

Knowledge, attitude, and practice of physicians toward asthma inhaler techniques in Qassim, Saudi Arabia

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ABSTRACT

Introduction: Asthma is a chronic inflammatory disease of the airways. Inflammation in airways leads to hypersensitivity and airway obstruction which is responsible for the symptoms of asthma like wheezing, dyspnea, chest tightness and cough that aggravates in the morning. The prevalence ranges from 1.1 to 9.9% in adults. Systemic therapy and inhalational therapy comprising of bronchodilators and steroids are the two major treatment options. **Aims & objectives:** To assess physicians knowledge, attitude & practice toward asthma inhaler devices and inhalation techniques, and classify physician's attitudes as either poor or adequate. **Methodology:** A cross sectional study was conducted in Qassim, Saudi Arabia among health care providers for a duration of 6 months. Practicing physicians in the three major cities in Qassim were included in the study while non-practicing physicians and those practicing in the small cities and peripheries were excluded. Data collection was done by using a predesigned self-reported online questionnaire consisting of 22 items under 3 major sections- demography, knowledge and practice of physicians. Templates were generated in MS Excel sheet and analysis of data was done using SPSS software. Chi square test was the test of significance used and $p < 0.05$ was considered significant. **Results:**

Metered-dose inhaler (MDI) with a spacer (56, 62.2%) was the most preferred device among dry powder inhalers (18, 20%) and nebulization solution (16, 17.8%). Most of the physicians responded correctly that the first and foremost step in correct MDI inhalation was shaking the device (67, 74.4%). More than three-fifths (57, 63.3%) of physicians claimed to have taught the caregivers oneach visit to use an inhaler. The increasing age of the physician was found to be associated with a better understanding, positive attitude and good practice. A significant difference was seen based on the nationality ($p = 0.003$) and the speciality of the physician ($p = 0.012$) in their understanding of inhaled corticosteroids. **Conclusion:** Older male physicians and a family physicians rather than a general physician were found to have better knowledge and a positive attitude toward advising patients regarding inhalers.

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INTRODUCTION

Bronchial asthma (BA) is one of the most common chronic health problems. It is characterized by inflammation of the airways. The airway constricts in response to one or perhaps more triggers such as extrinsic stimulants, irritants, cold air, fatigue or emotional stress, culminating in an inflammatory response and intermittent airway obstruction.¹ The pathophysiology centers around bronchial hyperresponsiveness caused by an inflammatory process driven mostly by T-helper type 2 cells in genetically susceptible persons. Cough, chest tightness, shortness of breath, and expiratory wheezing, especially late at night or early in the morning, are the most noticeable symptoms of an asthma attack.²

According to the World Health Organization, asthma affected 262 million people in 2019 and killed 455,000 people.³ It affects up to 300 million individuals globally, with an additional 100 million people expected to develop bronchial asthma by 2025.⁴ The prevalence of bronchial asthma in adults varies by nation and ranges from 1.1 to 9.9% in adults.⁵ Asthma was formerly assumed to be more common in high-income countries than in low-income countries; however, new data suggests an increased clustering of cases in low- and middle-income countries, implying an increased global burden.⁶

KEYWORDS:

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Asthma treatment options include systemic therapy and inhalational therapy. There are two main types of inhalers:

- Bronchodilators (such as sal butamol) that open the air passages and relieve symptoms; and
- Steroids (such as beclometasone) reduce inflammation in the air passages. This improves asthma symptoms and reduces the risk of severe asthma attacks and death

Inhalation remains the most common method of drug administration, and it offers more benefits than systemic treatment.⁷ Patients with chronic respiratory disorders such as asthma and chronic obstructive pulmonary disease (COPD) can benefit from inhalational therapy. Aerosol must be adequately administered to the airways to achieve the intended therapeutic effect.⁸ The most often used devices for providing inhalational therapy are metered dosage inhalers (MDIs), dry powder inhalers (DPIs), and nebulizers.⁹ Inhaled medications in the form of tiny droplets are instantly absorbed into the bloodstream and available to the body within minutes. The inhalational drug route is one of the quickest and least invasive techniques for treating respiratory problems.^{10,11} However, if inhaled therapy is not administered properly, it might cause mucosal irritation, bronchospasm, dyspnea, airway burns, headaches, coughing, tachycardia, palpitations, nausea, and hypoxemia in patients.⁸

