

Original Research

Assessing the use of MDI among asthmatic patients in Saudi Arabia

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Abstract

Background: Asthma is an important public health problem worldwide on account of its prevalence. Education of asthmatic patients about appropriate use of MDIs would be more effective medications. **Objectives:** To assess the appropriateness of using MDIs among asthmatic patients and to determine the factors significantly associated with correct use of MDI. **Method:** A descriptive study was conducted on 399 asthmatic patients on internet on Google from 28th October to 28th November 2015. A questionnaire was filled out and SPSS version 21 was used for data analysis. Standard method was used to obtain descriptive statistic comprising means, percentage and standard deviations in order to describe demographic variables. Analysis of variance (ANOVA) test was used to compare means of contentious and categorical variables of demographic characteristics and medical background with using MDIs and find association between them. P-value of 0.05 and less were regarded as statistically significant. **Results:** In the studied sample, 87% were age less than 45 years, 74% of cases were females. About 92% of cases were higher and above level of education. More than half of subjects had asthma for more than five years. There were 36% of patients using MDI. Only a few patients (12%) had the correct all skills using MDIs. There were significant association between using MDIs with age and duration of asthma ($p < 0.001$). **Conclusions:** Despite the well-known fact that a good MDI technique is of greatest importance, Majority of asthmatic patients have poor skills of MDI appropriate use. Incorrect MDIs technique is common among asthma patients. Health care professional must be focused on training on use MDI among the younger and newly diagnosis asthmatic patients. This indicating the need for regular formal training programmes on inhaler techniques so as to decipher correct practices in inhalation therapy.

Keywords: Asthmatic patients; Saudi Arabia; MDI; Questionnaire

INTRODUCTION

Asthma cannot be cured, but appropriate management can control the disorder and allow people to a good quality of life.¹

Asthma is a severe and sometimes fatal chronic disease affecting a large proportion of the population. In Saudi Arabia has a relatively low prevalence of diagnosed asthma; however, many of the patients with known asthma are not under good control.² A high prevalence of uncontrolled asthma in the community outpatient clinic setting and identified risk factors that can contribute to poor asthma control.³

Asthma is an important public health problem worldwide on account of its prevalence, it's under recognition, inadequate pharmacotherapy and self-management by patients. There is evidence to suggest that denial of having a chronic condition, poor knowledge of the disease process, medication use, and poor self-management are

frequent reasons for increased morbidity in asthma.⁴

Asthma is often thought of as a childhood disease, but it can affect people at any age. The severity and impact of the disease can change over the course of a person's life time. There are currently around 4.3 million adults (around 1 in 12) receiving treatment for asthma in the UK (Asthma facts and FAQs 2014). Little is known about the asthma knowledge of older adults in the general community. While studies have measured community-wide asthma knowledge, they have not specifically focused on older adults.⁵

Asthma is a major public health problem affecting 300 million patients around the world. Its prevalence and impact are particularly on the rise in urbanized regions and expanding worldwide, associated with environmental and lifestyle changes. Saudi Arabia has a relatively low prevalence of diagnosed asthma; however, many of the patients with known asthma do not have it under good control.⁶ Asthma causes higher morbidity and mortality rates among the elderly population. Appropriate education and management strategies may help to reduce these.

A large proportion of patients prescribed inhaled medications do not use their inhalers correctly. Overall, up to 90% of patients show incorrect technique in clinical studies with either standard pressurised metered dose inhalers (pMDIs) or dry-powder inhalers (DPIs).⁶

Uncontrolled asthma and ineffective management

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remains a public health challenge in the developing countries like Saudi Arabia. Uncontrolled asthma remains a frequent cause of emergency department (ED) visits and hospital admissions. Improper asthma inhaler device use is most likely one of the major causes associated with uncontrolled asthma and frequent ED visits.⁷

Asthma remains a serious global health challenge. Poor control of asthma symptoms is due in part to incorrect use of oral inhaler devices that deliver asthma medications, such as poor inhalation technique or use of a metered dose inhaler (MDI) after the recommended number of doses is expelled.⁸

