

RESEARCH PAPER

Identification of Inhaler Technique Errors Among Asthmatic Patients

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ABSTRACT:

Proper inhaler technique is a fundamental problem that directly relates to asthma control. Adequate inhaler administration is influenced by a variety of factors, including patient- and device-related factors. Of these factors, device-related errors are more prevalent, and their resolution helps to control illness. A cross sectional, study has been done by using a structured questionnaire form hospital outpatient setting, 70 patients participated using pressurized metered dose inhaler and dry powder inhalers their technique was evaluated face to face, the most common steps of error are detected, and the data analyzed using the SPSS program. Patients who used the proper inhaler technique (7.1% controlled) were in a better control state than those who used the erroneous inhaler technique (28.6% controlled and 62.9% uncontrolled), (p-value 0.011). Overall, the most frequent mistakes were failing to softly exhale before using an inhaler (50%), failing to hold one's breath for five seconds (50%), failing to breathe inappropriately (52.9%), and failing to clean the mouthpiece (65.7%). Specific errors varied across inhaler types, with the most errors observed for pMDI inhalers. In short, using an inhaler correctly is essential for managing and monitoring asthma control. Most people use their inhalers incorrectly, which results in uncontrolled disease.

KEY WORDS: Inhaler technique, Asthma, pMDI, DPI.

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1. INTRODUCTION:

Millions of people around the world wide are affected by Occlusive pulmonary diseases such as bronchial asthma and chronic obstructive pulmonary disease (COPD) (Čukić, Lovre et al. 2012). Their treatments strategy revolve mostly around inhalation therapy (Schreiber, Sonnenburg et al. 2020) due to their direct effect on the respiratory system. Inhalation therapy has many advantages over systemic drug delivery, including lower doses, a quicker onset of action, and fewer adverse drug reactions (Rogliani, Calzetta et al. 2017). The two most common types of inhalers use are metered dose inhalers (MDIs) and dry-powder inhalers (DPIs) (Al-Worafi 2018, Usmani, Lavorini et al. 2018).

Appropriate inhaler usage is crucial for effective asthma control (Ramadan, Sarkis et al. 2020).

When it comes to achieving positive outcomes in pharmacological therapy, inhalation technique and patient adherence are just as crucial as the doctor's prescription (Ramadan, Sarkis et al. 2020). Poor asthma control, increase hospitalisation rates (Melani, Bonavia et al. 2011), and higher medical costs (Brennan, Osman et al. 2005, Vestbo, Hurd et al. 2013), which may be associated with incorrect inhaler usage, leading to inadequate respiratory system medication delivery (Prabhakaran, Lim et al. 2006, Lavorini and Usmani 2013). Despite receiving all the essential information and training, many mistakes related to inappropriate inhaler use are caused by patients' inadequate knowledge of how to use their inhalers, such as removing the capsule or breathing out away from the DPI device (Melani 2021).

It's suggested that inadequate patient compliance to inhaler technique, insufficient information, and improper training about the use of this long period therapy related to treatment failure (Dudvarski

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Ilic, Zugic et al. 2016). According to the review that conducted by Sanchis, Gich, and Pedersen 2016 on the inhaler administration errors and patients' technique improvement over the time, it was found that coordination, inspiration, and holding the breath before exhaling, all contribute to poor technique (Sanchis, Gich et al. 2016). Many other factors affect proper inhaler administration, such as age, education level, and socioeconomic state (Mohd Arif, Lee et al. 2021), therefore patient advising and counselling increase competence in inhaler management (Fink and Rubin 2005) and are crucial parts of asthma control (Al-Worafi 2018).

