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Community pharmacists ' competence on correct inhaler techniques in Benghazi, Libya.

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ABSTRACT

Background:

The inadequate use of inhaled therapy leads to poor control of asthma and chronic obstructive pulmonary disease management. Pharmacists are in the best position to educate patients about the correct use of inhalers. This study aimed to evaluate the community pharmacists' competence on the appropriate use of inhalers in Benghazi, Libya.

Method:

A cross sectional survey was conducted among community pharmacists from January to February 2022 in Benghazi using a self-administered questionnaire consisted of two sections: demographic data and checklists to assess the correct application of Ventolin® and Diskus® inhalers.

Results:

This study revealed that only a small proportion of participants had previous training on the use of two devices. According to the assessment criterion of Ventolin® and Diskus® inhaler techniques, only 10.6% and 34.1% of respondents had performed all the critical steps correctly with a total score of 7 or above respectively. The least correctly demonstrated steps were step 4 of Ventolin® (tilt the head back slightly) 10.8% and step 8 of Diskus® (breathe out slowly away from the mouthpiece) 14.9%. Gender had no significant association with competence of adequate inhaler techniques of Diskus® (p-value = 0.05) and Ventolin® (p-value = 0.858). To the contrary, other variables such as work experience and previous training on inhalation techniques had influence on ability of respondents to demonstrate the correct techniques of Ventolin® with p-value = (0.003, 0.000) and Diskus® with p-value = (0.017, 0.000) respectively.

Conclusion:

There was poor competence among community pharmacists in using Ventolin® and Diskus® inhalers. Indicating the need for implementing regular training programs for healthcare providers particularly pharmacists to enable them educate their patients.

KEYWORDS: Community pharmacists, Inhaler techniques, Competence, Benghazi.

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INTRODUCTION

Asthma and chronic obstructive pulmonary disease (COPD) are respiratory diseases that are highly prevalent worldwide [1]. Poor control of asthma in developing countries ranges from 52% to 83% compared to 45% in developed countries [2]. Inhaled medications play a key role in respiratory diseases management due to their local rapid onset of action with a reduced risk of systemic side effects .[1-3]

Currently, various types of inhaler devices are used to administer aerosolized medications. Among them, the most popular are pressurized metered dose inhalers (pMDIs) (e.g. Ventolin®) and dry powder inhalers (DPIs) (e.g. Diskus® and Turbuhaler®) [4]. The pMDI was introduced in 1950 for the delivery of bronchodilators and corticosteroids [5]. The efficient use of pMDIs needs coordination between inhalation and device actuation, a slow and deep inhalation followed by a breath hold of at least 10 seconds which is difficult for many patients particularly children and elderly [4,5]. DPIs have been available since 1967, and they are breath actuated making them easier to use than pMDIs [3,6]. However, most of DPIs devices depend on rapid and powerful inhalation for drug delivery, which can be problematic for patients who have difficulty to breathe in forcefully and deeply . [4]

Despite advances in inhaler device technology, numerous studies have stated that errors in inhaler techniques by patients are common with both pMDIs and DPIs [4,7,8]. There are several reasons for the lack of disease control and increased healthcare costs in asthma and COPD patients. The most importantly is improper application of inhaler devices which is associated with the delivery of less therapeutic doses of medications .[1,2,9]

Patients should be appropriately educated by healthcare professionals on proper inhaler techniques. Many studies showed comparable results with healthcare providers (physicians, nurses and pharmacists) having poor knowledge on the appropriate use of various inhalers. Consequently, it may not be shocking that patients use inhalers improperly [10]. In application of inhaler device, it is important to distinguish between critical (sometimes defined as essential or crucial) errors, which can significantly reduce, or prevent entirely the deposition of medication to the airways and non-critical errors, which are likely to result in a reduced amount of medication reaching the airways .[4]

Community pharmacists can play an important role in educating and counseling patients on a correct inhaler application due to their accessibility and frequent contact with patients on prescription refilling and proficiency on medications [2,11]. Previous studies have reported that pharmacists had positive impact on improving inhaler techniques with asthma and COPD patients. In addition, education of patients by pharmacists has been found to be more effective than other teaching methods such as watching videos or reading inhaler pamphlets [12-14]. Hence, increasing the imperative need for inhaler competency (that is, correct and effective inhaler use) .[4]

In developing countries, there is few studies that focus on the role of community pharmacists in educating patients on proper inhaler techniques. This study was aimed to assess knowledge and skills of community pharmacists on adequate inhaler techniques of Ventolin® (pMDI) and Diskus® (DPI) inhalers in Benghazi, Libya. To the best of our knowledge, the current study is the first to be done in Benghazi, Libya.

