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# IMPROPER TECHNIQUE OF USING METER DOSE INHALER IN A SAMPLE OF ASTHMATIC PATIENTS

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**Keywords:**

Iraqi asthmatic patient, MDI, Inhaler technique and Patient education

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**ABSTRACT: Background:** Improper asthma inhaler device use was most likely one of the major causes associated with uncontrolled asthma and frequent respiratory clinic visits. Therefore, assessment of the effect of the improper use of metered dose inhaler device in the control of bronchial asthma, and the factors that have important impact on asthma management and control. **Objectives:** To evaluate the inhaler technique among asthmatic patients and to investigate the characteristics of these patients and factors associated with improper use of inhaler devices and its relationship with asthma control. **Methods:** A cross-sectional study of 100 patients who visited respiratory clinic at Baghdad Teaching Hospital with bronchial asthma from 1st of August 2014 to 28th February 2015. Information was collected about demographic data and asthma control and we assessed the inhaler techniques for each patient using an inhaler technique checklist. **Results:** Among the 100 asthma patients, 50 (50%) were male, 50 (50%) female. There was a statistically significant association between educational defects with the gender (P value <0.05). There was a statistically significant association between educational defects with the age (P value = 0.01). There was a statistically significant association between educational defects with the education level of patients (P value = 0.00). There was a statistically significant association between educational defects with the duration of disease of the patient (P value = 0.03). There was a statistically significant association between educational defects with the disease education of the patient (P value = 0.00). There was a statistically significant association between educational defects with asthma control test (ACT). **Conclusion:** Improper inhaler device use was major factor associated with poor asthma control.

**INTRODUCTION:** Asthma is a chronic inflammatory disorder of the airway characterized by bronchial hyperactivity to a variety of stimuli, leading to a variable degree of airway obstruction, some of which may become irreversible over many years [1, 2]. It is a clinical diagnosis based on a history of recurrent episodes of wheeze, chest tightness breathlessness, and / or cough, particularly at night.

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Evidence of generalized and variable airflow obstruction, which may be detected as intermittent wheeze on examination or *via* tests such as peak expiratory flow (PEF) measurement [1, 2].

Asthma is one of the most common chronic diseases globally and currently affects approximately 300 million people worldwide. The prevalence of asthma has risen in affluent countries over the last 30 years but now appears to have stabilized, with approximately 10 - 12% of adults and 15% of children affected by the disease. In developing countries where the prevalence of asthma had been much lower, there is a rising prevalence, which is associated with increased urbanization. The prevalence of atopy and other allergic diseases has also increased over the same

time, suggesting that the reasons for the increase are likely to be systemic rather than confined to the lungs. This epidemiologic observation suggests that there is a maximum number of individuals in the community, who are likely to be affected by asthma, most likely by genetic predisposition. Most patients with asthma in affluent countries are atopic, with allergic sensitization to the house dust mite *Dermatophagoides pteronyssinus* and other environmental allergens. Asthma can present at any age, with a peak age of 3 years. In childhood, twice as many males as females are asthmatic, but by adulthood the sex ratio has equalized. The commonly held belief that children "grow out of their asthma" is justified to some extent.

Deaths from asthma are uncommon, and in many affluent countries have been steadily declining over the last decade. A rise in asthma mortality seen in several countries during the 1960's was associated with increased use of short-acting β 2 -adrenergic agonists (as rescue therapy), but there is now compelling evidence that the more widespread use of (ICS) in patients with persistent asthma is responsible for the decrease in mortality in recent years [3, 4].

**Assessment of Asthma Control:** The gold standard in assessing asthma control is the Global Initiative for Asthma (GINA) criteria. It is difficult to follow GINA criteria in assessing asthma control in resource poor settings because of the lack of access to pulmonary functions tests. The Asthma Control Test (ACT) questionnaire is a simple, self-administered, accessible and validated tool that is used in assessing control among asthmatics. The ACT has the added advantage that it does not require lung function assessment [5].