Doctors are the most important members of the healthcare team, as they are responsible for administering inhalational therapy for respiratory problems and educating and teaching patients on how to use it. Therefore, the effectiveness of inhalation therapy is determined by doctors' expertise, attitude, experience, and ability to counsel and explain to patients. Because there are few studies evaluating physicians' knowledge, attitude, and practice regarding asthma inhalational therapy, this study was conducted to investigate physicians' knowledge, attitude, and practice toward asthma inhaler devices and inhalation techniques and then classify their attitudes as either poor or adequate.

METHODOLOGY:

A hospital-based prospective cross-sectional study was carried out for 6 months among healthcare providers practicing at a primary care center in Qassim, Saudi Arabia. Primary care centers under the jurisdiction of the Qassim directorate, which were involved in the study, included the primary care centers in Buraydah, Alrass, and Onaizah. There are 44 primary health care centers in this region. Practicing physicians from various disciplines such as internal medicine, pediatrics, general practitioner, and family physicians working in these 44 primary care centers in the Qassim region were recruited for the study. Considering that at least two doctors would be working in one primary health center and the non-response rate of 10%, a minimum of 80 physicians were included in the study. The recruitment was done by a complete enumeration sampling technique. The inclusion criteria were practicing physicians in the three major cities in Qassim who are involved in the health care process, while the exclusion criteria were nonpracticing physicians, those practicing in the small cities and peripheries. Data collection was done using a predesigned self-reported online questionnaire consisting of 22 items under 3 major sections- demography, knowledge, and physicians' practice.

The demographic section included age, gender, specialty, years in practice, etc. The knowledge section includes knowledge levels of physicians regarding asthma inhaler techniques by simulating clinical scenarios of different inhaler device practices and their effectiveness, and the practice section includes questions relating to the perception and attitude of physicians towards asthma inhaler techniques. Questions were graded on a 5-point Likert scale, including one for strongly disagree and five for strongly agree, and responses were collected accordingly.

After the data collection was complete, templates were generated in an MS Excel sheet, and data analysis was done using SPSS software (version 25). Quantitative data were analyzed by frequency distribution, while the association was computed by applying the chi-square test, where the value of $P < 0.05$ was considered statistically significant. Participants were informed about the procedure and purpose of the study, and written informed consent was taken from them. Strict confidentiality was maintained while handling data and about the study participants' identity and information.

RESULTS

Socio demographic characteristics of study participants [Table 1]:

Table 1: Socio demographic characteristics of study participants

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Age</i>		
20 -29	27	30.0%
30 -39	30	33.3%
40 -49	25	27.8%
50 and older	8	8.9%
<i>Gender</i>		
Male	43	47.8%
Female	47	52.2%
<i>Nationality</i>		
Saudi	54	60.0%
Pakistani	4	4.4%
Egyptian	16	17.8%
Sudanese	14	15.6%
Bangladeshi	1	1.1%
Yemeni	1	1.1%
<i>Medical specialty</i>		
General practitioner	60	66.7%
Family Medicine	30	33.3%
<i>Which area in Qassim do you work in?</i>		
Unaizah	18	20.0%
Buraydah	43	47.8%
Al-Mithnab	11	12.2%
Al-Bukayriyah	7	7.8%
Ar Rass	11	12.2%
<i>Years in practice:</i>		
1-5	32	35.6%
6-10	29	32.2%
11-15	10	11.1%
>15	19	21.1%
<i>Several asthma patients per week:</i>		
1-10	72	80.0%
11-20	18	20.0%

A total of 90 physicians comprised the study participants. Almost one-third of them belonged to the age-group of (20-29) years (27,30%), (30-39) years (30, 33.3%) and (40-49) years (25, 27.8%) each. Out of 90, 47 (52.2%) were female, and 43 (47.8%) were male. Sixty percent of participants

belonged to Saudi nationals. There were 60 (66.7%) general practitioners and 30 (33.3%) family physicians. About 32.2% (29) had an experience of 6-10 years of practice, and 80% (72) of them see 1-10 patients with asthma per week.