Education in which the patient demonstrated inhaler technique for the healthcare provider is linked to improved inhaler technique, asthma control, and reported adherence, in comparison to no education or education limited to demonstration by the healthcare provider (Giraud, Allaert et al. 2011, Usmani, Lavorini et al. 2018). The role of community pharmacists has shown great enhancement in patients' proficiency in inhaler use (Al-Worafi 2018), that's why it is necessary for pharmacists, nurses, physicians, and other healthcare practitioners to find out the barriers related to inhaler performance and for the purpose of determining what obstacles patients face while employing it (Young, Len-Rios et al. 2017). Patients are found to be not using their inhalers effectively, they should be re-educated and have a conversation with their healthcare providers about the difficulties they are having with their device and possible treatment alternatives. Treatment options should think about ways to streamline the current process such measures as converting to once-daily therapy, using combination therapies to cut down on the number of different inhalers required, and using inhalers of the same type for both relief and controller medications (Braido, Chrystyn et al. 2016). Incorrect inhalation techniques during asthma management are associated with decreased medication delivery and poor disease control. In our community, inhaler technique errors are not adequately evaluated; therefore, in this study, we aimed to examine inhaler technique errors and asthma control.

2. MATERIALS AND METHODS

2.1. Study setting and design

Participants recruited from Rizgary teaching hospital and Consultant Medical City (CMC) hospital outpatients participated in a cross-

sectional study, Erbil, Kurdistan Region/Iraq beginning on October 1 and ending on December 31, 2022. Patients diagnosed with bronchial asthma who are already on inhaler therapy were recruited from both hospitals, the approval of recruited patients was obtained, and in the case of children younger than 18 years of age, the approval of the parents was obtained, and the data were gathered under their supervision.

History and demographic data were collected from the patients, we enrolled patients (≥ 8 years old), the duration of the illness and the medication used for asthma therapy (prescribed inhaled corticosteroid (ICS) and broncho dilators therapy for at least six months). Additionally, the data were gathered on whether the patient received any formal education about how to use their inhaler devices. The asthma control over the last month were evaluated by physician, we determined whether the patient knew how to use the prescribed inhaler properly following specific steps in the check list. The assessment of the inhaler technique in all subjects was completed by the same researcher, who was knowledgeable in inhaler technique education. The inhaler technique used by patients was assessed by the researcher using validated inhaler technique check-lists (shown in table 1). All subjects received education about the correct inhaler technique once the trial assessments were completed. Subjects were excluded from the study if they did not self-administer their medication and those without a documented diagnosis of bronchial asthma.

2.2. Statistical Analysis

The SPSS software (version 29, USA) was used to analyze the data. The presentation of data is in terms of number and percentage (%) or mean \pm standard deviation (SD). Categorical variables were summed using frequencies and percentages. Chi-squared tests were used to test the association between clinical characteristics across the variables regarding inhaler technique use and asthma control status. P-values ≤ 0.05 were considered significant.

3. RESULTS

3.1. Patient's characteristics

Seventy patients were enrolled in the study, with 21 using a pMDI inhaler, 24 using a Turbuhaler, 6 using a Handihaler, and 19 using an Easyhaler. Table 2, shows the general characteristics of the patients, there were 26 males (37.1%) and 44 females (62.9%), their mean age was (41 \pm 19.6)

years and (39.9±16.1) respectively. Majority had a primary education 19 (27.1%), followed by post-graduate 15 (21.4%), and non-educated 13 (18.6%). Instruction on inhaler technique was primarily provided by doctors, who accounted for 67 (95.7%) of patients, and only one patient reported that the instruction was difficult to comprehend.

Regarding the level of satisfaction of the patients with their inhaler device, 62 (88.6%) were confident in using their inhalers and 60 (85.7%) of patients stated that they were satisfied with their inhalers use, however, the vast majority of patients (90.0 %) had returned to the clinic because of their symptoms; the mean number of visits per inhaler type was (5.4±3.59), (5.5±4.7), (5.5±5.2), and (7.26±4.34) for PMDIs, Turbuhalers, Handihalers, and Easyhaler respectively. For 45 (64.3%) of the patients, their doctors stated “their asthma status is considered uncontrol).

3.2. Inhaler technique errors

Overall, among all patients (as shown in table 3), pMDI users have the highest rate of at least one inhalation technique error (100%), followed by Turbuhaler users (95.8%), Handihaler users (83.3%), and Easyhaler users (78.9%). Simultaneously, four (21.1%) Easyhaler users had proper inhaler technique, whereas only one patient among Turbuhaler (4.2%) and Handihaler (16.7%) had correct technique.

