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Research Article

ASSESSMENT OF INHALER TECHNIQUES IN ASTHMATIC PATIENTS IN KING ABDULAZIZ SPECIALIST HOSPITAL AND KING FAISAL COMPLEX, TAIF 2021

Sarah Musaed Alluheibi¹, Talal AlMalki², Hind Musaed Alluheibi³.¹ M.B.B.S., Family Medicine Resident, Ministry of Health Program of Taif, Saudi Arabia.² Family Medicine Consultant.³ MBBS, Ibn Sina National College.

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Abstract:

Introduction: Uncontrolled asthma continues to be a leading cause of emergency department (ED) visits and hospitalizations. Improper asthma inhaler device use is most certainly one of the leading reasons for uncontrolled asthma and frequent emergency department visits. **Methodology:** This was a cross-sectional study conducted among asthmatic patients in Taif, Saudi Arabia, to assess the use of inhaler techniques for further proper asthma control in the future. A self-administrated questionnaire was distributed for data collection. **Results:** A total of 210 patients were included in this study, most of them (64.8%) used MDI devices, 18.1% used Turbuhaler, 8.6% used Diskus, and 8.6% used MDI with spacer. The majority (87.1%) were found to improperly use inhalers. Gender ($P=0.000$), age ($P=0.000$), follow-up with a doctor ($P=0.000$), educational level ($P=0.000$), being educated about asthma medication ($P=0.000$), ED visits ($P=0.000$), and the device used ($P=0.026$) were significantly associated with the mean score of inhaler use. **Conclusion:** We found that improper inhaler use was common among asthmatic patients in Taif, Saudi Arabia. Females, younger participants, those who follow-up with PHC physicians, those with a university degree, those who never visited the ED this year, and those who used the Turbuhaler device had the most proper inhaler use significantly.

Keywords: Inhaler techniques; asthma; device; therapy.**Corresponding author:****Sarah Musaed Alluheibi,**

M.B.B.S., Family Medicine Resident,

Ministry of Health Program of Taif, Saudi Arabia.

QR code



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INTRODUCTION:

Asthma is a chronic inflammatory airway disease characterized by bronchial hyperresponsiveness and reversible airflow restriction.¹

Asthma is a common and potentially serious chronic disease that imposes a substantial burden on the patient, their family and the community; it causes respiratory symptoms, limitations of activity, and flare-ups (attacks) that sometimes require urgent health care and maybe fatal, fortunately, asthma can be effectively treated. Most patients can achieve goal control of their asthma when asthma is under good control.¹

This disease affects approximately 300 million individuals worldwide, with a 50% increase in prevalence every ten years. Bronchial asthma affects around 8-25 % of Saudi patients.^{1,2}

The main purpose of asthma management is to control clinical manifestations and minimize emergency department (ED) consumption for acute asthma treatment to control asthma's effect on the patient, family, and community.^{1,3,5}

A single study reported that only 5% asthma control among patients seen at tertiary care hospitals.⁶ Improper asthma control plays a major role in ED visits and hospitalization;⁷ in the USA, ED consumption for BA management is near to one-third of all asthma costs in the USA. Thus the cost of uncontrolled BA care is substantial.⁸

Taking corticosteroids by inhalation the best-known route for proper drug delivery for the management of bronchial asthma and could reduce asthma hospital admission by as much as 80%.⁹

The benefit of inhaled treatment is the direct, localized delivery of a high concentration of drugs to the airways with the lowest possible systematic adverse effects.¹⁰ However, wrong use of inhaler devices is one of the common causes of proper asthma control.¹¹⁻¹⁵

Proper inhaler technique is crucial for effective control of asthma while the wrong use of inhaler devices in the treatment of BA reduce drug delivery; in other words, Effective use of inhalers requires proper inhalation technique, patient's commitment to the treatment regimen and drug effectiveness, thus leads to uncontrolled asthma management and frequent ED visits.^{11,12,14-19}