Table 2: Knowledge levels of physicians regarding asthma inhaler techniques

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
your knowledge of inhalers comes mainly from		
Attending meetings, courses, or workshops organized by scientific societies	37	41.1%
Reading articles or books specializing in the topic	19	21.1%
Learned from practice or other physicians at your center	20	22.2%
Attending meetings, courses, or workshops organized by pharmaceutical industries	9	10.0%
Reading the leaflet included with the inhaler devices	5	5.6%
Which device do you prefer?		
Metered-dose inhaler (MDI) with spacer (aero chamber)	56	62.2%
Dry powder inhaler(DPI)	18	20.0%
Nebulization solution	16	17.8%
The first step for correct MDI (with aero chamber) inhalation is:		
Shake the device before Use	67	74.4%
Exhale deeply before inhalation	5	5.6%
Connect MDI to a spacer	11	12.2%
Inhale deeply and forcefully	4	4.4%
Continue deep, slow inspiration	3	3.3%
The second step for correct MDI (with aero chamber) inhalation is:		
Connect MDI to a spacer	50	55.6%
Inhale deeply and forcefully	8	8.9%
Continue deep, slow inspiration	10	11.1%
Shake the device before inhalation	12	13.3%
Exhale deeply before inhalation	10	11.1%
When you instruct a child care giver to use a spacer (aero chamber), where do you fix the end of the spacer (mask type)?		
Over nose	21	23.3%
Over mouth	18	20.0%
Over nose and mouth	51	56.7%
The next step for correct MDI inhalation after activation of the device once is:		
To take 3 breaths	28	31.1%
To take 6 breaths	30	33.3%
To wait for 5 seconds	32	35.6%
For how long you should wait before the next actuation of the device:		
10 seconds	49	54.4%
20 seconds	24	26.7%
30 seconds	17	18.9%
Which of the following is true regarding the use of inhaled corticosteroids:		
Wash your mouth after each use to prevent thrush	52	57.8%
To minimize its use due to side effects	16	17.8%
It can stunt children's growth	19	21.1%
Inhaled steroids are harmful	3	3.3%
The most important step for correct DPI inhalationis:		
Exhale deeply before inhalation	28	31.1%
Shake the device before inhalation	20	22.2%
Inhale deeply and force fully	21	23.3%
Firing the device after beginning inspiration	13	14.4%
Continue deep and slow inspiration	8	8.9%

Knowledge levels of physicians regarding asthma inhaler techniques [Table 2]:

The source of knowledge varied among the physicians. Almost two-fifth (37, 41.1%) of participants reported that their understanding of inhalers is due to attending meetings, conferences, courses, and workshops organized by the scientific society. The other source of information was reading articles or books (19, 21.1%) or through their exposure while practicing medicine (20, 22.2%). Metered-dose inhaler (MDI) with a spacer (56, 62.2%) was the most preferred device among dry powder inhalers (18, 20%) and nebulization solution (16, 17.8%). Most physicians responded correctly that the first and foremost step in correct MDI inhalation was shaking the device (67, 74.4%). More than half of the physicians (50, 55.6%) correctly stated the second step in MDI inhalation, connecting the MDI to the spacer. After activating the MDI inhaler, 35.6% of physicians (n= 32) correctly advised the caregivers to wait for 5 seconds. Most of the physicians (51, 56.7%) instructed the child's caregiver to fix the end of the spacer over the nose and mouth. Most of them (52, 57.8%) believed that the patient should wash their mouth after each use to prevent thrush. Regarding DPI inhalation, 31.1% (28) should exhale deeply before inhalation.

Attitude and practices of physicians towards asthma inhaler techniques [Table 3]:

More than three-fifths (57, 63.3%) of physicians claimed to have taught the caregivers to use an inhaler on each visit. Moreover, 46.7% (42) of them assessed the patient's skill to always use the new inhaler. Two- fifth (38, 42.2%) recommended washing

the spacer with warm water and a detergent after each use. About 32.2% (29) of physicians considered the disease being treated the most important factor while prescribing an inhaler device.