Asthma MDI technique assessment and knowledge

Metered-dose inhalers (MDIs) have become a firsthand therapeutic strategy for the management of respiratory diseases, mainly for chronic obstructive pulmonary disease (COPD) and asthma. It has been determined, however, that patients do not always use these devices correctly. Our primary goal was to establish the level of technical knowledge of patients with asthma on the use of MDIs, as well as other associated factors related to the effective use of this delivery method.⁹ Inhaler technique is associated with adherence and influences asthma control. Inhaler training by pharmacists is feasible and seems to improve inhaler technique, asthma control and adherence.¹⁰ Poor MDI technique is common among inner-city patients with asthma and is associated with poor adherence to controller medications. Assessment of MDI technique may be a simple clinical aid to identify patients with low adherence to controller medications.¹¹ Inhalation technique of patients improves after imparting systematic educational intervention. A practical demonstration of all the steps proved more effective than simple verbal/written advice. In view of increasing errors being committed over a period of time, repeated demonstration of the proper technique using a standard check-list significantly improves the errors committed during inhaler use.¹² The frequency of inhaler technique errors was high and no device was clearly preferred over the others. Using the preferred inhaler device was not associated with less errors.¹³

The pharmacists demonstrated particularly poor skills involving steps for coordination of the actuation process with the mechanics of inhalation with MDI. The errors detected in this simple assessment session, if translated to patient self-medication errors, are potentially significant.¹⁴ Majority of patients using inhalation devices made errors while using the device. Proper education to patients on correct usage may not only improve control of the symptoms of the disease but might also allow dose reduction in long term.¹⁵ Pharmacists reported they frequently educate patients and assess MDI technique for new prescriptions but not very often for patients recently started, as well as for long-term users. Six months after an educational program, attitudes and beliefs toward this activity were either not changed or, in some, improved.

Pharmacists perceive that there is not enough time to assess and educate patients who use MDIs.¹⁶ Among older patients with asthma, interventions to promote proper medication use should simplify tasks and patient roles to overcome cognitive load and suboptimal performance in self-care.¹⁷ The educational programme led to a significant improvement in asthma morbidity and that the implantation of educational programs is possible for special populations when these programmed are adapted to the socioeconomic profile of the patients, with a significant gain in terms of the reduction of symptoms and improved pulmonary function and quality of life of .¹⁸ Written instruction alone is inadequate in teaching correct inhalation technique. Verbal instruction and technique assessment are essential for patients to achieve proper technique. Patients may perform better on the Turbuhaler than on other inhalation devices.¹⁹

The main objective of this study is to exploring the assessments of using Metered-Dose Inhaler (MDI) among adult asthmatic patients in Saudi and finding and to determine the factors significantly associated with correct use of MDI

METHOD AND MATERIALS

Study design

This is a descriptive study. It's a questionnaire-based cross sectional analysis. Data collected from a sample of 399 asthmatic patients on Saudi Arabia, who answered questionnaire online by using Google forms survey from 28th October to 28th November 2015. The study aim are to assess the use of MDI in Saudi Arabia and association between socio-demographic character and medical background and mean Assessment cores of using MDI. The exclusion criteria for this study excluded patient aged less than 18 years and the patient who are not asthmatic

Study instrument

Data collection tool was a structured questionnaire, which was designed by making use of other different published studies based on extensive literature review and adding questions that were considered of value based on local asthmatic related assessments of using MDIs. The questionnaire was prepared in English but prior to use in the study, was translated to from its original English version to Arabic. After validation of questioner by group of experts (five PhD doctors). The reliability of the questionnaire used in assessment was revised by members of Pharmacy College in Qassim University. The questionnaire was filled by asthmatic patient. Web based survey was carried out by collection of data through self-administer electronic set of questions through survey Google web link.

The first part of the questionnaire included questions regarding patients' demographic characteristic as gender, age, education and smoking history. It also included questions regarding patient medical backgrounds as



duration of having asthma, type of inhaler they use, source of health information about asthma and information was provided during education programs.

The second part is the assessment of MDI technique and skills there were eleven questions related to assessment of technique of MDI use, to ensure the correct delivery of drug.

Each assessment of MDIs technique and skills questions was scored as (1) for correct answer and zero (0) for an incorrect answer.

Two categories were defined on the bases of the score obtained by each participant:

Good MDIs use technique: when patients respond to greater than or equal to seven the mean score of MDIs use technique ($\geq 70\%$).