**TABLE 1: GINA CRITERIA**

| Characteristic | Controlled | Partly controlled (any present in any week) | Uncontrolled |
|---|---|---|---|
| Daytime symptoms | None (≤ twice/wk) | >twice/wk | ≥3features of |
| Limitations of activities | None | Any | Partly controlled |
| Nocturnal symptoms/awakening | None | Any | asthma |
| Need for rescue /'reliever' treatment | None (≤twice/wk) | >twice/wk | present |
| Lung function (PEF or FEV1) | Normal | <80% predicted or personal best (if known) on any day ≥1y | in any wk |
| Exacerbation | None | | 1 in any wk |

**TABLE 2: ASTHMA CONTROL TEST**

**1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or at home?**

| | | | | |
|---|---|---|---|---|
| All of the time ◯ | Most of the time ◯ | Some of the time ◯ | A little of the time ◯ | None of the time ◯ |

**2. During the past 4 weeks, how often have you had shortness of breath?**

| | | | | |
|---|---|---|---|---|
| More than once a day ◯ | Once a day ◯ | 3 to 6 times a week ◯ | Once or twice a week ◯ | Not at all ◯ |

**3. During the past 4 weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?**

| | | | | |
|---|---|---|---|---|
| 4 or more nights a week ◯ | 2 or 3 nights a week ◯ | Once a week ◯ | Once or twice ◯ | Not at all ◯ |

**4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?**

| | | | | |
|---|---|---|---|---|
| 3 or more times per day ◯ | 1 or 2 times per day ◯ | 2 or 3 times per week ◯ | Once a week or less ◯ | Not at all ◯ |

**5. How would you rate your asthma control during the past 4 weeks?**

| | | | | |
|---|---|---|---|---|
| Not controlled at all ◯ | Poorly controlled ◯ | Somewhat Controlled ◯ | Well controlled ◯ | Completely controlled ◯ |

If your score is 25, your asthma is control.
If your score is 20-24, your asthma is partial control.
If your score is 19 or less, your asthma is uncontrolled. [7]

**Types of Inhalers:**

**1- Dry Powder Inhalers:** A dry powder inhaler (DPI) is a breath-actuated device that delivers the drug in the form of particles contained in a capsule or blister that is punctured prior to use. This type of inhaler requires an adequate inspiratory flow rate for drug delivery, as it eliminates the need for propellants. Because of this inspiratory flow rate requirement, DPIs are not appropriate for the treatment of acute asthma attacks.

**Types of DPIs:**

**A. Turbuhaler:** The turbuhaler is breath activated and has no propellant or carrier added to the medicine. This means you will hardly notice any powder in your mouth.

**B. Accuhaler:** Accuhaler is a breath activated device. Doses of the medicine are set into a fail strip inside the accuhaler.

**C. Handihaler:** The handihaler delivers the medicine Spiriva is used by people with COPD

**2- Metered Dose Inhalers (MDI):** MDI inhaler are sometimes called aerosol inhaler. When the inhaler is pressed, a measured dose of medicine is released through the mouthpiece. MDI are more widely used and more familial [8].

**TABLE 3: INHALER DEVICE CHECK LIST**

| Use of a pressurized metered-dose inhaler |
|---|
| 1. Remove the cap and shake the canister |
| 2. Hold the canister upright at opening of mouth, incline the head backwards |
| 3. Begin a slow breath |
| 4. Actuate the MDI once while continuing with a slow breath |
| 5. Inhale to total lung capacity |
| 6. Hold breath for at least 10 seconds |

**MDI Advantages:**

1. Portability.
2. Multidose delivery capability.
3. Lower risk of bacterial contamination.
4. Prevent, reliever, symptom controller and combination medications are all
5. A spacer can improve performance.
6. A haler aid device is available for people who have difficulty pressing the inhaler [8].

**MDI Disadvantages:**

1. Needs correct actuation and inhalation coordination.
2. Oropharyngeal drug deposition.
3. Flammability possibility of new HFA (hydro-fluoroalkane) propellants.
4. Some people find it difficult to press the inhaler and breathe in at exactly the Night time.
5. It may be hard to tell when the inhaler is empty.
6. Need weekly cleaning to prevent blocking [8].

**Aim of Study:** The aim of study is to assess the effect of the improper use of meter dose inhaler device in the control of bronchial asthma. And the factors that affect the inhaler technique.

**Patients and Methods:**

**Type of Study:** This cross-sectional study was conducted at Baghdad Teaching hospital.

**Timing and Setting:** No. of asthmatic patient enrolled adult patients (≥ 18 years old) diagnosed with asthma who visited the respiratory consulting department between 1st of August 2016 and 28th February 2017.