Association of age, gender, specialty, and nationality of the physician with knowledge levels, attitude, and practices of physicians towards asthma inhaler techniques [Table 4,5,6,&7]

The physicians' knowledge, attitude, and practice were assessed against their age, gender, specialty, and nationality. The increasing age of the physician was found to be associated with a better understanding, positive attitude, and good practice. This is evident from the fact that physicians with ages more than 40 advised more number of patients (30.3%) compared to physicians of age (30-39) years (7, 23.3%) and (20-29) years (1, 3.7%) (p 0.032). A significant difference in the basis of age was observed in the source of knowledge (p 0.024), instruction to fix the end of the spacer over the nose and mouth (p 0.043), teaching the correct use of inhaler on each visit (p <0.00), to wash the spacer after each use (p 0.014) and to assess the skill of caregiver always on how to use the inhaler (p 0.004). However, no such difference based on gender-based was observed. A significant difference was seen based on the nationality (p 0.003) and the physician's specialty (p 0.012) in their understanding of inhaled corticosteroids. Additionally, the assessment of the skill of caregivers in using inhalers was done by 66.7% (20) family physicians and only 36.7% (22) general physicians remove always, and this difference was statistically significant (p 0.003). Overall, a physician of age more than 40 years, male gender, and a family

Table 3: Attitude and practices of physicians towards asthma inhaler techniques

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
Do you always teach the child's guardian about the use of inhalers?		
Only first time	30	33.3%
In each visit	57	63.3%
Never	3	3.3%
When is it recommended to wash the spacer with warm water and a detergent:		
After each use	38	42.2%
Once weekly	21	23.3%
Once monthly	20	22.2%
Never wash	11	12.2%
When you prescribe an inhaler device, which of the following variables do you consider most important:		
The patient's preference	22	24.4%
The disease being treated	29	32.2%
The patient's age	26	28.9%
The patient's previous experience using a specific inhaler	10	11.1%
The patient's cultural level	3	3.3%
When you prescribe a new inhaler, do you or another healthcare worker assess the patient's skill with its use?		
Sometimes	16	17.8%
Usually	23	25.6%
Always	42	46.7%
Hardly ever	9	10.0%

Table 4: Association of age with knowledge levels, attitude, and practices of physicians towards asthma inhaler techniques