METHOD :

STUDY DESIGN AND SAMPLING PROCEDURE:

An interview based cross sectional study was employed among a randomly selected sample of community pharmacists in Benghazi, Libya, from January to February 2022. The evaluation tool was a self-administered questionnaire which included two sections. The first section covered demographic information of respondents including their age, qualification, gender and years of experience.

Table 1. Checklist for assessment of Ventolin® inhaler (pMDI) technique, adapted from the NAEPP.

Step	Correct	Incorrect	Skipped
1. Shake the contents well *			
2. Remove the cap *			
3. Hold the inhaler upright			
4. Tilt the head back slightly			
5. Breath out slowly away from the mouthpiece*			
6. Open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it *			
7. Begin breath in slowly and deeply through the mouth and actuate the canister once *			
8. Hold breath for 10–20 seconds and remove the inhaler from your mouth*			
9. Exhale and wait one minute before the second dose			
10. Shake again before the second dose			
11. After use, replace the mouth piece cover			

*** Critical or essential steps that incorrect performance will lead to little or no delivery of medications to the lungs.**

It also provided information if they received prior training on the correct inhalation techniques of Ventolin® and Diskus® inhalers. In the second section, a guideline recommended checklist was used for each device to assess community pharmacists' competence on correct inhalation techniques.

The checklist of Ventolin® inhaler was adapted from the National Asthma Education and Prevention Programmes of America (NAEPP) [10,15]. The checklist included 11 steps, among them six critical or essential steps (1, 2, 5, 6, 7 and 8) as illustrated in table 1. Meanwhile, the checklist to assess the correct technique of Diskus® inhaler was adapted from previous studies [2,16]. This checklist also involved 11 step, among them three critical steps (2, 3 and 6) as shown in table 2.

Table 2. Checklist for assessment of Diskus® inhaler technique, Adapted from [2, 16]

Step	Correct	Incorrect	Skipped
1. Check dose counter			
2. Open the inhaler using thumb grip *			
3. Holding horizontally, load dose by sliding lever until it clicks (Push the lever back completely) *			
4. Breathe out slowly away from the mouthpiece (to empty the lungs)			
5. Place the mouthpiece in mouth and seal lips			
6. Breathe in forcefully and deeply*			
7. Hold breath for about 5- 10 seconds or as long as comfortable			
8. Breathe out slowly away from the mouthpiece			
9. If an extra dose is needed, repeat steps 3 - 9			
10. Close the inhaler (To close the inhaler slide the lever back toward you (return to its original position)			
11. Rinse one's mouth out after inhaling and do not swallow the rinsing water			

*** Critical or essential steps that incorrect performance will lead to little or no delivery of medications to the lungs.**

DATA COLLECTION TECHNIQUE AND MANAGEMENT :

The first section of questionnaire was filled immediately by the community pharmacist. Then each respondent was given Ventolin® and Diskus® devices and asked them to demonstrate the technique for each device to the interviewer considering he/she as an asthmatic patient. Each respondent was evaluated individually and no oral instructions was provided about inhalation techniques. Every step categorized as correct, incorrect and skipped option and a score of 1 was given for each correct answer. The score for the given 11 step was written immediately by the interviewer. Competency of community pharmacists on correct inhalational techniques was based on their ability to demonstrate all the essential steps correctly with a total score of seven or above .[10,15]

STATISTICAL ANALYSIS:

The collected data were coded, entered and then analyzed using Statistical Package for Social Sciences (SPSS) software version 23. Demographic data and demonstration of each step of inhaler device were described in frequencies and percentages. Mean scores and standard deviations were also computed .

Chi-square test of association was used to determine if gender, qualification, years of experience and previous training on inhalation techniques had any effect on community pharmacists' ability to demonstrate the correct use of Ventolin® and Diskus® inhalers. Independent sample t-test was applied to see if there is a difference among the mean scores of correct techniques of two devices. A p-value < 0.05 was considered as a statistically significant.