**Methods:** The enrolled no. of patients had a documented diagnosis of bronchial asthma as diagnosed by reversibility test and who were use meter dose inhaler (MDI). We excluded patients without a documented diagnosis of bronchial asthma and those who did not use MDI. During the respiratory consulting department visit, we have taken 100 patients of bronchial asthma, 50 patients male and 50 patients female.

Trained co-investigator collected information about demographic data, the patients, age, educational level, education about medication, the duration of the illness, the data were gathered on whether the patient received any formal education about asthma as a disease and, how to use their inhaler devices, The co-investigators also verified this information by reviewing the medical record of the patients and they assessed the asthma control over the last month by administering the Asthma Control Test (ACT). The co-investigators also determined whether the patient knew how to use the prescribed inhaler properly following specific steps in the check list **Table 3**.

All patients were observed for two trials of using their inhalers and proper use was identified if the patient fulfilled all of the steps required.

**Statistical Analysis:** The data collected was transferred and analyzed using IBM SPSS Statistics version 20. Descriptive statistics, such as the means and standard deviations, were used to summarize the quantitative variables. The frequencies and percentages were used to summarize categorical variables. Chi-squared tests were used to test the association between clinical characteristics across the variables regarding asthma device**.** Use and asthma control test. P-values less than 0.05 were considered significant. Multiple logistic models were used to identify the risk factors that were associated with the improper use of asthma inhaler devices.

**RESULTS:** Among the 100 asthma patients, 50(50%) were male, 50(50%) female **Table 4, 5**. describe distribution of age, **Table 6** describe educational status of the patient, **Table 7** describe duration of disease, **Table 8** describe disease education.

**TABLE 4: DISTRIBUTION OF GENDER**

| Gender | Frequency | Percent |
|---|---|---|
| Male | 50 | 50 |
| Female | 50 | 50 |
| total | 100 | 100 |

**TABLE 5: DISTRIBUTION OF AGE**

| | Frequency | Percent |
|---|---|---|
| 21-30 years | 35 | 35 |
| 31-40 years | 13 | 13 |
| 41-50 years | 19 | 19 |
| More than 51years | 33 | 33 |
| Total | 100 | 100 |

**TABLE 6: EDUCATIONAL STATUS**

| | Frequency | Percent |
|---|---|---|
| Primary | 39 | 39 |
| Post Primary | 40 | 40 |
| Secondary | 11 | 11 |
| Institute | 2 | 2 |
| College | 8 | 8 |
| Total | 100 | 100 |

**TABLE 7: DESCRIBE DISTRIBUTION OF DURATION OF ASTHMA**

| | Frequency | Percent |
|---|---|---|
| 1-6 years | 51 | 51 |
| 7-12 years | 39 | 39 |
| More 13 years | 10 | 10 |
| Total | 100 | 100 |

**TABLE 8: DESCRIBE DISEASE EDUCATIONAL STATUS**

| | Frequency | Percent |
|---|---|---|
| a | 43 | 43 |
| b | 16 | 16 |
| c | 16 | 16 |
| d | 25 | 25 |
| Total | 100 | 100 |

a= patients have information disease about the asthma
b= patient educated how to use inhaler
c= patients have information disease about the asthma and educated how to use inhaler.
d= patients haven't information about asthma disease and not educated how to use inhaler

**Fig. 1** show comparison between educational defects with the gender which is show statistically significant, especially step (3, 6) **Table 4** Inhaler device check list), P value ‹0.05 significant.

**Fig. 2** show comparison between educational defects with the age which is show statistically significant, especially step (3, 6) **Table 4** Inhaler device check list), P value = 0.01 significant.

**Fig. 3** show comparison between educational defects with the education which is show statistically significant, especially step (3, 6) (**Table 4** Inhaler device check list), P value = 0.00 significant.

**Fig. 4** show comparison between educational defects with the duration of disease of the patient which is show statistically significant, especially step (3, 6) (**Table 4** Inhaler device check list), P value = 0.03 significant.