In table 4 application performance of devices is separated by inhaler type. Among the total 70 patients participated in the study the highest rate of error detected in the step which patients need to clean the mouth piece of inhaler after use 46 (65.7%). More than half of the patients (37 (52.9%) failed to breath in correctly for which is a main step for medication delivery to site of action and half of the patients failed to breath out gently (away from inhaler) before inhaler use and no breath holding for 5 seconds or more 35 (50%). Inhaler technique had a significant impact on patients' control status (as shown in table 5). 44 (62.9%) of 45 patients with uncontrolled disease status exhibited improper technique *P* value (0.011).

3.3. Inhaler technique and control status according variables

As shown in tables 2 and 6, 60 (85.7%) patients were satisfied with their inhaler use, but only 5 (7.1%) patients had the complete inhaler technique, and more than half (52.9%) had uncontrolled asthma, whereas 62 (88.6%) patients were confident with their inhaler use, but only 4 (5.7%) patients had complete inhaler technique, and only 24 (34.3%) patients had a controlled disease status. The highest rate of incomplete technique was observed among patients with a primary school educational level and uneducated, who all had incomplete inhaler technique 19 (27.1 %) and 13 (18.6 %) respectively, their disease status was uncontrolled 11 (15.7 %), and 10 (14.3 %) respectively.

Patients aged between 41-60 years 24 (34.3%) had incomplete inhaler technique and 16 (22.9%) of them had uncontrolled asthma, while those aged 61 all the patients had incomplete inhaler technique 9 (12.9%) and 7 (10%) of them had uncontrolled asthma. Those patients who were using inhalers for less than 10 years had higher rate of incomplete inhaler technique and uncontrolled asthma 56 (80%) and 37 (52.9%) respectively.

4. DISCUSSION:

Inhalation therapy is the most efficient method for drug delivery to the lungs because it is the quickest and safest. In order to comprehend the influence of inhaler technique on disease control, it is essential to consider a number of specifics regarding the steps required to use an inhaler correctly. Ineffective inhaler technique may result in uncontrolled asthma and increased hospitalizations (Bosnic-Anticevich, Cvetkovski et al. 2018, Dhadge, Shevade et al. 2020). There are various factors that influence patients' inhaler technique performance; some of these contributing factors were identified in the current study and may have played a role in the high percentage of incomplete inhaler technique and uncontrolled disease status.

This study has shown that the majority of patients perform their inhaler technique incorrectly 91.4 % (table 3), similar findings has been found by (Jahedi, Downie et al. 2017, Melani 2021). Most of the patients have uncontrolled disease 64.3 % (table 1), primarily seemed to be due to incorrect technique, this result match those observed by (Al-Jahdali, Ahmed et al. 2013, Baddar, Jayakrishnan et al. 2014, Melani 2021). As

concomitant with (Price, Román-Rodríguez *et al.* 2017, Lee, Song *et al.* 2021, Melani 2021), most of the errors are from the patients with MDI and less from those with DPI; this is because MDI require more precise coordination and actuation (Lee, Song *et al.* 2021).

For patients with MDI main difficulties are in simultaneous coordination and actuation step which is main step for technique failure as 90.5 % of the patients struggled with this coordination, similarly, studies done by (Price, Román-Rodríguez *et al.* 2017, Cho-Reyes, Celli *et al.* 2019, Lee, Song *et al.* 2021) observe the same results. Other common errors we observed are failure to clean the mouth piece after use 71.4%, failure to breath out away from inhaler before use 81% and shake device prior to use 47.6 % as shown in table 4. Shaking the pMDI device prior to use is crucial because this causes uniform distribution of the drug particles within the propellant, and proper timing between shaking the pMDI and firing can ensure that the correct amount of drug is delivered to the lungs, which in turn affects the disease control status (Hatley, Parker *et al.* 2017). In a review done by Cho-Reyes, Celli *et al.* 2019, collecting data 1979-2018 on pMDI inhaler user errors among USA patients, the common errors in pMDI inhaler use among patients were Failure to breath out gently (away from inhaler) before inhaler use, holding breath for 5-10 seconds, failing to breath in correctly, failure to exhale after inhalation away from the device, and shaking before use, also in our study the highest rate of errors were among the mentioned steps above.

