD patients. J Bras Pneumol 2009; 35(9) : 824-831.
14. Molimard M. How to achieve good compliance and adherence with inhalation therapy. Curr Med Res Opin. 2005; 21 Suppl 4 : S33-7.
15. Lavorini F, Magnan A, Dubus JC, Voshaar T, Corbetta L, et al. Effect of incorrect use of dry powder inhalers on management of patients with asthma and COPD. Respir Med. 2008; 102(4) : 593-604.
16. Henry C, David P. Not all asthma inhalers are the same : actors to consider when Prescribing an inhaler. Primary Care Respiratory Journal 2009; 18(4) : 243-249.
17. Plaza V, Sanchis J, Roura P, Molina J, Calle M, et al. Physicians' knowledge of inhaler devices and inhalation techniques remains poor in Spain. J Aerosol Med Pulm Drug Deliv. 2012; 25(1) : 16-22.
18. Rootmensen GN, van Keimpema ARJ, Jansen HM, de Haan RJ. Predictors of incorrect inhalation technique in patients with asthma or COPD : A study using a validated videotaped scoring method. J Aerosol Med Pul Drug Delivery 2010; 23(5) : 1-6.
19. Vitull G, Sonia G, Yashpal J, Jigyasa T. To study the type of inhaler devices used and Errors in Inhaler Technique Committed by patients of Chronic pulmonary Diseases in Punjab. APICON 2009.