RESULTS:

RESPONDENTS' DEMOGRAPHICS:

The demographic data of participants are summarized in table 3. A total of 209 community pharmacists were approached and only two pharmacists were not willing to participate.

Table 3. Demographics of respondents

Parameter/ characteristic	n (frequency)	%
Gender		
Female	124	59.9
Male	83	40.1
Qualification		
Bachelor degree (pharmacist)	165	79.7
Diploma degree (pharmacist assistant)	42	20.3
Age		
20-25	39	18.8
26-30	91	44.0
31-35	39	18.8
36-40	8	3.9
41-45	7	3.4
> 45	23	11.1
Years of experience		
< 1	33	15.9
1 - 3	70	33.8
4 - 6	46	22.2
7 - 9	26	12.6
10 - 12	22	10.6
13 - 15	6	2.9
> 15	4	1.9

The study sample was randomly selected from the majority of community pharmacies in Benghazi city, which included 79.7% pharmacists and 20.3% pharmacist assistants. The results also showed that females were higher than males with 59.9% and 40.1% respectively. The age range between 26-30 was represented by 44% of respondents, whereas an equal percentage of participants 18.8% aged between 20-25 and 31-35 years. The remaining were 36 years old or above. Regarding years of experience as a community pharmacist, 33.8% of respondents have an experience between 1 and 3 years, while approximately 35% of them have between 4 and 9 years of working experience and only a small

percentage (around 15%) have an experience of 10 years or above.

COMPETENCE OF RESPONDENTS ON CORRECT INHALER TECHNIQUES:

Overall, only 40.1% and 33.8% of participants had received training on the use of Ventolin® and Diskus® inhalers respectively. 33.3% of respondents stated that they never provide training to patients on how to use the inhaler. However, only 23.2% frequently provide training on inhaler use to patients during dispensing of medications.

ASSESSMENT OF A CORRECT INHALER TECHNIQUE OF VENTOLIN®:

The proportion of participants who demonstrated each step on the use of Ventolin® correctly is shown in table 4. Generally, when the assessment criterion of pMDI was applied, only 7 participants (3.4%) had a score of 11 (demonstrate all steps correctly), while 65 (31.3%) of them scored 0. It was found that a high proportion of respondents got score below 7 (67.3%). The mean score of correct steps was (4.45 ± 3.6). Only 10.6% of participants had performed all the essential steps correctly with a total score of 7 or above. Consequently, competence of community pharmacists in using Ventolin® inhaler correctly was poor.

The findings scoring of each step showed that step 4 (tilt the head back slightly) was the least demonstrated step 10.8%, followed by step 9 (exhale and wait one minute before the second dose) and step 10 (shake again before the second dose) were presented by 25.5% and 26.9% respectively. However, more than 50% of participants performed step 11 properly (after use, replace the mouth piece cover).

Table 4. Response of community pharmacists to demonstrate each step of pMDI technique (Ventolin®).

Step	Number of participants correctly demonstrating the steps (%)
1. Shake the contents well *	77 (37)
2. Remove the cap *	138 (66.4)
3. Hold the inhaler upright	100 (48.1)
4. Tilt the head back slightly	22(10.6)
5. Breath out slowly away from the mouthpiece*	62(29.8)
6. Open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it *	130(62.5)
7. Begin breath in slowly and deeply through the mouth and actuate the canister once *	81 (38.9)
8. Hold breath for 10–20 seconds and remove the inhaler from your mouth*	90 (43.3)
9. Exhale and wait one minute before the second dose	53 (25.5)
10. Shake again before the second dose	56 (26.9)
11. After use, replace the mouth piece cover	112 (53.9)
Mean ± SD (standard deviation)	4.45 ± 3.6

*** Critical steps that incorrect performance will lead to little or no delivery of medications to the lungs**

Out of the six critical steps, only two steps were adequately represented, these include step 2*(66.4%) (remove the cap) and step 6*(62.5%) (open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it). Meanwhile, three critical steps were performed by more than one third of participants as following; step 1* (37%) (shake the contents well), step 7* (38.9%) (begin breath in slowly and deeply through the mouth and actuate the container once), and step 8* (43.3%) (hold breath for 10–20 seconds and remove the inhaler from your mouth).