The DPIs are breath-actuated, unlike typical pressurized metered-dose inhalers (pMDIs), therefore they eliminate the need to coordinate actuation and inhalation. However, certain patients having an asthma exacerbation may be unable to create the forced inhalation necessary for DPIs (Melani 2007, Laube, Janssens *et al.* 2011). For patients with DPI, mistakes were mostly observed with emptying lung before inhalation, breathing in deeply and strongly, and holding breath after inhalation for sufficient time as shown in table 4, this is match with previous conducted research (Price, Román-Rodríguez *et al.* 2017). In addition, research reveals that the most common mistakes made by DPI users include failing to exhale prior to breathing through the device and failing to hold their breath after inhaling through the device. These errors would drastically restrict medicine delivery to the lungs,

with negative consequences for the treatment of disease (Lavorini, Magnan *et al.* 2008, Sanchis, Gich *et al.* 2016).

Easyhaler associated with better technique than Turbuhaler (table 3), although there is not sufficient data to support why. This may be due to different steps that require for each inhaler. Easyhaler require shaking unlike other DPIs and this provide more even distribution and transfer of the powder particle, and dose loading occur simply by pressing the head which is much easier than Turbuhaler which require twisting of the base which maybe a source of confusion to the patients, and Handihaler require individual dose loading which might make it a source of burden and error to the patient, this might support the idea of Kaplan and Price 2018, which states that device properties such as simplicity and convenience to use are all important for the patients.

Common mistakes noted by DPI and MDI users include not cleaning the mouthpiece 65.7 %, 50% of the patients failed to hold breath for 5 seconds and to breath out before inhaler, with 44.3% of the patients didn't perform gargling after using the device as shown in table 4. Since the majority of the inhaled drug is retained in the oral cavity and oropharynx, high doses and long durations of inhalation have been linked to a number of adverse effects on oral tissues. For example, prolonged use of beta-2 agonists is associated with decreased salivary production and secretion and increased frequency of dental caries, whereas inhaled corticosteroids increase the risk and frequency of oropharyngeal candidiasis (Godara, Godara *et al.* 2011). Patient education addressing these precautions is essential to prevent these potential side effects.

According to the education, none of the patients in primary and secondary school have performed correct technique and majority of the patients in these stages are uncontrolled, this finding corroborates the results of Sestini, Cappiello *et al.* 2006, Arora, Kumar *et al.* 2014, Onyedum, Desalu *et al.* 2014, Lee, Song *et al.* 2021, Melani 2021, who suggests that higher education level associated with better outcomes.

As shown in table 2, a surprising result is that most of the patients are satisfied (85.7%) and confident (88.6%) with their inhaler; never the less, a large part of them do not perform their technique adequately, and most of them are uncontrolled. Current finding further support those found by Jahedi, Downie *et al.* 2017, who suggested that inhaler technique was unlikely to

be related to satisfaction. However, this study does not support those has found by Onyedum, Desalu et al. 2014, in which patient who were confident with their inhaler were more likely to complete the steps of the technique than their corresponding counterparts. This controversy may be associated with some comorbid disease or the quality of the inhaler used by the patient, or most likely poor adherence to the medication due to different factors, such as side effects of the inhalation medication, and lack of proper inhaler technique education (Welch, Nelson et al. 2004). which was not enrolled in current study.

Regarding effect of age on inhaler technique performance, Deerojanawong, na Sakolnakorn et al. 2009 suggested that younger children made error significantly more frequently; however, (Wieshammer and Dreyhaupt 2008, Melani, Bonavia et al. 2011) suggested that incorrect device performance was more common among older adults and the elderly, and none of our patients over 60 performed all steps correctly. Most of the patients has been the devices for ≤ 10 years, hence they had the most incomplete technique 80% at 52.9% of the had uncontrolled disease . We expected that a longer duration would aid in better inhalation technique, but patients who had been using inhalers for a long

time performed their technique less accurately as shown in table 6. (Batterink, Dahri et al. 2012) discovered similar results; this was likely due to a lack of ongoing checking and retraining of their technique, as well as the aging process in elderly patients.

