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Research Article

**EVALUATION OF THE KNOWLEDGE OF PROPER  
METERED-DOSE INHALER AND SPACER USAGE  
TECHNIQUE IN HEALTH CARE PROFESSIONALS**<sup>1</sup>Shehryar Asif Malik, <sup>2</sup>Ahmad Usman, <sup>3</sup>Muhammad Husnain<sup>1</sup>Department of General Medicine, Nishtar Medical University and Hospital, Multan,  
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Email address: mhasnainashiq@gmail.com**Article Received:** January 2020    **Accepted:** February 2020    **Published:** March 2020**Abstract:**

**Objective:** To evaluate the knowledge of physicians regarding the proper technique of using metered-dose inhaler and spacer, to avoid the disappointingly common misuse of the metered dose inhalers among the patients of asthma and chronic obstructive pulmonary disease.

**Methods:** This cross-sectional study was conducted on 75 consenting nurses and doctors working in general medicine and emergency medicine at Nishtar Hospital Multan selected by non-probability convenient sampling. Their knowledge regarding the technique of using metered-dose inhaler and spacer was evaluated by a self-administered questionnaire. Data were analyzed with SPSS version 25, and the association was examined using Chi-square and Fisher's Exact Test.

**Results:** The mean age of the respondent was 25.5±7.7 years. 33(44%) were males, 45(60%) were doctors, and nurses were 30(40%) in number. Adequate knowledge of the spacer device was demonstrated by only 20 out of 75 participants, representing 26.7% of the total respondents. A mere 21.3% of the participants checked their patient's inhaler technique. Only 9 out of the 75 (12%) participants, all of whom were doctors, knew at least three essential steps of the correct method of usage of the metered-dose inhaler. None of the participants knew all the correct steps for the use of the metered-dose inhaler.

**Conclusion:** The knowledge of health care providers regarding the use of the metered-dose inhaler and spacer was poor. There is a need to train and retrain health care providers to boost their knowledge of proper inhaler use via regular education programs with constant reminders in the form of online videos or seminars.

**Keywords:** Asthma, Inhalers, Spacers, Knowledge, Doctors, Nurses.

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**INTRODUCTION:**

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are two extremely prevalent chronic respiratory diseases worldwide [1]. If not properly treated, the patients suffering from these diseases are prone to develop multiple complications, including acute exacerbations needing hospital admissions, adding a toll to the health care systems. Over the past years, many evidence-based guidelines and multiple modes of therapy have been developed. Nevertheless, disease control continues to be suboptimal in patients with these two chronic obstructive lung diseases. Numerous causes can be attributed to the lack of disease control in asthma and COPD patients. One of the essential reasons is the incorrect use of the common mode of therapy i.e., inhalational therapy via inhalers and spacers. This leads to poor disease control and significant morbidity and mortality. [2–4].

Inhaled medication has a pivotal role in the treatment of obstructive respiratory diseases. This route of application of medicine has the advantage of delivering the drug directly into the airways. Thus leading to high local concentrations with minimal systemic absorption and reduced risk of systemic side effects [5]. Several types of inhalational devices are available for this route of drug administration, including metered-dose inhalers, disk inhalers, turbo inhalers, spacers etc. [6]. Metered-dose inhalers (MDIs) are the commonest devices in the management of obstructive lung diseases [7]. These inhalers consist of a pressurized canister containing the medication. A measured aerosol dose of the drug is released when the inhaler is activated by pressing on the canister. To increase drug delivery and overcome the problem of hand-breath coordination, a spacer device is often used alongside the inhaler. Spacers are inexpensive, readily available, and very effective [8,9]. However, the use of these devices is tricky, and a variety of different sequential steps are necessary to achieve the correct application of these devices. Incorrect performance of one or more steps can substantially reduce the delivery of the administered substance and consequently, the effectiveness and safety of the medication [10].