The number of asthma patients per week :	1-10	26	96.3	23	76.7	23	69.7	72	80.0	
	11-20	1	3.7	7	23.3	10	30.3	18	20.0	0.032
Your knowledge of inhaler use comes mainly from :	Attending meetings, courses, or workshops organized by scientific societies	8	29.6	10	33.3	19	57.6	37	41.1	
	Reading articles or books specializing in the topic	9	33.3	8	26.7	2	6.1	19	21.1	
	Learned from practice or other physicians at your center	7	25.9	5	16.7	8	24.2	20	22.2	
	Attending meetings, courses, or workshops organized by pharmaceutical industries	0	0.0	5	16.7	4	12.1	9	10.0	0.024
	Reading the leaflet included with the inhaler devices	3	11.1	2	6.7	0	0.0	5	5.6	
Which device do you prefer?	Metered-dose inhaler (MDI) with spacer (aero chamber)	15	55.6	19	63.3	22	66.7	56	62.2	
	Dry powder inhaler (DPI)	8	29.6	3	10.0	7	21.2	18	20.0	
	Nebulization solution	4	14.8	8	26.7	4	12.1	16	17.8	0.273
The first step for correct MDI (with aero chamber) inhalation is:	Shake the device before Use	20	74.1	21	70.0	26	78.8	67	74.4	
	Exhale deeply before inhalation	0	0.0	3	10.0	2	6.1	5	5.6	
	Connect MDI to a spacer	5	18.5	2	6.7	4	12.1	11	12.2	
	Inhale deeply and forcefully	2	7.4	2	6.7	0	0.0	4	4.4	0.375
	Continue deep, slow inspiration	0	0.0	2	6.7	1	3.0	3	3.3	
The second step for correct MDI (with aero chamber) inhalation is :	Connect MDI to a spacer	14	51.9	13	43.3	23	69.7	50	55.6	
	Inhale deeply and forcefully	0	0.0	5	16.7	3	9.1	8	8.9	0.107
	Continue deep, slow inspiration	6	22.2	3	10.0	1	3.0	10	11.1	
	Shake the device before inhalation	4	14.8	4	13.3	4	12.1	12	13.3	
	Exhale deeply before inhalation	3	11.1	5	16.7	2	6.1	10	11.1	
When you instruct a child caregiver to use a spacer (aero chamber), where do you fix the end of the spacer (mask type)?	Over nose	12	44.4	4	13.3	5	15.2	21	23.3	
	Over mouth	4	14.8	6	20.0	8	24.2	18	20.0	0.043
	Over nose and mouth	11	40.7	20	66.7	20	60.6	51	56.7	
The next step for correct MDI inhalation after activation of the device once is :	To take 3 breaths	10	37.0	4	13.3	14	42.4	28	31.1	
	To take 6 breaths	9	33.3	12	40.0	9	27.3	30	33.3	0.134
	To wait for 5 seconds	8	29.6	14	46.7	10	30.3	32	35.6	
For how long you should wait before the next actuation of the device:	10 seconds	17	63.0	13	43.3	19	57.6	49	54.4	
	20 seconds	5	18.5	12	40.0	7	21.2	24	26.7	0.365
	30 seconds	5	18.5	5	16.7	7	21.2	17	18.9	
Which of the following is true regarding the use of inhaled corticosteroids:	Wash your mouth after each use to prevent thrush	9	33.3	19	63.3	24	72.7	52	57.8	
	To minimize its use due to side effects	7	25.9	5	16.7	4	12.1	16	17.8	0.087
	It can stunt children's growth	9	33.3	5	16.7	5	15.2	19	21.1	
	Inhaled steroids are harmful	2	7.4	1	3.3	0	0.0	3	3.3	
The most important step for correct DPI inhalation is :	Exhale deeply before inhalation	4	14.8	12	40.0	12	36.4	28	31.1	0.174
	Shake the device before inhalation	8	29.6	7	23.3	5	15.2	20	22.2	
	Inhale deeply and forcefully	8	29.6	3	10.0	10	30.3	21	23.3	
	Firing the device after beginning inspiration	6	22.2	4	13.3	3	9.1	13	14.4	
	Continue deep and slow inspiration	1	3.7	4	13.3	3	9.1	8	8.9	
Do you always teach the child's guardian about the use of inhalers?	Only first time	17	63.0	9	30.0	4	12.1	30	33.3	0.000
	In each visit	8	29.6	21	70.0	28	84.8	57	63.3	
	Never	2	7.4	0	0.0	1	3.0	3	3.3	

Factors	Categories	Age (in years)						Total	P-value	
		20 - 29		30 - 39		40 and older				
		N		N		N				N
When is it recommended to wash the spacer with warm water and a detergent:	After each use	6	22.2	17	56.7	15	45.5	38	42.2	0.014
	Once weekly	5	18.5	8	26.7	8	24.2	21	23.3	
	Once monthly	8	29.6	4	13.3	8	24.2	20	22.2	
	Never wash	8	29.6	1	3.3	2	6.1	11	12.2	
When you prescribe an inhaler device, which of the following variables do you consider most important:	The patient's preference	5	18.5	6	20.0	11	33.3	22	24.4	0.751
	The disease being treated	9	33.3	10	33.3	10	30.3	29	32.2	
	The patient's age	9	33.3	9	30.0	8	24.2	26	28.9	
	The patient's previous experience using a specific inhaler	4	14.8	4	13.3	2	6.1	10	11.1	
	The patient's cultural level	0	0.0	1	3.3	2	6.1	3	3.3	
When you prescribe a new inhaler, do you or another healthcare worker assess the patient's skill with its use?	Sometimes	5	18.5	4	13.3	7	21.2	16	17.8	0.004
	Usually	2	7.4	13	43.3	8	24.2	23	25.6	
	Always	13	48.1	11	36.7	18	54.5	42	46.7	
	Hardly ever	7	25.9	2	6.7	0	0.0	9	10.0	

Table 5: Association of gender with knowledge levels, attitude, and practices of physicians towards asthma inhaler techniques