According to the findings of this study, only three people had received instruction on proper inhaler use from a pharmacist (table 6), given that pharmacists are easily accessible to both patients and healthcare providers. Pharmacists are thus well-positioned to play a key role in boosting education and continuously assessing optimal inhaler technique, which in turn improves adherence, disease control, and quality of care. Many studies have looked at pharmacists' roles in teaching inhaler technique, and the outcomes have consistently shown an improvement in both inhaler proficiency and illness management (Basheti, Salhi et al. 2019, Bridgeman and Wilken 2021). Our study may have been constrained by the fact that we did not account for inhaler side effects or other comorbid conditions that patients may have, both of which play a role in proper inhaler use and disease management.

Table 1. Inhaler technique Check list

Steps	Inhaler specific question
pMDI (Rapihaler)	
1	Removing the cap
2	Hold inhaler upright
3	Shake inhaler before use
4	Breath out gently (away from inhaler)
5	Put mouthpiece between teeth (without biting) and close lips to form good seal.
6	Start to breathe in slowly and deeply through mouth and, at the same time, press down firmly on canister
7	Continue to breathe in slowly and deeply
8	Hold breath for about 5 seconds or as long as comfortable.
9	Remove inhaler from mouth.
10	Breathe out gently (away from the inhaler)
11	Replace cover.
12	Clean the mouth piece
13	Mouth Gargle (in case of steroids)
Turbuhaler	
1	Removing the cap
2	Hold inhaler upright
3	Keep inhaler upright while twisting grip at the base: twist around and then back until click is heard
4	Breath out gently (away from inhaler)
5	Put mouthpiece between teeth (without biting) and close lips to form good seal.

6	Breathe in strongly and deeply as long as you can
7	Hold breath for about 5 seconds or as long as comfortable.
8	Remove inhaler from mouth.
9	Breathe out gently (away from the inhaler)
10	Replace cover.
11	Clean the mouth piece
12	Mouth Gargle (in case of steroids)
Handihaler	
1	Open the device by pressing the green button
2	Hold inhaler upright
3	Insert the capsule and press the green button firmly
4	Breath out gently (away from inhaler)
5	Put mouthpiece between teeth (without biting) and close lips to form good seal.
6	Breathe in strongly and deeply as long as you can
7	Hold breath for about 5 seconds or as long as comfortable.
8	Remove inhaler from mouth.
9	Breathe out gently (away from the inhaler)
10	Replace cover.
11	Clean the mouth piece
12	Mouth Gargle (in case of steroids)
Easyhaler	
1	Removing the cap
2	Hold inhaler upright
3	Shake inhaler before use
4	Breath out gently (away from inhaler)
5	Put mouthpiece between teeth (without biting) and close lips to form good seal.
6	Start to breathe in strongly and deeply through mouth and, at the same time, press down firmly on canister
7	Hold breath for about 5 seconds or as long as comfortable.
8	Remove inhaler from mouth.
9	Breathe out gently (away from the inhaler)
10	Replace cover.
11	Clean the mouth piece
12	Mouth Gargle (in case of steroids)

Table 2. Demographics of the 70 participants in the study

Variables	No. (%), Mean±SD				Total
	pMDI	Turbuhaler	Handihaler	Easyhaler	
Age	21 (30%)	24 (34.3%)	6 (8.6%)	19 (27.1%)	
	38.6±17.57	42.54±19.84	41.17±20.25	39.26±13.19	
Gender					
Male	8 (11.4%)	8 (11.4%)	4 (5.7%)	6 (8.6%)	26 (37.1%)
female	13 (18.6 %)	16 (22.9 %)	2 (2.9%)	13 (18.6 %)	44 (62.9%)
Education level					
Primary school	11 (15.7%)	6 (8.6%)	0 (0%)	2 (2.9%)	19 (27.1%)
Secondary school	2 (2.9%)	2 (2.9%)	2 (2.9%)	4 (5.7 %)	10 (14.3%)
High school	0 (0%)	3 (4.3%)	1 (1.4%)	4 (5.7 %)	8 (11.4%)
Under Graduate	2 (2.9%)	2 (2.9%)	1 (1.4%)	0 (0%)	5 (7.1%)
Post Graduate	2 (2.9%)	6 (8.6%)	1 (1.4%)	6 (8.6%)	15 (21.4%)
Uneducated	4 (5.7 %)	5 (7.1%)	1 (1.4%)	3 (4.3%)	13 (18.6%)
Marital status					
Single	8 (11.4%)	5 (7.1%)	1 (1.4%)	6 (8.6%)	20 (28.6%)
Married	13 (18.6 %)	19 (27.1%)	5 (7.1%)	13 (18.6 %)	50 (71.4%)
Instruction on inhaler technique					
Physiciens	19 (27.1%)	23 (32.9%)	6 (8.6%)	19 (27.1%)	67 (95.7%)
Pharmacists	2 (2.9%)	1 (1.4%)	0 (0%)	0 (0%)	3 (4.3%)

