

Evaluation of Inhalational Procedures and the Most Frequent Mistakes Made by Patients with Bronchial Asthma who were Hospitalized in Tertiary Care Settings

Dimple Makhija¹, Anupama Arya², Shalabh Jauhari³, Deen Dayal Verma⁴

¹Senior Resident, Department of Pulmonary Medicine, SGPGI, Lucknow, India

²Associate Professor, Department of Community Medicine Government Doon Medical College, Dehradun, India

³Associate Professor, Department of Microbiology Government Doon Medical College, Dehradun, India

⁴Assistant Professor, Department of Community Medicine, Government Doon Medical College, Dehradun, India

Received: 30-08-2022 / Revised: 30-09-2022 / Accepted: 20-10-2022

Corresponding author: Dr Deen Dayal Verma

Conflict of interest: Nil

Abstract

Aim: The purpose of this study was to evaluate the proper use of inhalational procedures as well as the most frequent mistakes made by bronchial asthma patients.

Methodology: This research was a cross-sectional examination, and it was carried out during the months of July 2021 and July 2022. Participants in the study were required to have a diagnosis of asthma and be receiving treatment with an inhaler. Those patients who attended the outpatient department of respiratory medicine and fulfilled the inclusion criteria were included. All of the participants were evaluated with the use of a pre-made questionnaire as well as a standardized check list, both of which were completed with the help of an interview-based methodology. Data were imported into Microsoft Excel 2010 before being analyzed using Epi Info 7.0 and SPSS 16.0 respectively. Calculations of appropriate frequencies, percentages, and proportions were carried out, in addition to any essential statistical examinations. The findings showed that there were 120 participants, 60 of whom were female, and 60 of whom were male. Additionally, 100 patients made use of dry powder inhalers (DPIs), and 20 patients, made use of metered-dose inhalers (MDIs). Of these, 80 patients exhibited improper technique, with 30 patients using DPI and 10 patients using MDI. The percentage of patients using DPI was 60 percent. In a group of 60 patients with poor clinical control, 50 patients with inappropriate technique had asthma that was either partly managed or not controlled at all. In spite of the fact that there are right recommendations available, improper inhaler technique continues to be the primary cause responsible for inadequate asthma control and low compliance rates.

Keywords: Inhalational method, dry powder inhaler, metered-dose inhaler, asthma

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Asthma is a widespread chronic inflammatory disorder that affects the airways. It affects individuals of all ages and both sexes, and there are over 300

million people in the globe who suffer from asthma. Of these people, approximately 10 percent live in India. This results in a substantial strain being placed on the

expenses of healthcare in our nation. Patients who suffer from bronchial asthma often begin their therapy with inhaled drugs, and the use of inhaler devices is the most common method for administering these medications during this phase of treatment [1,2]. Inhalational devices come in a wide variety of forms; however, pressurized metered-dose inhalers (MDIs) and dry powder inhalers (DPIs) are the sorts of inhalational devices that are used for medication delivery in the treatment of asthma the most often. Many people who suffer from asthma do not have the proper technique for using their inhaler devices. Because improper usage of the device may reduce the efficacy of the medication that is administered, this can result in less-than-ideal treatment of asthma symptoms [2-6].

It is necessary, as a result, to have a comprehensive understanding of the device use mistakes as well as an accurate quantification of these errors in order to successfully implement patient treatments and to design new devices in such a way that frequent errors are avoided. In clinical practice, it is common to see patients misusing their inhalers or performing the inhalation technique incorrectly. This is related with greater inhaler usage, lower bronchodilation, diminished patient adherence to the treatment regimen, poor drug delivery, and disease management [2,3].

In the current research, there was a plan to evaluate the inhalational methods of eligible bronchial asthma patients and related frequent mistakes conducted during the techniques. This was done so that inferences may be made about the greatest therapeutic advantages of inhaler usage.

Materials and Methods

In a tertiary hospital, patients with bronchial asthma who presented in the outpatient department (OPD) as well as the inpatient department were included in this cross-sectional observational research. The study was carried out in a hospital setting.

According to the inclusion and exclusion criteria, a total of 120 patients with bronchial asthma who had been diagnosed by a pulmonologist and who had visited the outpatient section of the respiratory medicine department over the course of two months were recruited in the study.

Patients having a bronchial asthma diagnosis (according to the GINA recommendations) who were utilizing inhaler medication (MDI or DPI) and were between the ages of 14 and 70, regardless of gender, were considered for inclusion in the study. In order to go on with the study effort, clearance from the institutional ethics committee was required.

After outlining the process in detail, permission was solicited from each individual participant in the form of a written document as well as an oral statement. The approval of the patient's parents was required for any patient less than 18 years old. The left thumb imprint was obtained from patients who were illiterate after the complete research was explained to them and it was confirmed that they were ready to take part in the study. In addition, the patients' details were kept anonymous throughout the process.

Both MDI and DPI, which were a part of the research project, were available from the government. The device that was used was a Rotahaler, and the combination of budesonide 200 g and formoterol 6 g was the dose that was administered. In addition, the same quantity of budesonide and formoterol was present in the MDI.