The misuse of inhaler devices in obstructive airway diseases is a pretty common and old problem and has not improved over the past years, despite the progressive technical improvement in their designs. Saunders, in 1965, published the first paper describing the misuse of inhaled medication [11]. Up to 94% of patients have demonstrated inhalers' mishandling in clinical studies [12]. Proper knowledge and practice of correct inhalation technique have shown to bring a positive impact on disease and patient outcomes [13].

Keeping all this view, we conducted our study to evaluate the knowledge of health care professionals of Nishtar Hospital Multan regarding the correct use of inhalers and spacers.

**MATERIALS AND METHODS:**

After obtaining the approval from the Ethical Review Board, this cross-sectional study was conducted in Nishtar Hospital Multan. The study participants were doctors and nurses working in the department on internal medicine and emergency medicine. A total of 75 participants were included in this study by non-probability convenient sampling. They were asked to complete a self-administered questionnaire asking about their socio-demographics and their typical approach to managing asthma and COPD patients. They were required to outline the steps in the correct use of a metered-dose inhaler and spacer. The sequence of steps considered correct was based on the guidelines of National Asthma Education and Prevention Programs of America [14]

1. Shake the inhaler\*.
2. Take the cap off the inhaler mouthpiece\*.
3. Hold the inhaler upright.
4. Breathe out.
5. Place the inhaler mouthpiece between the lips and the teeth; keep the tongue from obstructing
  1. the mouthpiece\*.
6. Trigger the inhaler while breathing in deeply and slowly\*.
7. Continue to inhale until the lungs are full. \*
8. Hold the breath while.
9. Breathe out slowly.

(\*Essential steps)

Adequacy of inhalational techniques was defined based on the ability of the respondents to identify at least 3 of the essential steps in inhaler use, and these were categorized as having good knowledge. Those who had less than 3 of the essential steps were categorized as having poor knowledge. Regarding the knowledge of spacer device, those who were able to indicate that the use of spacer was to administer asthma drugs and increase delivery of salbutamol aerosol to the lungs were recorded as having good knowledge of its use while those who failed to indicate these as correct responses were scored as having poor knowledge of spacer device.

The collected data was entered and analyzed with SPSS version 25. Statistical significance between demographics and knowledge of three essential steps of correct use of inhaler was tested by Fisher's Exact Test. The level of statistical significance was  $p < 0.05$ . To explore the statistical relationship between sociodemographic factors and adequate knowledge of the spacer device, Chi square test was used.

**RESULTS:**

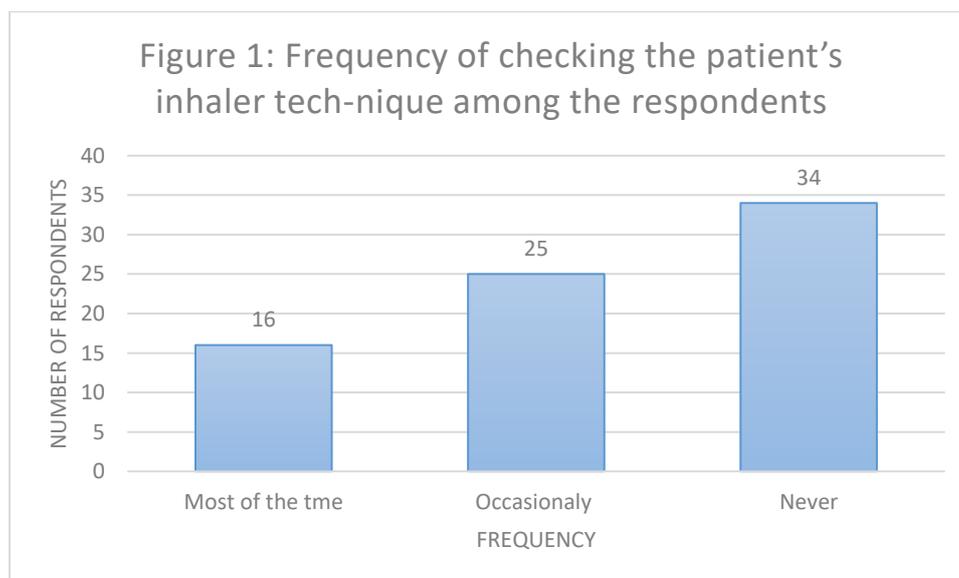
The mean age was  $25.5 \pm 7.7$  years. Forty-seven (62.7%) were under 30 years, 33 (44%) were male. 45 (60%) were doctors, and nurses were 30 (40%), in