Chi-square test revealed that there was a significant difference (p-value = 0.000) in competency of demonstrating inhalation techniques among community pharmacists who received training on technique of pMDIs and who did not. As well as, qualification and years of experience had influence on the ability of respondents to demonstrate the correct inhaler techniques with p-value = 0.023 and p-value = 0.003 respectively. To the contrary, gender influence on their competency was found to be insignificant (p-value = 0.858).

ASSESSMENT OF A CORRECT INHALER TECHNIQUE OF DISKUS®:

Scoring demonstration of Diskus® inhaler by respondents is illustrated in table 5. Overall, according to the assessment criterion of Diskus® inhaler, only four participants (1.9%) had a score of 11, whereas 94 (45.2%) of participants scored 0. The results also showed that more than half of respondents got score below 7 (55.8%). The mean score of correct steps was (3.99 ± 3.91) and only 34.1% had demonstrated all the essential steps correctly with a total score of 7 or above. Therefore, competence of community pharmacists in using Diskus® inhaler correctly was poor.

The higher percentage of correctly performed steps was between 45% and 50%, among them all the critical steps. These include step 2* (50%) (open the inhaler using thumb grip), step 3* (49.5%) (holding horizontally, load dose by sliding lever until it clicks) and step 6* (44.7%) (breathe in forcefully and deeply). On the other hand, step 8 (breathe out slowly away from the mouthpiece) and step 11 (rinse one's mouth out after inhaling and do not swallow the rinsing water) were presented the least correctly responded steps with 14.9% and 15.4% respectively. Step 1 (check dose counter) and step 7 (hold breath for about 5-10 seconds or as long as comfortable) demonstrated by 29.3% and 35.1% of respondents respectively.

Table 5. Response of community pharmacists to demonstrate each step of Diskus® inhaler technique.

Step	Number of participants correctly demonstrating the steps (%)
1. Check dose counter	61 (29.3)
2. Open the inhaler using thumb grip *	104 (50)
3. Holding horizontally, load dose by sliding lever until it clicks *	103 (49.5)
4. Breathe out slowly away from the mouthpiece (to empty the lungs)	45 (21.6)
5. Place the mouthpiece in mouth and seal lips	97 (46.6)
6. Breathe in forcefully and deeply *	93 (44.7)
7. Hold breath for about 5- 10 seconds or as long as comfortable	73(35.1)
8. Breathe out slowly away from the mouthpiece	31 (14.9)
9. If an extra dose is needed, repeat steps 3 - 9	90 (43.3)
10. Close the inhaler (To close the inhaler slide the lever back toward you (return to its original position)	97 (46.6)
11. Rinse one's mouth out after inhaling and do not swallow the rinsing water	32 (15.4)
Mean ± SD	3.99 ± 3.91

*** Critical steps that incorrect performance will lead to little or no delivery of medications to the lungs**

In the current study, gender and qualification had no significant association with competence of adequate inhaler technique of Diskus® with *p*-value = 0.05 and *p*-value = 0.057 respectively. However, other variables such as work experience and who received training on inhalation technique of Diskus® had significant differences with competency of demonstrating inhalation techniques with *p*-value = 0.017 and *p*-value = 0.000 respectively.

DISCUSSION:

One of the major contributors to poor asthma and COPD control has been identified due to inadequate inhaler techniques [17-20]. Understanding of the proper or right use of inhalers is dependent on healthcare professionals who must educate and counsel their patients. Pharmacists as a member of healthcare team have greater responsibility in demonstration of correct medication or device use [18]. Therefore, an adequate inhaler use by patients cannot be achieved if the healthcare providers are not knowledgeable and lack the proper understanding of inhaler use [20].

Findings of the current study demonstrate that a wide gap exists in the knowledge and competence of the majority of community pharmacists toward correct inhaler techniques. The low competency regarding inhaler techniques observed in this study is comply with studies from other countries that reported a high proportion of pharmacists showing inadequate use of inhalers [2,21,22].

In comparison of mean scores of respondents toward correct inhaler techniques of two devices, independent sample t-test showed that there was no a significant difference between them (*p*-value = 0.215).

ASSESSMENT OF A CORRECT INHALER TECHNIQUE OF VENTOLIN®:

Regarding demonstration of ventolin® (pMDI) technique, only seven of the current participants (3.4%) had a score of 11, similar to a previous study in Mekelle, Ethiopia, that reported only two respondents had adequate competency in demonstrating pMDI [15]. Unlike the finding from Oman where 15% of respondents performed all the steps correctly [23].