The pulmonologist first evaluated each participant to determine whether or not they met the eligibility requirements, and only after the patients provided their informed permission where they included in the research project. Patients who were not willing to engage in the research, patients who suffered from other issues than asthma, and patients who were in a severe condition were not included in the study.

When conducting interviews with qualified participants, we employed a standardized questionnaire that had been developed in advance. The information needed from the patient was gathered in a single session lasting no more than fifteen minutes, and there was no need for any further follow-up. The investigator and the pulmonologist both directly saw the inhalational technique, and the assessment of the approaches was done according to the required stages of proper use for each inhaler device.

Inhalational techniques were deemed "incorrect" if even a single step had an error, regardless of how many steps were involved. In the case study form, questions about the patient's age, gender, diagnosis, educational level, occupation, type of inhaler treatment, as well as the patient's knowledge of the diagnosis and first education regarding therapy, were asked.

The inhaling procedure was carried out in accordance with the predetermined procedures [7-9].

Statistical analysis

The information was input into Microsoft Excel 2010. Epi Info 7.0 and SPSS 16.0 were used in order to do the analysis on the data. (A Report by SPSS, Inc., Published in 2007) Version 16.0 of the SPSS program for Windows SPSS Inc., located in Chicago, Illinois, USA) Calculations of appropriate frequencies, percentages, and proportions were carried out, in addition to any essential statistical examinations.

Results

[Table 1] contains information on the patients' demographics and background. Inhalation was studied, and the researchers looked for significant connections between demographic factors such as age, education level, and profession, but they came up empty.

Only 40 patients of the total 120 patients were able to successfully complete the inhaler method. 16 patients were on MDI and 57 patients had DPI out of the 73 patients who were doing the procedure incorrectly.

Table 1

Variable	n(%)	Evaluation of technique		
		Correct technique, n (%)	Incorrect technique, n (%)	
Age (years)				
<40	60	20	40	0.67
2.40	60	19	41	
Gender				
Female	60	20	40	0.01
Male	60	22	38	
Education				
Illiterate	30	10	20	0.43
Literate	90	40	50	
Occupation				
Student	1		1	0.05
Service/job	20	10	10	
Labor/physical work	25	11	14	
Refired/unemployed	64	20	44	
Medical staff	10	1	9	
Residence				
Urban	110	40	70	0.45
Rural	10	5	5	

Patients made mistakes in the use of the inhaler during one or more of the phases. The steps at which the maximum number of errors were made were Steps 6 and 7, in which patients were unable to do slow and deep inhalation and holding breath for 10 seconds due to a lack of hand–mouth coordination at the time of actuation. Among the 16 patients using MDI, the steps at which the maximum number of errors were made were Steps 6 and 7. The following typical error was the observation of repeated actuations without the requisite interval of thirty seconds between each puff (Step 10). Another typical error occurred between Steps 8 and 9, when the person would lean their head backward and then hold their breath for at least ten seconds before exhaling. In the current research, there were 57 patients on DPI who exhibited improper technique, which is 50.44 percent of the total. Step 4 was the point in the process that the majority of patients made a mistake. Patients did not exhale fully before beginning Step 5 of the device, which required them to take quick and powerful breaths in. After taking a breath from the device, the next two significant mistakes that were made were not exhaling until the RV (Step 10) and not holding one's breath (Step 11).

Forty-six patients, or 40.7% of the total, experienced poor control of their asthma symptoms, which may have been due to improper technique. [Table 4] shows that despite the improper method, twenty-seven patients had successfully managed asthma.

A number of patients reported experiencing various adverse effects, including hoarseness, oral candidiasis, oral ulceration, and others, which are outlined in Table 5.

Discussion

Asthma is a condition that affects people all over the globe, and the primary method of treatment involves the use of inhalers. If patients continue to use inhalers with the wrong technique, their asthma will not be

well managed [9]. The manner in which our patients used their inhalers was analyzed, and the patients were instructed on the necessary steps to take in order to maximize the administration of the medication in order to achieve superior clinical control.

The average age of the 120 people who took the survey was 52.5 years old, and women made up 63.71% of the total. We did not find any relationships between the inhalational method and gender, age, ethnicity, education level, or employment. Only 21 of the 113 patients were utilizing MDI, and of those 21 patients, 16 patients were doing the method incorrectly, making the total number of patients practicing the technique incorrectly 21.9% of the total number of patients. A research with the same objectives was carried out in Nigeria, and 79.8 percent of the participants there used MDI improperly [10]. It's possible that this is because our research had a smaller sample size of patients on MDI. According to the findings of research, the most efficient method for medication deposition is to first take a slow and deep breath, then hold your breath for at least ten seconds. Based on the results of our research, this was the most prevalent kind of mistake made by patients. A research with the same objective that was carried out in Nigeria revealed that the majority of patients did not complete this stage correctly. It is very necessary to provide a space of 30–60 seconds between two dosages in order to give the drug time to work and relax the airways [10]. Twelve patients, or 6.43 percent, were performing several actuations with no time interval in between each one. According to the findings of a research that was carried out in Saudi Arabia, eighty percent of patients made a mistake at this stage [11]. DPI was by far the most prevalent kind of inhaler treatment used in our facilities. When we were evaluating the proper way to use DPI, the most frequent mistake that people made was failing to exhale before using the inhaler. It was seen in 41 cases, which is 56.16% of the total. This conclusion is consistent with the

findings of a previous research that was conducted in Pakistan and found that the most frequent mistake detected was a failure to exhale before inhaling [12]. One further mistake that was made was that the subject did not inhale deeply and forcefully, which is the most important phase in the process of successfully delivering medication to the airways. A research that was conducted in the Indian state of Madhya Pradesh has an inaccuracy that is quite similar [13].