Did you understand the instruction					
Yes	21 (30.4)	23 (32.9%)	6 (8.6%)	19 (27.1%)	69 (98.6%)
No	0 (0%)	1 (1.4%) by myself	0 (0%)	0 (0%)	1 (1.4%)
Satisfaction with inhaler therapy use					
Satisfied	18 (25.7%)	21 (30%)	3 (4.3%)	18 (25.7%)	60 (85.7%)
Dis-satisfied	3 (4.3%)	3 (4.3%)	3 (4.3%)	1 (1.4%)	10 (14.3%)
Confidence of use of the inhalers					
Confident	19 (27.1%)	21 (30%)	5 (7.1%)	17 (24.3%)	62 (88.6 %)
Not confident	2 (2.9%)	3 (4.3%)	1 (1.4%)	2 (2.9%)	8 (11.4%)
Return to clinic due symptoms					
Yes	17 (24.3%)	22 (31.4%)	5 (7.1%)	19 (27.1%)	63 (90%)
No	4 (5.7%)	2 (2.9%)	1 (1.4%)	0 (0%)	7 (10%)
No. of visit times per year					
	5.4±3.59	5.55±4.7	5.5±5.2	7.26±4.34	
Duration of use (years)					
≤10	18 (25.7%)	20 (28.6%)	5 (7.1%)	18 (25.7%)	61 (87.1%)
11-20	1 (1.4%)	4 (5.7%)	1 (1.4%)	1 (1.4%)	7 (10%)
21-30	2 (2.9%)	0 (0%)	0 (0%)	0 (0%)	2 (2.9%)
Control status					
Controlled	3 (4.3%)	10 (14.3)	0 (0%)	12 (17.1%)	25 (35.7%)
Uncontrolled	18 (25.7%)	14 (20%)	6 (8.6%)	7 (10%)	45 (64.3%)

Table 3. inhaler technique among all 70 participants

Inhaler device	Number (%)	
	Complete inhaler technique	Incomplete inhaler technique
pMDI	0 (0%)	21(100%)
Turbohaler	1 (4.2%)	23 (95.8%)
Handihaler	1(16.7%)	5 (83.3%)
Easyhaler	4 (21.1%)	15 (78.9%)
Total	6 (8.6%)	64 (91.4%)

Table 4. Application performance of devices

Inhaler specific question	Number (%)				
	pMDI (n=21)	Turbuhaler (n=24)	Handihaler (n=6)	Easyhaler (n=19)	Total (n=70)
Not removing the cap/Opening the device	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Not keeping inhaler upright	2 (9.5%)	0 (0%)	0 (0%)	1(5.3%)	3 (4.3%)
Not twisting grip at the base: twist around and then back until click is heard	N/A	2 (8.3%)	N/A	N/A	2 (2.9%)
Not Inserting the capsule and pressing the green button firmly	N/A	N/A	1 (16.7%)	N/A	1 (1.4%)
Not Shake inhaler before use	10 (47.6%)	N/A	N/A	1(5.3%)	8 (11.4%)
Failure to breath out gently (away from inhaler) before inhaler use	17 (81%)	10 (41.7%)	4 (66.7%)	4 (21.1%)	35 (50%)
Not putting mouthpiece between teeth (without biting) and not enclose tightly with the lips.	9 (42.9)	0 (0%)	1 (16.7%)	1(5.3%)	11 (15.7%)