In 2018 Omar Sharif Usmani *et al.* conducted a study

titled Critical inhaler errors in asthma and COPD, showed wide variations in how critical errors are defined. The evidence shows an important association between inhaler errors and worsened health outcomes. Given the negative impact diminished disease outcomes impose on resource use, our findings highlight the importance of achieving optimal inhaler technique and a need for a consensus on defining critical and non-critical errors.²⁰ In 2018 Yaser M. Al-Worafi *et al.* conducted a study titled evaluation of inhaler technique among patients with asthma and COPD in Yemen, showing that most patients could not utilize their MDI appropriately. Therefore, patients should be educated regarding the correct MDI technique upon dispensing inhaler medications.²¹ In 2017 Bharti Chogtu *et al.* conducted a study named evaluation of the relationship of inhaler technique with asthma control and quality of life that All patients, particularly those above 40 years, should be given proper instructions regarding inhaler use to obtain therapeutic advantage.²² In 2017 Maha Al Ammari *et al.* conducted a cross-sectional observational study to assess inhaler technique in Saudi hospitalized patients with asthma and chronic obstructive pulmonary disease that Inhaler technique in hospitalized Saudi patients were inadequate. Health care professionals should understand the importance of reassessing and educating patients regularly for inhaler technique, recommend the use of a spacer when needed, and regularly assess and update their inhaler technique skills.²³ In 2016 Mark L Levy *et al.* conducted a study named Inhaler technique: facts and fantasies that Both incorrect inhaler technique and irregular usage of inhaler medication are common causes of poor asthma control.²⁴ In 2013 Hamdan AL-Jahdali *et al.* conducted a study named Improper inhaler technique is associated with poor asthma control and frequent emergency department visits that improper asthma inhaler device use is related to poor asthma control and frequent ED visits. They also identified many avoidable risk factors that cause improper use of inhaler devices in asthma patients visiting the ED.²⁵ In 2011 Melani AS *et al.* conducted a study named Inhaler mishandling remains common in real life and is associated with reduced disease control that inhaler mishandling continues to be common inexperienced outpatients referring to chest clinics and associated with increased unscheduled healthcare resource use and poor clinical control.¹² The researcher noted that most uncontrolled asthma is due to improper use of inhalers techniques, leading to limitation of activity, decreased quality of life, and risks such as hospital admission due to exacerbations.

Up to the researcher knowledge, no similar study had

been conducted in Taif. In addition, the researcher works as a junior physician for the last 3 years gave him great motivation to study this issue.

The researcher chose the pulmonary clinic at KASH and KFH as it provides a good number of asthmatic patients compared to other settings, making it easier to reach a high number of patients.

Aim of the study

Assessment of inhaler techniques in asthmatic patients in pulmonary clinic king Abdulaziz specialist hospital and king Faisal complex for further proper asthma control and educating the patient about the proper inhaler use for better drug delivery.

Objectives

- 1- To assess patient practice and techniques of the use of the inhaler.
- 2- To assess the relation of inhaler technique and demographic data.

Methodology

Study Area

Taif is a city in Makkah Al-Mokarramah Province of Saudi Arabia at an elevation of 1,879 m (6,165 ft.) on the slopes of the Sarwat Mountains (Al-Sarwat Mountains). It has a population of 1,750,000 (2014 census). The city is the center of an agricultural area known for its grapes, roses and honey. In Taif, there are many different health care sectors, including hospitals and primary healthcare centers. The study will be conducted at a pulmonary clinic in king Abdulaziz specialist hospital and king Faisal complex in Taif.²⁶

Study Population

Two hundred ten asthmatic patients attend the pulmonary clinic at king Abdulaziz specialist hospital and king Faisal complex in a month.

Inclusion criteria

Adult patients > 18 years old.

Study Design

This was a cross-sectional study.

Study period

1. Preparatory period (4-8 weeks)
 - Selecting the title and carrying out the literature review
 - Taking the permission
 - Preparing the questionnaire
2. Fieldwork (4 weeks)
 - Data collection

Data entry and analysis

3. Writing the report (2-4 weeks)

Sample size

Asthmatic patients at KASH and KFH pulmonary clinic were with around 210 patients during the data collection month.

Sampling technique

The researcher took the whole sample 210. The checklist researcher interviewed the target population visiting the KASH and KFH pulmonary clinics with a checklist and recording the data by herself. The researcher visited the KASH and KFH pulmonary clinics 4weeks to do the interviews. A self-administered demographic questionnaire was given to the patient to fill it immediately after the interview and was asked to give it back to the researcher. The data was collected and be coded and entered into a personal computer by the researcher. Thanks and appreciation were used to encourage the participants to be involved in the study.

Data collection tool

Both the questionnaire and the checklists used for gathering data was based mainly on data collection instrument validated by published research.²⁵

Questionnaire: (Self-administered questionnaire consisted of demographics such as occupation, age, gender, education level, nationality, duration of the illness, follow up and ER visits).

The researcher checked a checklist of a pressurized metered-dose inhaler, MDI with spacer, Turbuhaler and Diskus.