Poor MDIs use technique: when patients respond to less than seven the mean score of MDIs use technique ($< 70\%$).

Statistical analysis

The data of this study was analyzed by using statistical package for social science (SPSS) version 21.0 software program. First, data were entered to Google forms spreadsheet and coded then transferred to SPSS for analysis.

Standard method was used to obtain descriptive statistic comprising means, percentage and standard deviations in order to describe demographic variables. Analysis of variance (ANOVA) test was used to compare means of contentious and categorical variables and find association between them. *P-value* of < 0.05 and less were regarded as statistically significant.

RESULT

Demographic characteristics

Table 1 shows the socio-demographic characteristics of the participants in this study in which among 399 participants who were answered questionnaires in Saudi Arabia, 299 (74.9%) were female and 100 (25.1%) of them were male asthmatic patient. The age of participants, two hundred and two (50.6%) were between 18-25, then seventy eight (19.5%) were between 26-35 and about (12.3%) of patients more than 45 years. Concerning the education level the majority of them 239 (59.9%) were university education and 5(1.3 %) of them were non-educated, majority 239 (85 %) of patients were non-smoker.

Medical background

Table 2 shows that 203 (50.97%) of patients had asthma for a duration longer than 5 years and 34 (8.5 %) were did not know the duration. Regarding last asthma attack about 153(38.3%) of patients had more than 4 weeks, and 54 (13.5%) had 2-4 weeks and 58 (14.6%) they did not

know last asthma attack they had. Regarding the types of asthma medications used 219 (54.9%) of patients know, and 219 (54.9%) they did not know (39.33%). Majority of patients 232 (58.2 %) received information from health care health workers as the main source of patients' information followed 105 (26.3 %) received information from internet.

Variables	n (%)
Gender	
Female	299 (74.9%)
Male	100 (25.1%)
Age (years)	
18 – 25 years	202(50.6%)
26 – 35 years	78(19.5%)
36 – 45 years	70(18.5%)
>45 years	49(12.3%)
Level of education	
Non education	5 (1.3%)
Primary education	27 (6.8%)
High school education	113(28.3%)
University education	239(59.9%)
Above university education	15(3.7%)
Smoking History	
Current smoking	35 (8.8%)
Previous smoking	25(6.2%)
Non smoker	339 (85%)

Variables	n (%)
Duration of asthma	
< 5 years	162(40.6%)
>5 years	203(50.9%)
Last asthma attack	
Less than 2 weeks	134(33.6%)
2-4 weeks	54(13.5%)
More than 4 weeks	153(38.3%)
Types of asthma medications you used	
No	180(45.1%)
Yes	219 (54.9%)
What is your main source of asthma information	
Magazine	4 (1.0%)
Health care(Pharmacist Doctors , Nurse ,other)	232 (58.2 %)
Internet	105 (26.3 %)
News papers	5 (1.3 %)
Publications	20 (5.0 %)
T.V and Radio	33 (8.3 %)

Only a minority (12%) of patients could perform all eleven steps correctly, i.e., obtained the maximum 11 points (Figure 1)

Table 3 showed that regarding use MDI devices, the percentage of correct handling committed in each step was calculated. Among the 11 steps in MDI administration procedure: step 11 (After use replace the mouthpiece cover) was the least correctly done (12.8%) followed by step 6 (Tilt your heads lightly backwards)(51.1%) while



Variables	n (%)
Removes the mouthpiece cover and check the mouth piece thoroughly to see its clean	
No	167 (41.9%)
Yes	232 (58.1%)
Shakes the inhaler vigorously?	
No	117 (29.3%)
Yes	282 (70.7%)
Holds the inhaler upright between index finger and thumb	
No	104 (26.1%)
Yes	295 (73.9%)
Breathes out gently through your mouth and immediately place the mouthpiece in your teeth	
No	122 (30.6%)
Yes	277 (69.4%)
Grips the mouthpiece firmly with your lips	
No	93 (23.3%)
Yes	306 (76.7%)
Tilt your heads lightly backwards	
No	199 (49.9%)
Yes	200 (50.1%)
Starts breathing in slowly through your mouth At the same time	
No	176 (44.1%)
Yes	223 (55.9%)
Removes the inhaler from your mouth and holds breath for at least 10 seconds	
No	134 (33.6%)
yes	265 (66.4%)
Breathes out slowly	
No	150 (37.6%)
Yes	249 (62.4%)
If another dose is required wait for at least one minute repeated step 1 to 4	
No	192 (48.1%)
Yes	207 (51.9%)
After use replace the mouthpiece cover	
No	348 (87.2%)
Yes	51 (12.8%)