Factors	Categories	Gender						P-value
		Male		Female		Total		
		N		N		N		
The number of asthma patients per week:	1-10	33	76.7	39	83.0	72	80.0	0.460
	11-20	10	23.3	8	17.0	18	20.0	
Your knowledge of inhaler use comes mainly from :	Attending meetings, courses, or workshops organized by scientific societies	22	51.2	15	31.9	37	41.1	0.211
	Reading articles or books specializing in the topic	6	14.0	13	27.7	19	21.1	
	Learned from practice or other physicians at your center	9	20.9	11	23.4	20	22.2	
	Attending meetings, courses, or workshops organized by pharmaceutical industries	5	11.6	4	8.5	9	10.0	
	Reading the leaflet included with the inhaler devices	1	2.3	4	8.5	5	5.6	
Which device do you prefer?	Metered-dose inhaler (MDI) with spacer (aero chamber)	26	60.5	30	63.8	56	62.2	0.947
	Dry powder inhaler (DPI)	9	20.9	9	19.1	18	20.0	
	Nebulization solution	8	18.6	8	17.0	16	17.8	
The first step for correct MDI (with aero chamber) inhalation is:	Shake the device before Use	34	79.1	33	70.2	67	74.4	0.180
	Exhale deeply before inhalation	0	0.0	5	10.6	5	5.6	
	Connect MDI to a spacer	5	11.6	6	12.8	11	12.2	
	Inhale deeply and forcefully	3	7.0	1	2.1	4	4.4	
	Continue deep, slow inspiration	1	2.3	2	4.3	3	3.3	
The second step for correct MDI (with aero chamber) inhalation is :	Connect MDI to a spacer	26	60.5	24	51.1	50	55.6	0.888
	Inhale deeply and forcefully	3	7.0	5	10.6	8	8.9	
	Continue deep, slow inspiration	5	11.6	5	10.6	10	11.1	
	Shake the device before inhalation	5	11.6	7	14.9	12	13.3	
	Exhale deeply before inhalation	4	9.3	6	12.8	10	11.1	

Factors	Categories	Gender						P-value
		Male		Female		Total		
		N		N		N		
When you instruct a child caregiver to use a spacer (aero chamber), where do you fix the end of the spacer (mask type)?	Over nose	7	16.3	14	29.8	21	23.3	0.215
	Over mouth	11	25.6	7	14.9	18	20.0	
	Over nose and mouth	25	58.1	26	55.3	51	56.7	
The next step for correct MDI inhalation after activation of the device once is :	To take 3 breaths	12	27.9	16	34.0	28	31.1	0.489
	To take 6 breaths	13	30.2	17	36.2	30	33.3	
	To wait for 5 seconds	18	41.9	14	29.8	32	35.6	
For how long you should wait before the next actuation of the device:	10 seconds	23	53.5	26	55.3	49	54.4	0.891
	20 seconds	11	25.6	13	27.7	24	26.7	
	30 seconds	9	20.9	8	17.0	17	18.9	
Which of the following is true regarding the use of inhaled corticosteroids:	Wash your mouth after each use to prevent thrush	27	62.8	25	53.2	52	57.8	0.811
	To minimize its use due to side effects	7	16.3	9	19.1	16	17.8	
	It can stunt children’s growth	8	18.6	11	23.4	19	21.1	
	Inhaled steroids are harmful	1	2.3	2	4.3	3	3.3	
	Exhale deeply before inhalation	14	32.6	14	29.8	28	31.1	
The most important step for correct DPI inhalation is :	Exhale deeply before inhalation	17	31.5	11	30.6	28	31.1	0.824
	Shake the device before inhalation	13	24.1	7	19.4	20	22.2	
	Inhale deeply and forcefully	11	20.4	10	27.8	21	23.3	
	Firing the device after beginning inspiration	9	16.7	4	11.1	13	14.4	
	Continue deep and slow inspiration	4	7.4	4	11.1	8	8.9	
Do you always teach the child’s guardian about the use of inhalers?	Only first time	23	42.6	7	19.4	30	33.3	0.064
	In each visit	29	53.7	28	77.8	57	63.3	
	Never	2	3.7	1	2.8	3	3.3	
When is it recommended to wash the spacer with warm water and a detergent:	After each use	25	46.3	13	36.1	38	42.2	0.075
	Once weekly	8	14.8	13	36.1	21	23.3	
	Once monthly	12	22.2	8	22.2	20	22.2	
	Never wash	9	16.7	2	5.6	11	12.2	
	The patient’s preference	12	22.2	10	27.8	22	24.4	

Table 7: Association of Medical Specialties with knowledge levels, attitude, and practices of physicians towards asthma inhaler techniques

