EVALUATION OF ROTAHALER TECHNIQUE AND IMPACT OF INTERVENTION IN PATIENTS WITH BRONCHIAL ASTHMA AND/OR CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Shrestha D[1], Devkota KC[2], KC A[2], Gurung RS[1], Shrestha L[3]

[1]Department of Pharmacology, Nepal Medical College and Teaching Hospital, Attarkhel, Nepal
[2]Department of Medicine, Nepal Medical College and Teaching Hospital, Attarkhel, Nepal
[3]Department of Clinical Physiology, Maharajgunj Medical Campus, Institute of Medicine, Maharajgunj, Nepal

ABSTRACT

Improper inhalation technique is highly prevalent in asthma and COPD patients. Improper technique of inhaler device is associated with decreased medication delivery and inadequate disease control. Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD has highlighted the importance of regular inhalation technique assessment in improving the efficiency of drug delivery. It was an interventional study conducted in NMCTH, Jorpati, Kathmandu. Inhalation technique of 100 patients diagnosed with COPD and/or asthma were evaluated with a checklist. Then, the patients were trained with instructions, face-to-face demonstration and video demonstration regarding the correct use of the rotahaler. All patients were re-evaluated on their next OPD visit. Out of 100 patients included in the study, 63% were female whereas 37% participants were male. The mean age of participants was 60.42±13.95 years. Only 13% participants performed all the steps of inhaler use correctly before training. Male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively. The most common incorrectly performed step was breathing out gently to residual volume. The mean pre-training score was 5.96±1.35 whereas the mean post-training score was 7.5±0.75. The difference in mean pre-training and post-training scores was highly significant statistically ($p<0.01$). Patients using rotahaler device need face to face training to achieve correct technique of its use. Regular assessment and reinforcement of correct inhalation technique is essential for proper use of rotahaler devices by the patients.

KEYWORDS

Asthma, COPD, inhalation technique, rotahaler

CORRESPONDING AUTHOR

Dr. Deepti Shrestha,
Department of Pharmacology,
Nepal Medical College, Attarkhel, Kathmandu
Email: deepti.shrestha82@gmail.com

INTRODUCTION

Bronchial asthma and chronic obstructive pulmonary disease (COPD) are leading causes of global morbidity and mortality.[1,2] Pressurized metered dose inhalers (pMDI) and dry powder inhalers (DPI) are the most appropriate drug delivery systems for drugs used in these diseases because there is minimal systemic absorption of the drugs used and hence will improve drug safety.[3]

Improper technique of inhaler device use has been found to be associated with decreased medication delivery and inadequate disease control.[4] The proper technique of inhaler device use is an important factor to be considered during the management of these diseases. Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD has emphasized the importance of assessing inhalation technique in improving the efficiency of drug delivery.[5] Improper use of inhaler devices have been reported in various studies.[6,7] The presence of incorrect inhalation technique has been reported to be as high as 94% of patients.[8-12]

Bronchial asthma and COPD are very common diseases in Nepalese population. The rotahaler use technique is one of the determinants of drug delivery to the respiratory tract and hence the disease control. Improper inhalation technique is highly prevalent in the asthma and COPD patients. The study on rotahaler inhalation technique and the impact of intervention in asthma and COPD patients are lacking in Nepalese context. So, it would be worthy to study the frequency of proper rotahaler technique and the impact of intervention in asthma and COPD patients in Nepal Medical College Teaching Hospital (NMCTH).

The main aim of this study is to evaluate the rotahaler technique in patients of bronchial asthma and/or COPD and the influence of educational intervention on it.

MATERIALS AND METHODS

This study is an interventional study. It was conducted in the out-patient department (OPD) of pulmonary unit of Medicine Department of NMCTH, Jorpati, Kathmandu on COPD and/or asthma patients, who had been using rotahaler device, from April to November 2017, after ethical approval was obtained from Research and Institutional Review Committee of NMCTH.

One hundred participants were included in the study. Patients diagnosed with COPD and/or asthma, aged ≥18 years, using rotahaler device were included, whereas patients admitted in the hospital, patients with acute exacerbation and patients using other kinds of inhaler devices were excluded from this study. After taking informed consent, patients were assessed for inhalation technique. Use of rotahaler were evaluated in a practical manner by asking patients to demonstrate their inhalation technique using rotahaler.

The steps performed by patients were evaluated with a checklist which was made on the basis of the instructions provided by manufacturer and previous studies.[9,11,12] Each correct step was scored one and each incorrect step or missed step was scored zero.[12] After the assessment, patients were given instructions, face-to-face demonstration and video demonstration regarding the correct use of the rotahaler, and were trained until they could use the device correctly.

All patients were requested to demonstrate their inhalation technique after one month and were re-evaluated. The collected data was analyzed with SPSS version 16.0. The frequencies of proper use of rotahaler were reported as percentage. The mean score of rotahaler use before and after intervention were compared by paired t-test.

RESULTS

Out of 100 patients included in the study, 39 were diagnosed as asthma and 61 were diagnosed as COPD. Female participants were 63% whereas 37% participants were male. The mean age of participants was 60.42±13.95 years and the highest percentage of participants were in the age group of 61-80 years i.e. 57%.