number. Ninety-six percent of them were involved in managing Asthma and COPD. The sociodemographic characteristics of respondents are shown in Table 1.

**Table 1: Sociodemographic characteristics of respondents. n=75**

Sociodemographic Characteristics	Frequency	Percent %
<b>Age (Years)</b>		
<30	47	62.7
$\geq 30$	28	37.3
<b>Gender</b>		
Male	33	44.0
Female	42	56.0
Religion		
<b>Marital Status</b>		
Single	24	32.0
Married	51	68.0
<b>Job Title</b>		
Medical Doctor	45	60.0
Nurse	30	40.0
<b>Doctors (n=45)</b>		
House Officers	18	40
Residents	27	60
<b>Nurses (n=30)</b>		
Student Nurses	8	26.7
Registered Nurses	22	73.3

16 out of 75 respondents checked the inhaler technique of their patients mostly, while 34 out of 75 never did. (Figure 1)



The frequency of good or poor knowledge of inhaler and spacer is shown in Tables 2 and 3, respectively. None of the respondents got the complete (nine steps) step-wise inhaler technique correctly. Only 9 out of 75 (12%) knew at least three essential steps in using the inhaler correctly. A slightly higher proportion 6 (22.2%) of the residents knew at least three essential steps in using inhaler compared to 3 (16.7%) of house officers. This difference was not statistically significant. None of the nurses knew at least 3 of the essential steps in using the

metered-dose inhaler. Sixty of the respondents reported ever seeing a spacer device. Among them, adequate knowledge of spacer device was demonstrated by 20, representing 26.7% of the total respondents. Adequate knowledge on spacers was demonstrated by 12(50.0%) of residents and 4 (25%) house officers. Only 4 (26.7%) of the senior nurses and none of the junior nurses had adequate knowledge.

Regarding knowledge of steps involved in meter dose inhaler use, most of the respondents got step one and two correctly (34.7% and 37.3% respectively), while the least correct percentage was of the last two steps which involved "hold breath as long as you can tolerate and remove inhaler and breathe out slowly (2.7% and 2.7% respectively). No participant indicated step 3, which is to hold the inhaler in an upright position.

**Table 2: Sociodemographic characteristics and Adequate Knowledge of Inhaler Use**

Sociodemographic Characters	Knowledge of at least three essential steps of Inhaler Use		Fisher's Exact Test
	Yes n (%)	No n (%)	
<b>Age (years)</b>			
< 30	6(12.8)	41(87.2)	1.00
≥30	3(10.7)	25(89.3)	
<b>Gender</b>			
Male	5(15.2)	28(84.8)	0.495
Female	4(9.5)	38(90.5)	
<b>Marital Status</b>			
Single	3(12.5)	21(87.5)	1.000
Married	6(11.8)	45(88.2)	
<b>Doctor</b>			
House Officer	3(16.7)	15(83.7)	0.721
Resident	6(22.2)	21(77.8)	