Variable	n (%)
Assessments of using MDIs	
Good	238(59.7%)
Poor	161(40.3%)
**Good: >70% of the maximum possible scores.	
*Poor: <70% of maximum possible scores.	

step5 (Grips the mouthpiece firmly with your lips)and step 3(Holds the inhaler upright between index finger and thumb?) were the most correctly performed (76.7% and 73.9% respectively).

Level of assessment of using MDI among participant

Table 4 shows the frequency distribution of participants asthmatic related to assessment of using asthmatic

Variables	Mean (±SD)	P value
Gender		
Female	6.01(±3.37)	0.099
Male	6.64(±3.27)	
Age (years)		
18 – 25 years	5.91(±3.34)	<0.001
26 – 35 years	6.53(±3.58)	
36 – 45 years	7.95(±2.69)	
>45 years	6.96(±2.76)	
Level of education		
Non education	7.00(±2.35)	0.876
Primary education	6.96(±3.80)	
High school education	6.45(±3.46)	
University education	6.4(±3.23)	
Above university education	7.00(±3.48)	
Smoking History		
Current smoking	6.54(±3.30)	0.582
Previous smoking	6.29(±3.33)	
Non smoker	5.80(±3.24)	

*Maximum Assessment cores of using MDI=11

Variables	Mean (±SD)	P value
Duration of asthma		
< 5 years	6.54(±3.45)	<0.001
>5 years	7.30(±1.23)	
Last asthma attack		
Less than 2 weeks	7.16(±3.05)	0.485
2-4 weeks	6.81(±2.90)	
More than 4 weeks	6.75(±3.04)	
Do you know the types of Asthma Inhalers MDIs you have used		
No	3.33(±4.01)	0.758
Yes	6.51(±3.29)	

*Maximum Assessment cores of using MDI=11

inhalers. More than half of cases 238 (59.7) had good assessments level of using asthmatic inhalers respectively.

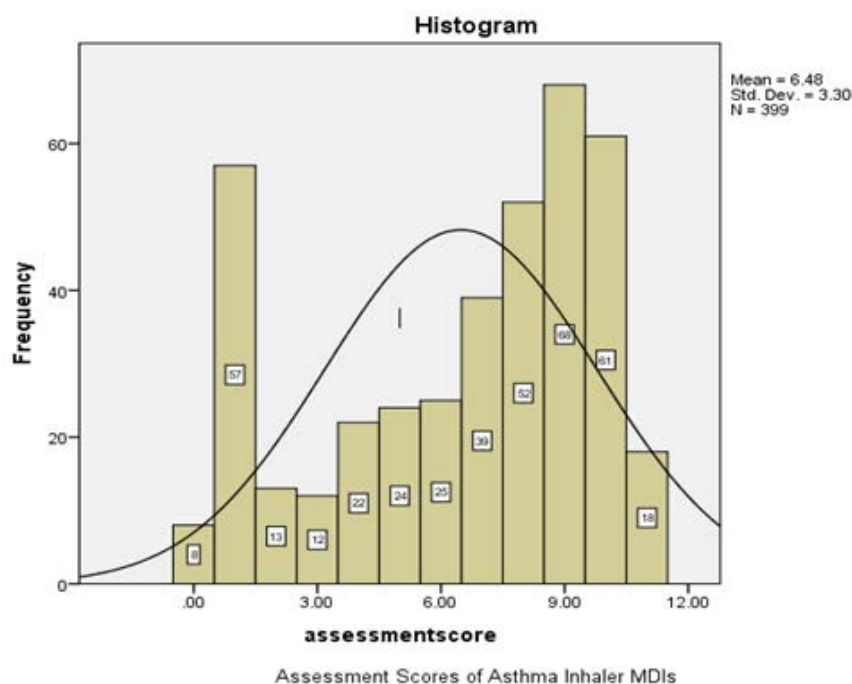
Patients' socio-demographic characteristics and assessment cores of using MDI

Table 5 shows mean assessment cores of using MDI were for patients' socio-demographic characteristics were significantly with age group (<0.001). There were no significant differences between males and females, level of education and smoking habit.