When we examined clinical control of symptoms in connection to inhaler technique, according to the GINA standards, 46 (63.01%) patients exhibited poor or partial clinical control with wrong technique. It seems that improper use of the inhaler is the single most significant risk factor associated with inadequate clinical control. There is a strong correlation between this and the research that was carried out in Ethiopia, in which it was found that 80 percent of the patients were only partly or inadequately managed due to faulty methodology [9]. According to the findings of this research, an individual's level of asthma control is substantially correlated with the method of inhalation (P less than 0.000001). There was found to be no significant relationship between the adverse effects of the inhaler and either the method of administration or the dose [14].

It is essential that patients be provided with opportunities to actively enhance their fundamental knowledge about the diagnosis of asthma and the proper use of inhalers. In addition to the recommendations that are now in place, which show the whole procedures of how to use various inhalers, additional measures, such as verbal assistance and visual demonstration in small groups or video tutorials, should be offered in order to enhance measures. When writing a patient's first prescription for an inhaler, it is critical to ascertain the patient's preferences in order to improve the likelihood of patient

compliance and acceptance of the prescribed device.

The correct method for using an inhaler has been shown to have a strong correlation with effective clinical asthma management. Inhalational technique should be taught to patients by medical professionals on their initial appointment, and patients should be reminded to bring their inhalers to all subsequent visits so that technique, compliance, and clinical control may be evaluated. This will result in improved patient outcomes.

References

1. World Health Organization. WHO GINA Report. Global Strategy for Asthma Management and Prevention, Updated 2018. World Health Organization; 2018.
2. Al-Jahdali H, Ahmed A, Al-Harbi A, Khan M, Baharoon S, Bin Salih S, *et al.* Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. *Allergy Asthma Clin Immunol* 2013; 9:8.
3. Melani AS, Bonavia M, Cilenti V, Cinti C, Lodi M, Martucci P, *et al.* Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med* 2011; 105:930-8.
4. Hesselink AE, Penninx BW, Wijnhoven HA, Kriegsman DM, van Eijk JT. Determinants of an incorrect inhalation technique in patients with asthma or COPD. *Scand. J. Prim Health Care* 2001; 19:255-60.
5. Giraud V, Roche N. Misuse of corticosteroid metered-dose inhaler is associated with decreased asthma stability. *Eur Respir J* 2002; 19:246-51.
6. Lindgren S, Bake B, Larsson S. Clinical consequences of inadequate inhalation technique in asthma therapy. *Eur J Respir Dis* 1987; 70:93-8.
7. Ganguly A, Das AK, Roy A, Adhikari A, Banerjee J, Sen S. 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.
8. Janaina BM, Carlos RP, Irma G. Inhaled medication for asthma management: Evaluation of how asthma patients, medical students, and doctors use the different devices teach. *J Pneumol* 2003; 29:75-81.
 9. Kebede B, Mamo G, Molla A. Association of asthma control and metered-dose inhaler use technique among adult asthmatic patients attending outpatient clinic, in resource-limited country: A prospective study. *Can Respir J* 2019; 2019:6934040.
 10. Onyedum C, Desalu O, Nwosu N, Chukwuka C, Ukwaja K, Ezeudo C. Evaluation of inhaler techniques among asthma patients seen in Nigeria: An observational cross-sectional study. *Ann Med Health Sci Res* 2014; 4:67-73.
 11. Al-Wasil MA, Al-Mohaimed A. Assessment of inhalation technique in primary care asthmatic patients using metered-dose inhalers with or without a spacer. *Ann Saudi Med* 2003; 23:264-9.
 12. Farooq MZ, Waqar W, Mustaqeem M, Khan JA, Saadullah S. Assessment of inhalation technique among patients of chronic respiratory disorders in Civil Hospital Karachi: A cross sectional study. *J Pak Med Assoc* 2016; 66:1502.
 13. Khurana AK, Dubey K, Goyal A, Pawar KS, Phulwaria C, Pakhare A. Correcting inhaler technique decreases severity of obstruction and improves quality of life among patients with obstructive airway disease. *J Family Med Prim Care* 2019; 8:246-50.
 14. Ayinampudi BK, Gannepalli A, Pacha VB, Kumar JV, Khaled S, Naveed MA. Association between oral manifestations and inhaler use in asthmatic and chronic obstructive pulmonary disease patients. *J NTR Univ Health Sci* 2016; 5:17-23.