Factors	Categories	Medical specialty						P-value
		General practitioner		Family Medicine		Total		
		N	%	N	%	N	%	
The number of asthma patients per week :	1-10	48	80.0	24	80.0	72	80.0	1.000
	11-20	12	20.0	6	20.0	18	20.0	
Your knowledge of inhaler use comes mainly from :	Attending meetings, courses, or workshops organized by scientific societies	23	38.3	14	46.7	37	41.1	0.930
	Reading articles or books specializing in the topic	13	21.7	6	20.0	19	21.1	
	Learned from practice or other physicians at your center	14	23.3	6	20.0	20	22.2	
	Attending meetings, courses, or workshops organized by pharmaceutical industries	6	10.0	3	10.0	9	10.0	

Factors	Categories	Medical specialty						P-value
		General practitioner	Family Medicine		Total			
Which device do you prefer?	Reading the leaflet included with the inhaler devices	4	6.7	1	3.3	5	5.6	0.409
	Metered-dose inhaler (MDI) with spacer (aero chamber)	37	61.7	19	63.3	56	62.2	
	Dry powder inhaler (DPI)	14	23.3	4	13.3	18	20.0	
	Nebulization solution	9	15.0	7	23.3	16	17.8	
The first step for correct MDI (with aero chamber) inhalation is:	Shake the device before Use	43	71.7	24	80.0	67	74.4	0.213
	Exhale deeply before inhalation	5	8.3	0	0.0	5	5.6	
	Connect MDI to a spacer	9	15.0	2	6.7	11	12.2	
	Inhale deeply and forcefully	2	3.3	2	6.7	4	4.4	
	Continue deep, slow inspiration	1	1.7	2	6.7	3	3.3	
The second step for correct MDI (with aero chamber) inhalation is :	Connect MDI to a spacer	33	55.0	17	56.7	50	55.6	0.323
	Inhale deeply and forcefully	3	5.0	5	16.7	8	8.9	
	Continue deep, slow inspiration	7	11.7	3	10.0	10	11.1	
	Shake the device before inhalation	10	16.7	2	6.7	12	13.3	
	Exhale deeply before inhalation	7	11.7	3	10.0	10	11.1	
When you instruct a child caregiver to use a spacer (aero chamber), where do you fix the end of the spacer (mask type)?	Over nose	14	23.3	7	23.3	21	23.3	0.508
	Over mouth	14	23.3	4	13.3	18	20.0	
	Over nose and mouth	32	53.3	19	63.3	51	56.7	
The next step for correct MDI inhalation after activation of the device once is :	To take 3 breaths	20	33.3	8	26.7	28	31.1	0.294
	To take 6 breaths	22	36.7	8	26.7	30	33.3	
	To wait for 5 seconds	18	30.0	14	46.7	32	35.6	
For how long you should wait before the next actuation of the device:	10 seconds	33	55.0	1	53.3	49	54.4	.854
	20 seconds	15	25.0	9	30.0	24	26.7	
	30 seconds	12	20.0	5	16.7	17	18.9	
Which of the following is true regarding the use of inhaled corticosteroids:	Wash your mouth after each use to prevent thrush	30	50.0	22	73.3	52	57.8	0.012
	To minimize its use due to side effects	9	15.0	7	23.3	16	17.8	
	It can stunt children’s growth	18	30.0	1	3.3	19	21.1	
	Inhaled steroids are harmful	3	5.0	0	0.0	3	3.3	
The most important step for correct DPI inhalation is :	Exhale deeply before inhalation	17	28.3	11	36.7	28	31.1	0.487
	Shake the device before inhalation	13	21.7	7	23.3	20	22.2	
	Inhale deeply and forcefully	17	28.3	4	13.3	21	23.3	
	Firing the device after beginning inspiration	9	15.0	4	13.3	13	14.4	
	Continue deep and slow inspiration	4	6.7	4	13.3	8	8.9	
Do you always teach the child’s guardian about the use of inhalers?	Only first time	19	31.7	11	36.7	30	33.3	0.438
	In each visit	38	63.3	19	63.3	57	63.3	
	Never	3	5.0	0	0.0	3	3.3	
When is it recommended to wash the spacer with warm water and a detergent:	After each use	24	40.0	14	46.7	38	42.2	0.903
	Once weekly	15	25.0	6	20.0	21	23.3	
	Once monthly	14	23.3	6	20.0	20	22.2	
	Never wash	7	11.7	4	13.3	11	12.2	