Data analysis

Data was entered and analyzed by Statistical Package for the Social Sciences SPSS version 25.0. Appropriate statistical tests were used as indicated.

Ethical considerations

Permission from the MOH Program of Family Medicine Taif was obtained to conduct the research. Participants in the questionnaire filled individual consent. Approval by the research and ethical committee at MOH was taken. Permission was being taken. Confidentiality was maintained all through the research steps.

RESULTS:

Table (1) shows the sociodemographic characteristics of the included participants. A total of 210 patients were included in this study, and most (59.5%) were males. Less than half of them (44.8%) aged from (31-45 years), 40% aged over 40 years,

and 15.2% aged from 18-30 years. Nearly (52.4%) were used to follow-up with PHC physicians, 37.1% visited pulmonary physicians, and 10.5% visited internal medicine physicians. More than half of the participants (55.7%) had a university degree, and 44.3% had high school or less. 51% of the participants were educated about the medications and asthma by a physician, 31.9% by a health educator, and 17.1% by a pharmacist. 59% visited the ED once per year, 28.1% visited it twice or more per year, and only 12.9% never visited it. Most participants (64.8%) used MDI devices, 18.1% used Turbuhaler, 8.6% used Diskus, and 8.6% used MDI with spacer.

Table (2) assesses the inhalers' use among asthma patients. The majority (87.1%) were found to improperly use inhalers, whereas only 12.9% were using it properly.

Table (3) investigates the associations between the participants' sociodemographic characteristics and their use of asthma inhaler. Gender ($P=0.003$), age ($P=0.000$), follow-up with the doctor ($P=0.000$), educational level ($P=0.000$), education about asthma medication ($P=0.000$), ED visits ($P=0.000$), and the device used ($P=0.026$) were significantly associated with the mean score of inhaler use. Younger participants (18-30 years) had the most proper inhaler use (28.1%) compared to other age groups. Those who follow-up with PHC physicians (24.5%), with university educational (23.1%), were educated about asthma medications by a physician (25.2%), those who never visited the ED this year (100%), and those who used Turbuhaler (23.7%) had the most proper inhaler use.

Table (1): The sociodemographic characteristics of the participants.

Parameter		No. (%)
Gender	Female	85 (40.5%)
	Male	125 (59.5%)
Age, y	18-30	32 (15.2%)
	31-45	94 (44.8%)
	45+	84 (40%)
Follow up with doctor	a) PHC/FM	110 (52.4%)
	b) Pulmonary	78 (37.1%)
	c) Internal Medicine	22 (10.5%)
Educational level	a) High school or less	93 (44.3%)
	b) University	117 (55.7%)
Educated about medication and asthma by	a) a physician	107 (51%)
	b) health educator	67 (31.9%)
	c) a pharmacist	36 (17.1%)
ED visits	a) Never	27 (12.9%)
	b) Once per year	124 (59%)
	c) ≥ 2 per year	59 (28.1%)
Device used	a) MDI	136 (64.8%)
	b) Turbuhaler	38 (18.1%)
	c) Diskus	18 (8.6%)
	d) MDI with spacer	18 (8.6%)

Table (2): Assessing the use of inhalers among asthma patients.

Parameter	No.	%	
Use of asthma inhaler	Improper use	183	87.1%
	Proper use	27	12.9%

Table (3): The associations between the participants' sociodemographic characteristics and mean score of inhaler use.

Parameter		Use of asthma inhaler		P-value
		Improper use	Proper use	
Gender	Female	67 (78.8%)	18 (21.2%)	0.003
	Male	116 (92.8%)	9 (7.2%)	
Age, y	18-30	23 (71.9%)	9 (28.1%)	0.000
	31-45	76 (80.9%)	18 (19.1%)	
	45+	84 (100%)	0 (0%)	
Follow up with doctor	a) PHC/FM	83 (75.5%)	27 (24.5%)	0.000
	b) Pulmonary	78 (100%)	0 (0%)	
	c) Internal Medicine	22 (100%)	0 (0%)	
Educational level	a) High school or less	93 (100%)	0 (0%)	0.000
	b) University	90 (76.9%)	27 (23.1%)	
Educated about medication and asthma by	a) a physician	80 (74.8%)	27 (25.2%)	0.000
	b) health educator	67 (100%)	0 (0%)	
	c) a pharmacist	36 (100%)	0 (0%)	
ED visits	a) Never	0 (0%)	27 (100%)	0.000
	b) Once per year	124 (100%)	0 (0%)	
	c) ≥ 2 per year	59 (100%)	0 (0%)	
Device used	a) MDI	118 (86.8%)	18 (13.2%)	0.026
	b) Turbuhaler	29 (76.3%)	9 (23.7%)	
	c) Diskus	18 (100%)	0 (0%)	
	d) MDI with spacer	18 (100%)	0 (0%)	

Chi-square test was used.