In the present study, only a small proportion of respondents had demonstrated all the essential steps correctly. This was consistent with another study in Ethiopia where few respondents were competent by demonstrating the critical steps [10]. Additionally, a previous study conducted in the United Kingdom stated that only 7% of healthcare providers, including pharmacists could demonstrate all the accurate steps in a pMDI use [24]. Therefore, it is not surprising that patients frequently use their devices wrongly since healthcare professionals' understanding of the proper use of these devices is also poor.

From all steps, the frequently skipped and/or incorrectly responded was tilt the head back slightly, similar to the Nigerian study [18], but unlike the study done in Mekelle, Ethiopia, where exhale and wait one minute before the second dose was the most frequently skipped and incorrectly performed step [15]. While inadequate breath holding and waiting before a second puff practiced among healthcare providers were with high frequency of error in Iran and Oman studies [23,25].

Step 5* (breath out slowly away from the mouthpiece) was the most incorrect critical step demonstrated. In addition, the most skipped critical step was beginning breath in slowly and actuate the canister once, which is quite comparable to the Ethiopian study in Mekelle [15]. However, in the Nigerian study, the previous step was demonstrated usually by the practicing pharmacists 90.2% [18].

On the other hand, this study findings showed that step 2* (remove the cap) was the most correctly demonstrated step then step 6* (open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it). However, in the Nigerian study, step 7* which involves breathing slowly and deeply through the mouth and depress the canister once was the most frequently practiced step [18].

ASSESSMENT OF A CORRECT INHALER TECHNIQUE OF DISKUS®:

Scoring performance of Diskus® inhaler technique by respondents showed that only four participants had a score of 11, while approximately half of respondents scored 0, comparably similar to another study in Nigeria where only one participant performed all the steps correctly with the maximum score of 11, whereas 57.1% of respondents performed all the steps wrongly (scored 0) [2].

Furthermore, approximately half of participants demonstrated the three critical steps (2*, 3* and 6*) correctly. This was slightly better than the Nigerian study that found of the three critical steps in the use of Diskus®, only about a third could open the device properly and actually get the medication loaded and ready to use (steps 2* and 3*), and around a quarter take an adequate deep and forcefully breath to get the medication into the lung (step

6*). In contrast, a previous study have reported that the three essential steps of Diskus® were demonstrated correctly by 84% of the Australian pharmacists and 64% of the Jordanian pharmacists [22]. However, in the current study, breathe out slowly away from the mouthpiece was the least responded step and this was consistent with the previous study in Nigeria [2].

STUDY' LIMITATIONS:

The present study has some limitations that should be noted. Firstly, this study was a cross sectional survey conducted in Benghazi city, thus the results cannot be generalized to other cities or regions in Libya and impact of variables on community pharmacist responses over time cannot be evaluated. Secondly, recording of the demonstrations which were not carried out would have led to more reliable scoring. Finally, the direct interview of community pharmacists at their work place could affect the responses as it may be subjected to respondent bias.

AUTHORS' CONTRIBUTIONS:

Fatma A. Abdrabba has contributed in performed the design of the study, the manuscript' writing, analysis and interpretation of data and approved the final version of the manuscript. Other three authors contributed equally in collection of data.

ETHICAL CONSIDERATION:

The study was approved by the Faculty of Pharmacy-University of Benghazi. All responses remained anonymous and no personal identifiers were present in the questionnaire.

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CONCLUSION AND RECOMMENDATIONS:

This study concluded that community pharmacists in Benghazi, lack the proper competency and skills to demonstrate the correct use of Ventolin® and Diskus® inhalers. This might offer some explanation of poor usage of inhaler devices by patients. Indicating the need for establishing regular educational programs for healthcare providers particularly pharmacists to enable them educate their patients and effectively play their role in asthma and COPD care management.

The community pharmacists should learn to use interactive video counseling techniques to improve their skills and facilitate the use of these resources in patient counseling. In addition, they must ask the patient to repeat the steps after demonstration. As well as, they should give more time for counseling and give pamphlet in local language to those patients who are going to use the inhalation device for the first time.

Awareness of the most problematic steps may help educators concentrate their efforts on these steps during inhaler education. Patients with evidence of poor asthma control should be targeted for a review of their inhaler technique.

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