Failure to breathe in strongly and deeply (DPI) slowly and deeply (MDI) as long as you can in case of easy haler and MDI press down the canister.	19 (90.5)	7 (29.2%)	5 (83.3%)	6 (31.6%)	37 (52.9%)
Not holding breath for about 5 seconds or as long as comfortable.	16 (76.2 %)	7 (29.2%)	4 (66.7%)	8 (42.1%)	35 (50%)
Not removing inhaler from mouth.	0 (0%)	1 (4.2%)	1 (16.7%)	1(5.3%)	3 (4.3%)
Failure to breathe out gently (away from the inhaler)	4 (19%)	4 (16.7%)	2 (33.3%)	2 (10.53%)	12 (17.1%)
Not replacing the cover	0 (0%)	0 (0%)	1 (16.7%)	1(5.3%)	2 (2.9%)
Not cleaning the mouth piece	15 (71.4%)	17 (70.8%)	2 (33.3%)	12 (63.2%)	46 (65.7%)
No mouth Gargle (in case of steroids)	12 (57.1%)	13 (54.2%)	2 (33.3%)	4 (21.1%)	31 (44.3%)

Table 5. Inhaler technique and patient control status

Inhaler technique	Controlled	Uncontrolled	P Value
Correct	5 (7.1%)	1(1.4%)	0.011
Incorrect	20 (28.6%)	44 (62.9%)	

Table 6. Inhaler technique and control status according to the variables

Variable	Number (%), no=70			
	Inhaler technique		Control status	
	Complete inhaler technique	Incomplete inhaler technique	Controlled	Uncontrolled
Satisfaction with inhaler therapy use				
Satisfied	5 (7.1%)	55 (78.6%)	23 (32.9%)	37(52.9%)
Dis-satisfied	1(1.4%)	9 (12.9%)	2 (2.9%)	8 (11.4%)
Confidence of use of the inhalers				
Very confident	4 (5.7%)	58 (82.9%)	24 (34.3%)	38 (54.3%)
Not too confident	2 (2.9%)	6 (8.6%)	1 (1.4%)	7 (10%)
Education level				
Primary school	0 (0%)	19 (27.1%)	8 (11.4%)	11 (15.7%)
Secondary school	0 (0%)	10 (14.3%)	2 (2.9%)	8 (11.4%)
High school	2 (2.9%)	6 (8.6%)	5 (7.1%)	3 (4.3%)
Undergraduate	1 (1.4%)	4 (5.7%)	1 (1.4%)	4 (5.7%)
Postgraduate	3 (4.3%)	12 (17.1%)	6 (8.6%)	9 (12.9%)
Uneducated	0 (0%)	13 (18.6%)	3 (4.3%)	10 (14.3%)
Age (years)				
9-20	1 (1.4%)	10 (14.3%)	4 (5.7%)	7 (10%)
21-40	3 (4.3%)	21 (30%)	9 (12.9%)	15 (21.4%)
41-60	2 (2.9%)	24 (34.3%)	10 (14.3%)	16 (22.9%)
61-80	0 (0%)	9 (12.9%)	2 (2.9%)	7 (10%)
Duration of use (years)				
≤10	5 (7.1%)	56 (80%)	24 (34.3%)	37 (52.9%)
11-20	1 (1.4%)	6 (8.6%)	1 (1.4%)	6 (8.6%)
21-30	0 (0%)	2 (2.9%)	0 (0%)	2 (2.9%)

5. CONCLUSIONS

Correct inhaler technique is a crucial measure for controlling of asthma, despite developing and improving different types of inhalers, it's still remained problematic. We concluded that all of the patients made at least one error and most of them are uncontrolled, majority of the problems come from MDI and to the lesser extent with DPIs, but still, they are not free from error. That's why it is critical that patients are advised as to the proper use of their inhalers and frequently checking their technique as well as correcting their errors together with retraining them as required.

Conflict of interest:

The authors declare no conflict of interest.

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