Table 1. Demographic characteristics of patients and association of patient characteristics with rotahaler use technique

Patient characteristics	Percentage of patients (n=100)	Number (percentage) of patients performing all steps correctly	p-value
A. Age group			
< 20 years	1	0 (0)	0.58
21-40 years	11	3 (27.27)	
41-60 years	27	3 (11.11)	
61-80 years	57	7 (12.28)	
>80 years	4	0 (0)	
B. Sex			
Male	37	8 (21.62)	0.04
Female	63	5 (7.93)	
C. Diagnosis			
Asthma	39	9 (23.07)	0.01
COPD	61	4 (6.55)	
D. Smoking habits			
Smoker	52	4 (7.69)	0.10
Nonsmoker	48	9 (18.75)	
E. Education			
Literate	24	6 (25.00)	0.04
Illiterate	76	7 (9.21)	
F. Duration of rotahaler use			
< 1 year	24	2 (8.33)	0.84
1-5 years	41	6 (14.63)	
6-10 years	25	4 (16)	
> 10 years	10	1 (10)	
G. Co-existing disease			
Yes	52	6 (11.53)	0.65
No	48	7 (14.58)	

Demographic characteristics of patients and association of rotahaler use technique with patient characteristics has been given in table 1.

Among the participants, 52% were smoker and 48% were nonsmoker. Among male participants, 81.08% were smokers and among female participants, 34.92% were smokers. Among female participants, 58.73% had history of using biomass fuel for cooking food. Most of the patient i.e. 76% were illiterate, while only 24% were literate. The highest percentage (41%) of duration of patients' rotahaler use was 1-5 years. Co-existing diseases were present in 52% of participants.

Correct inhalation technique had no association with age, smoking habit, duration of rotahaler use and coexisting disease. However, male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively and the difference was found to be statistically significant.

Table 2. Performance of patients in various steps of rotahaler use

S.N.	Steps	Percentage of patients performing the steps correctly	
		Before training	After training
1.	Hold the rotahaler vertically	90	100
2.	Place capsule into the raised square hole of rotahaler	100	100
3.	Press the capsule firmly to the same level of raised square hole of rotahaler	100	100
4.	Hold the mouthpiece firmly with one hand and rotate the base with other	100	100
5.	Breathe out gently to residual volume away from the mouth piece	19	77
6.	Put the mouthpiece between teeth and close lips to form a good seal	53	92
7.	Inhale rapidly and deeply	67	83
8.	Remove the rotahaler from mouth and hold breath for 5-10 secs	67	98

The percentage of patients correctly performing each step of rotahaler use before and after training is shown in table 2.

Eighty seven percentage of patients performed at least one step incorrectly. The most common incorrectly performed step was breathing out gently to residual volume (81%), followed by putting the mouthpiece between teeth and closing lips to form a good seal (47%). Thirty three percent participants could not correctly inhale rapidly and deeply; 33% failed to remove rotahaler from their mouth and to hold the breath for 5-10 seconds, while 10% of patients did not hold the rotahaler device vertically.

Table 3. Mean pre-training and post-training inhalation technique scores

Performance	Mean score	p-value
Before training	5.96 ± 1.35	<0.01
After training	7.50 ± 0.75	

Table 3 shows the mean scores of the patients performing rotahaler technique. The mean pre-training score was 5.96±1.35 whereas the mean post-training score was 7.5±0.75. The difference in mean pre-training and post-training scores was highly significant statistically ($p<0.01$).

DISCUSSION

Rotahaler is the most commonly used inhaler in Nepal as it is cheaper and easily handled by the patients.[13] In our study, only 13% participants performed all the steps of inhaler use correctly before training which is consistent with findings of previous studies.[11] In this study, there was no association found between age, smoking habit, duration of use and coexisting disease with correct inhalation technique. However, male, educated and asthma patients had better inhalation technique in comparison to female, uneducated and COPD patients respectively which was found to be statistically significant ($p<0.05$). In study by Pun S *et al*, factors like age, education and smoking have been found to be related with more errors while performing the inhalation steps.[11] While Hasselink *et al* found no association between inhalation technique and age, sex, ethnicity, education, comorbidity and smoking habit, Pothrait *et al* found statistically significant difference only in participants with low education level.[6,14]

The most commonly mistaken step was "Breathe out gently to residual volume away from the mouth piece" which is similar to findings of studies by Palen J *et al*, Pun S *et al* and Sapkota D *et al* where 66%, 84% and 61% participants respectively made error in exhaling to residual volume.[9,11,15] When mistakes are done during the inhalation procedure, significant amount of drugs may fail to reach the lungs. Breathing out gently to residual volume away from the mouth piece is an important step, as without an adequate exhalation, patients may be unable to inhale forcefully and deeply enough through their inhaler in order to ensure deposition of drug into the lungs. Breathing out should be done away from the rotahaler. Breathing out into or through rotahaler may blow away the drug or form lumps of drug inside it making the drug less effective.[8,16]

The impact of educational intervention in inhalation technique was found to be highly significant ($p<0.01$), which is similar to findings of other studies.[12,14,17-19] This suggests that repeated training and demonstration can improve the rotahaler use technique in patients. Gracia- Antequera M *et al* also showed that patients receiving instruction of inhaler device use more than once over a period of time showed improvement in

their handling of inhaler devices.[20] So, patients using rotahaler devices will benefit from regular assessment of their technique and feedback, which will ensure compliance and adequate delivery of drug.

All patients using rotahaler device need face to face training and re-training to achieve correct technique of rotahaler use. Regular assessment and reinforcement of correct inhalation technique is essential for proper use of rotahaler devices by the patients.

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