**Table 3: Sociodemographic characteristics and Adequate Knowledge of Spacer Device**

Socio-demographic characteristics	Adequate Knowledge of Spacer Use		Chi square	p-value
	Yes	No		
<b>Age(Years)</b>				
< 30	15(38.5)	24(61.5)	1.319	0.251
≥30	5(23.8)	16(76.2)		
<b>Gender</b>				
Male	13(46.4)	15(53.6)	4.051	0.044
Female	7(21.9)	25(78.1%)		
<b>Marital Status</b>				
Single	11(52.4)	10(47.6)	5.275	0.022
Married	9(23.1)	30(76.9)		
<b>Doctors (n=40)</b>				
House Officers	4(25.0)	12(75.0)	2.500	0.114
Residents	12(50.0)	12(50.0)		
<b>Nurses (n=20)</b>				
Student nurses	0(0.0)	5(100)	Fisher's Exact Test 0.530	
Registered nurses	4(26.7)	11(73.3)		

**DISCUSSION:**

The improper use of inhalers and spacers by patients is a disappointingly common faced problem which leads to poor control of the chronic obstructive diseases. Different studies reported different rates of misuse in different populations [15]. In a recent study on 2,935 patients, misuse was observed in over 50% of users [16]. Poor coordination and failure to inhale slowly and deeply are well-known causes of metered-dose inhaler misuse [3]. These high rates of misuse can easily be attributed to inadequate inhalational technique education provided by pharmacists, nurses and doctors, and poor technique evaluation of patients in the follow-ups.

Our study revealed a grim situation of the state of knowledge among nurses and doctors. Only 9 out of the 75 (12%) participants, all of whom are doctors, knew at least three essential steps of the techniques in using the metered dose inhaler correctly. None of the participants got all the steps totally correct. Similar results were noted in another study as well [17]. Joseph, in his study, attributed the high percentage of misuse to the fact that health care providers, including physicians, nurses, pharmacists, and respiratory technicians were not acquainted with appropriate device handling [18].

Previous studies show that adding a spacer to the metered dose inhaler can help to eliminate poor hand-lung coordination [19]. However, unfortunately, in our study, the knowledge regarding spacers was also found to be astonishingly poor. Adequate knowledge of spacer devices was demonstrated by only 26.7% of the participants. Onyedum et al. conducted their study in Nigeria, where they identified the unavailability of spacer devices as one of the reasons practitioners may not be familiar with its use [20]. Another probable explanation is the poor adherence to asthma guidelines by physicians, as shown by Desalu [21].

GINA guideline has recommended that patients' inhalational technique should be checked at every clinic attendance in order to reinforce their knowledge, improve use, encourage adherence, and improve drug delivery [22]. Nevertheless, our study showed a grim situation in this case as well, where only 16 out of 75 respondents were in the habit of routinely checking and confirming the patient's technique of use. This can be attributed to the fact that hospitals of Pakistan, including Nishtar Hospital Multan, are overwhelmingly crowded with patients. With weak primary and social health care system, patients pour out into tertiary care hospitals. Moreover, due to lack of human capacity, asthma patients are mostly seen as part of the general medical clinic, and there are no specialized asthma clinics. This overload of patients lends the physicians no time for counseling and education of patients. Joseph put light on this fact in his study as well [18].

In addition to the need for significant improvement of our health system, steps need to be taken regarding the improvement of our medical education system. It has been demonstrated that even among physicians, there is a progressive loss of knowledge over time. To avoid this, educational seminars and conferences should be conducted, and physicians must be encouraged to keep their knowledge up to date. Regarding patient counseling and education, patients should be asked to bring their inhalers in each visit, and demonstrate their method of use. All patients need face-to-face training and retraining. The inhaler technique must be rechecked, and education must be regularly reinforced to maintain the correct technique. Handouts or videos, alone or in combination, are not adequate substitutes for face-to-face training, and as previously mentioned, the trainer must be aware of each patient's learning needs [23]. Regular reassessment and reinforcement of correct inhalation technique will lead to the proper transfer of medicine to the lungs and better control the disease.

**CONCLUSION:**

There is a need to train and retrain health care providers to boost their knowledge of proper inhaler use via regular education programs with constant reminders in the form of online videos or seminars. Only with good knowledge of proper usage techniques will they be able to educate their patients properly.

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