Evaluation of inhalational techniques of pressurized metered-dose inhaler with spacer in asthma patients

Sir,

Three-hundred million people worldwide are affected with asthma.[1] Inhalational route is the most preferred mode of drug delivery system for the treatment of asthma. This offers many advantages as drugs act directly on the airways and require administration of lower doses, with no side effects related to gastrointestinal system.[2] Most important determinants of the effectiveness of inhaled medications are the compliance and good inhalational techniques.[3] These inhalational techniques involve many steps and cumbersome for few patients; hence, the prescription of medication should always be accompanied by appropriate inhaler technique training by a health professional.[4] Although there are number of different devices and technological improvements, the limitations still remain for adequate drug delivery in the airways.[5] Selection of device should be based on availability, cost, patient and physician preference, and clinical setting.[6] Metered-dose inhaler (MDI) with spacer is the most commonly prescribed drug delivery system in asthma management.

Studies showed that incorrect inhalational techniques are associated with decreased drug delivery and poor control of the disease.[7-9] Demographic determinants such as sex, age, education level, and severity of obstruction also play a role in incorrect techniques.

There are only few studies with this subject from India. Hence, this study was conducted.

This is a prospective study conducted in the outpatient Department of Sri Siddhartha Medical College during July 2016 to May 2017. Stable asthma patients diagnosed as per the Global Initiative for Asthma (GINA) criteria and patients who are on treatment through pressurized MDI (pMDI) with spacer before with group of 10–75 years were enrolled for the study. Written informed consent was taken from individuals. All enrolled patients were assessed for inhalation techniques during their first (pre-training visit) visit by a qualified respiratory technician. We educated the patient with demonstration and narrated each step of correct inhalational technique as a standard checklist [Supplementary Table 1]. One month later (posttraining visit), all patients were reevaluated by the same technician.

All analyses were carried out using Statistical Package for the Social Sciences version software for Windows (SPSS Inc., Chicago, IL, USA). All demographic variables were recorded and their significance was evaluated using Chi-square test. Comparison of percentages of incorrect inhalation technique between pre- and post-training visits was also analyzed using the Chi-square test. We evaluated the potential risk factors for an incorrect inhalation techniques using univariable logistic regression analysis. Statistical significance was accepted at $P < 0.05$.

Of the total 120 patients studied, 72 (60%) were males and 48 (40%) were females ($P = 0.1205$). We noted highest numbers of patients in 20–40 years of age group (59/120; 49.1%). Family history of asthma was statistically significant ($P < 0.0000001$). We also noted high prevalence of asthma in middle-income group ($P < 0.0001$).

Table 1: Association of risk factors and incorrect techniques during pre- and post-training visits

Risk factors	Number of asthma patients	Number of patients who did incorrect techniques-pretraining	Number of errors (pretraining)	Number of patients who did incorrect techniques-posttraining	Number of errors (posttraining)	Adjusted OR (95% CI)	P^a
Sex							
Male	72	57	62	7	14	3.8 (1.9-6.9)	0.035
Female	48	47	90	16	26		
Age (year)							
<40	93	79	103	17	32	1.9 (0.8-5.3)	0.166
>40	27	25	49	6	8		
Education level							
Illiterate	15	14	45	10	18	4.1 (1.2-13.4)	0.022
Below 10th standard	64	58	77	8	14		
Above 10th standard	41	30	30	5	8		
PFT							
Mild	63	53	102	16	22	2.3 (0.8-6.3)	0.127
Moderate	44	41	43	5	15		
Severe	13	10	7	2	3		

[a]*P* value is obtained using univariate logistic regression analysis. CI: Confidence interval, OR: Odds ratio, PFT: Pulmonary function test

Evaluation during pretraining visit showed that 104 (86.6%) patients did 152 types of errors. Most number of errors noted between step 4 and step 8 (69.7%) which are critical steps in inhalation and adequate delivery, and during posttraining visit, we noted that 23 (19.1%) patients did 40 types of errors while performing the technique. Again, most number of errors noted between step 4 and step 8 (82.5%). Formal training resulted in statistically significant decrease in the percentage of incorrect techniques while using pMDI and spacer (86.6% vs. 19.1%, $P < 0.001$).

In our study, 15 (12.5%) patients were illiterate and they did 45 and 12 errors during pre- and post-training session, respectively. The association was statistically significant ($P = 0.0001$). Moreover, similarly, among female asthmatics (48 patients), we found 47 and 16 individuals doing 90 and 26 types of errors in pre- and post-training session, respectively. The association was statistically significant ($P = 0.035$) [Table 1].

A large body of evidence from randomized clinical trials has shown that patients' inhaler technique can be improved by education from a health professional or other person trained in correct technique. Low education level and female sex are two statistically significant factors associated with incorrectly performed inhalation technique in our study. Our study clearly demonstrates the significance of patient education and face-to-face training in decreasing the percentage of errors.

Financial support and sponsorship

The study was supported by Sri Siddhartha Medical College, Tumakuru.

Conflicts of interest

There are no conflicts of interest.

P Ravikumar, MK Raghavendra, G Priyadarshini Bai

Department of Pulmonary Medicine and Pharmacology, Sri Siddhartha Medical College, Tumakuru, Karnataka, India
E-mail: ravi_kumar3020@yahoo.com

REFERENCES

1. Global Initiative for Asthma. Global Burden of Asthma (GINA- 2015). Available from: http://www.ginasthma.com.
2. Avina Ferro JA, Navarro Ibarra JE. Aerosol terapia median telosnuevos inhaladores de dosis medida. Rev Fac Med UNAM 2003;46:190-2.
3. Giner J, Basualdo LV, Casan P, Hernández C, Macián V, Martínez I, *et al*. Guideline for the use of inhaled drugs. The working group of SEPAR: The nursing area of the sociedad española de neumología y cirugía torácica. Arch Bronconeumol 2000;36:34-43.
4. Global Strategy for the Diagnosis Management and Prevention of COPD Global Initiative for Chronic Obstructive Lung Disease (GOLD); 2014. Available from: http://www.goldcopd.org/. [Last accessed on 2014 Mar 13].
5. Dolovich MB, Ahrens RC, Hess DR, Anderson P, Dhand R, Rau JL, *et al*. Device selection and outcomes of aerosol therapy: Evidence-based guidelines: American College of Chest Physicians/American College of Asthma, allergy, and immunology. Chest 2005;127:335-71.
6. Chapman KR, Voshaar TH, Virchow JC. Inhaler choice in primary practice. Eur Respir Rev 2005;14:117-22.
7. Cochrane MG, Bala MV, Downs KE, Mauskopf J, Ben-Joseph RH. Inhaled corticosteroids for asthma therapy: Patient compliance, devices, and inhalation technique. Chest 2000;117:542-50.
8. Ganguly A, Das AK, Roy A, Adhikari A, Banerjee J, Sen S, *et al*. Study of proper use of inhalational devices by bronchial asthma or COPD patients attending a tertiary care hospital. J Clin Diagn Res 2014;8:HC04-7.
9. Basheti IA, Reddel HK, Armour CL, Bosnic-Anticevich SZ. Counseling about turbuhaler technique: Needs assessment and effective strategies for community pharmacists. Respir Care 2005;50:617-23.

Access this article online

Quick Response Code:

Website: www.lungindia.com

DOI: 10.4103/lungindia.lungindia_211_17

How to cite this article: Ravikumar P, Raghavendra MK, Priyadarshini GB. Evaluation of inhalational techniques of pressurized metered-dose inhaler with spacer in asthma patients. Lung India 2018;35:279-80.