Factors	Categories	Medical specialty				Total	P-value	
		General practitioner		Family Medicine				
When you prescribe an inhaler device, which of the following variables do you consider most important:	The patient's preference	14	23.3	8	26.7	22	24.4	0.045
	The disease being treated	20	33.3	9	30.0	29	32.2	
	The patient's age	21	35.0	5	16.7	26	28.9	
	The patient's previous experience using a specific inhaler	5	8.3	5	16.7	10	11.1	
	The patient's cultural level	0	0.0	3	10.0	3	3.3	
When you prescribe a new inhaler, do you or another healthcare worker assess the patient's skill with its use?	Sometimes	9	15.0	7	23.3	16	17.8	0.003
	Usually	22	36.7	1	3.3	23	25.6	
	Always	22	36.7	20	66.7	42	46.7	
	Hardly ever	7	11.7	2	6.7	9	10.0	

physician rather than a general physician was associated with significantly better knowledge and a positive attitude toward advising patients regarding inhalers.

DISCUSSION

Most of the physicians answered correctly regarding the first and foremost step in correct MDI inhalation (67, 74.4%); regarding the second step also, most of the physicians were correct (50, 55.6%). Most of the physicians (51, 56.7%) instructed the child's caregiver to fix the end of the spacer over the nose and mouth. However, an almost equal percentage of them had varied responses to activation of the device. They advised to take either 3 breaths (28, 31.1%), 6 breaths (30, 33.3%), or to wait for 5 seconds (32, 35.6%) for it.

Whereas just under half of the healthcare professionals (49%) got all nine steps of the inhalation technique right, with a third (34%) getting the eighth step right and somewhat less than a fifth (17%) getting the fifth, sixth, or seventh step right (combined)(12)

In our study, nearly half of the participants (37, 41.1 percent) said that attending scientific society meetings, conferences, seminars, and workshops helped them comprehend inhalers. Reading papers or books (19, 21.1 percent) or exposure while practicing medicine were the other sources of information (20, 22.2 percent).

According to another study conducted by Spaggiari S et al., only 9/50 physicians (18%) and 32/50 nurses (64%) reported having had particular training on inhalation techniques (41 percent overall). Those who said they hadn't had any formal training said they learned how to use inhalers independently or through observing co-workers. The local patient instructions were known by 19/50 physicians and 45/50 nurses (64 percent overall).¹³ Also, the results of a study done in Rio de Janeiro suggest that pediatrician's knowledge of inhalation therapy with dosed aerosol spacers and of asthma-related concepts is limited.¹⁴

Because of this deficient structured training, several studies have emphasized the dearth of formal training for professionals, prompting requests to "train the trainer."¹⁵⁻¹⁸

Most of the physicians in our study (57.8%) believed that patients should wash their mouths after each use to prevent

thrush. Regarding correct DPI inhalation, 31.1% said that one should exhale deeply before inhalation. A systematic review by Plaza et al., deficient preparation, not breathing out entirely before inhalation, and no breath-hold were the most common DPI mistakes.¹⁵

A study shows that senior doctors were more adept at using MDIs in practice than pediatric house staff.¹⁶ Similar findings are there in our study as it shows that older the doctors, knowledge (steps) was better.

Gender-wise, males were found to be having better knowledge when compared to females. similar findings are there in a study by Adeniyi et al.¹⁸

When comparing the knowledge and type of posts, it was found that Family physicians had better knowledge than general practitioners. Spaggiari et al. found that physicians had better knowledge than nurses.¹²

CONCLUSION

Quite a few asthma patient caregivers are unaware of properly using pMDI devices. This emphasizes the importance of developing frequent healthcare provider education programs and pieces of training with constant reminders in the form of videos and pictorial depictions in clinics. This will allow physicians/caregivers to offer accurate information to their patients, resulting in better asthma care. Also, It is necessary to train and employ respiratory therapists and asthma nurses who can focus on various areas of asthma care and assist in implementing physicians' treatment plans for effective asthmatic care.

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