Patients' medical background and assessment cores of using MDI

As shown in Table 5 mean Assessment cores of using MDI were only significantly higher with longer duration of asthma (<0.001). Other medical backgrounds variables were not significantly.





DISCUSSION

In this study, questions were asked to cover various aspects of asthma, and show a striking difference in asthma prevalence and severity closely related to sex and age. In general, the lifetime likelihood of developing asthma is about 10.5% greater in women than men. In contrast with study done by¹⁹ men were more than women. Males were 52% and females were 48%. Large number of our sample in this study were female which is more than 70% of the participants. In our study most of patients (92%) were educated to a high school education and above. The population which participated in the study is in high educational level like as study done by.¹⁹

In a retrospective cohort analysis of 2933 COPD and asthmatic patients presenting at the Asian Medical Center made by²⁰ showed that Overlap syndrome patients were older, included smaller proportions of males and of smokers and had lower forced expiratory volume in 1 s (FEV₁) (% predicted), in contrast with our study that we recognize that mostly who suffers from asthma between the population are those aged between 18-25 years 202 (50.6%), young population are more effected. More than 85% of them they are nonsmokers as in,²⁰ which give us the conclusion that asthma are mostly familial hypersensitive reaction and not only for smokers.

In this study the main source of patients' information regarding asthma was the health worker (58%). This result is consistent with the results of a study conducted by.²¹

In the part concerning medical background of asthma patients we can see highly educated patients which

they earn their knowledge about their condition from the physicians, which give us evidence about increased awareness in those patients. During a previous study which was conducted by²² to evaluate baseline, only 1 out of the 117 subjects could perform all the steps of inhaler usage correctly.

Asthma patients usually use metered-dose inhaler (MDI) for treatment. MDI device is ineffective if used without correctly used.

In our study showed that only 146(36.6%) of MDI users. About 12% of MDI users completed the eleven steps without mistakes. The same in the work by²³ in the Netherlands,(1998) only 11.1% patients completed the required steps. In contrast with work by²⁴ showed that only 22.1% of pMDI users and 37.3% of DPI users were able to complete all the steps in their different techniques. About 26.2% of both pMDI and DPI users completed the nine steps without mistakes

The most common errors in the use of MDI in our study were step 11 (After use replace the mouthpiece cover), followed by step 5 (Grips the mouthpiece firmly with your lips). These findings are contrast with those of²³ who identified steps 7 and 4 as the most common "skill" and "non-skill" mistakes respectively.

Low scores of correct handling of inhaler devices reported in this study are consistent with results published previously.^{6,25} Potential explanation of these low scores of correct handling of inhaler devices is the possibility that treating physicians may not spend enough time with their patients to teach them the proper use of the inhaler device. Furthermore, it is possible that the education



techniques demonstrated by the healthcare providers are done without an actual inhaler or demonstration device.

Other potential reasons for inhaler errors include the device itself, patients' beliefs and adherence. Patients who believe using their inhaler is an important part of their asthma management demonstrate higher levels of correct inhaler use

Educational level was not significantly correlated with scores of correct handling. This finding is in disagreement with those reported by a study published in Saudi Arabia.²⁶

Results shows also that age and duration of asthma disease were significantly correlated with scores of correct handling. This might suggest that patients from older age group is trying to be careful to use the device in the correct way. Furthermore, this finding might suggest that more duration of disease is the factor for correct use of the device. This finding is in contradict with Saudi study which did not find significant differences in the mean correct score between various age categories.²⁶ Our results disagreement with²⁷ who showed that elderly patients are unable to use MDI simply because of cognitive impairment. Regarding smoking, we found no significant difference in correct handling of the device

between smokers and non-smokers.

CONCLUSION

Despite the well-known fact that a good MDI technique is of utmost importance, patients still tend to have a relatively poor technique. Incorrect inhaler technique is common among asthma patients. Indicating the need for regular formal training programmes on inhaler techniques so as to decipher correct practices in inhalation therapy.

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CONFLICTS OF INTEREST

No conflicts of interest statement.

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