DISCUSSION:

Improper use of inhaler devices to treat bronchial asthma reduces drug delivery, patient adherence to the treatment plan, and drug efficacy. As a result, uncontrolled asthma is managed, and numerous ER trips are required.^{11, 14} Previous research has demonstrated that inappropriate inhaler device use reduces drug delivery, patient regimen adherence, and treatment effectiveness, all of which contribute to uncontrolled asthma and multiple ED visits.^(11,14,17-22) This study aims to assess the inhaler techniques among asthmatic patients in Saudi Arabia for further proper asthma control in the future and to educate the patient about the proper inhaler use for better drug delivery.

This study reported that most participants used MDI devices, followed by Turbuhaler device, Diskus, then MDI with spacer. This was similar to **Hamdan *et al.***, who reported that 92% of their patients also use MDI.²⁵ This conclusion is consistent with Saudi Arabian practice for this condition, as most patients were treated at primary health care and family medicine clinics, where MDIs are the most often used type of inhaler. This, however, should not be taken as the reason for incorrect inhaler use. Indeed, research

has revealed that newer dry powder inhalers (DPIs) are not connected with the improved inhaling technique. Devices should be chosen with the patient's acceptance and preferences in mind.¹³ **Lenney *et al.*** reported that a good inhaler technique is vital for a drug to be effective and bearing in mind the wide range of drugs used for the treatment of respiratory conditions.¹³

This study demonstrated that the majority (87.1%) were found to improperly use inhalers, with a mean score of (58.8±19.3). **Dalcin *et al.*** reported that according to the findings of their study, the number of inhaler technique errors has a substantial impact on the level of asthma control. Being widowed, using metered dose inhalers, having a monthly family income of fewer than three times the national minimum wage, and having two or more comorbidities were all related to inappropriate inhaler techniques.²⁷ **Coelho *et al.*** reported that the patients in their sample, all of whom had been submitted to periodic checks of their inhalation technique (as part of the program), used the devices appropriately. Proper inhalation technique is associated with asthma symptom control.¹⁷

This study found that females, younger participants, those who follow-up with PHC physicians, those with university education, those who never visited the ED this year, and those who used the Turbuhaler device had the most proper inhaler use significantly. Another study reported that over half of the asthma patients typically treated by pulmonologists utilized their inhalers inappropriately by incorrectly performing at least one of the critical stages for drug delivery. In contrast to our results, they found that patients utilizing the Turbuhaler made the most mistakes, whereas patients using the Accuhaler had the highest percentage of technique accuracy.²⁸

The follow-up was significantly associated with the proper use of inhalers; those who visited PHC physicians had a higher score than those who visited pulmonologists. A prior study discovered that a proper inhaler technique was connected with a longer duration of medication.⁶ A more recent study on asthma patients discovered that a lack of regular follow-up was more likely to result in incorrect inhaler device use.²⁹

Like our results, Molimard *et al.* found that patient-related factors including smoking, poor compliance, and critical errors in device manipulation have a significant negative impact on asthma control. This could be addressed by patient education.¹⁴

Lavorini *et al.* demonstrated that incorrect DPI technique with established DPIs is common among patients with asthma and COPD and suggests that poor inhalation technique has detrimental consequences for clinical efficacy. Health professionals and caregivers consider regular assessment and reinforcement of correct inhalation techniques essential components of successful asthma management. Improvement of asthma and COPD management could be achieved by new DPIs that are easy to use correctly and are forgiving of poor inhalation techniques, thus ensuring more successful drug delivery.¹⁸

Epstein *et al.* reported that Patient handling of Turbuhaler was generally good, with no evidence that a structured education intervention offered an advantage over the usual education incidental to the prescribing or dispensing process. The most common handling flaw, suboptimal breath-holding, is not specific to this device and is of uncertain clinical significance.¹⁹

CONCLUSION:

This study demonstrated that improper use of inhaler techniques was common among asthmatic patients in

Taif, Saudi Arabia. Most participants used the MDI device, followed by the Turbuhaler device, Diskus, then MDI with spacer. Females, younger participants, those who follow-up with PHC physicians, those with a university degree, those who never visited the ED this year, and those who used the Turbuhaler device had the most proper inhaler use significantly.

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