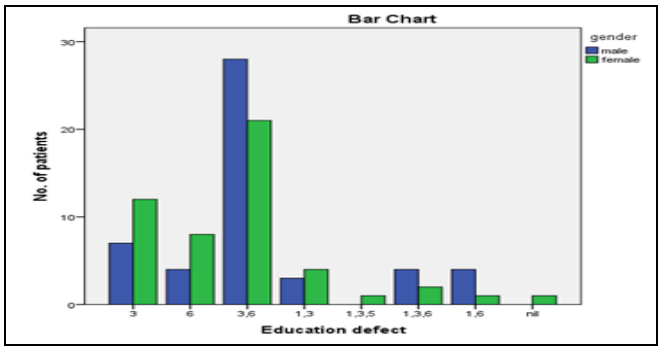


**FIG. 1: EDUCATION DEFECT *GENDER**

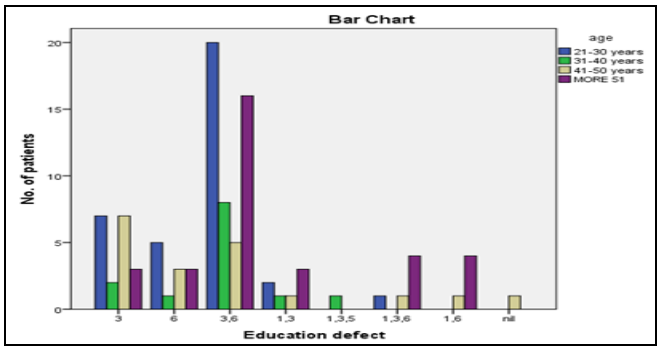


**FIG. 2: EDUC. DEFECT. * AGE**
P value = 0.01

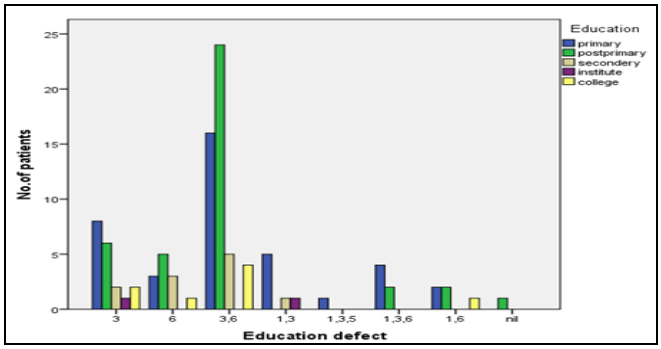


**FIG. 3: EDUC. DEFECT * EDUCATION**
P value=0.00

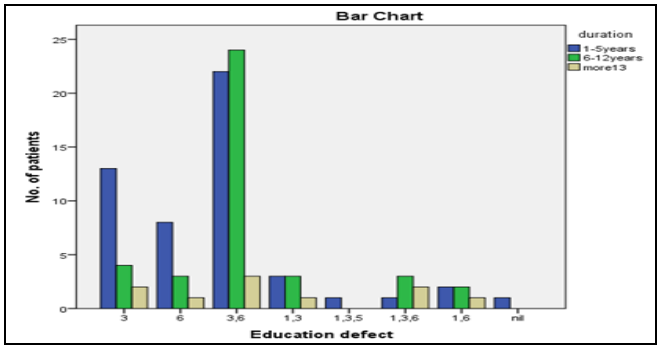


**FIG. 4: EDUC. DEFECT * DURATION**
P value=0.03

**Fig. 5** show comparison between educational defects with the disease education of the patient which is show statistically significant, especially step (3, 6) **Table 4** Inhaler device check list, P value = 0.00 significant.

**Fig. 6** show comparison between educational defects with asthma control test (ACT) which is show statistically significant , especially step (3,6) (**Table 4** Inhaler device check list), P value = 0.00 significant.

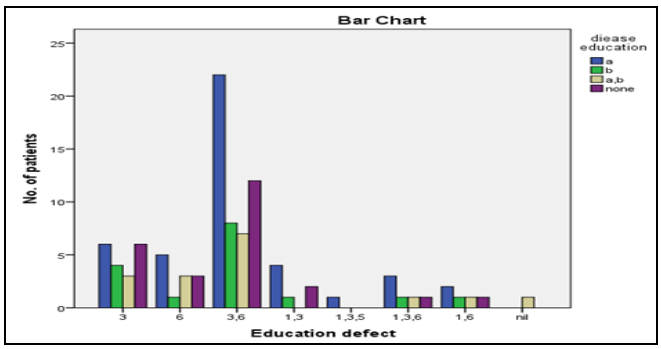


**FIG. 5: EDUC. DEFECT. * DISEASE EDUCATION**
P value=0.00

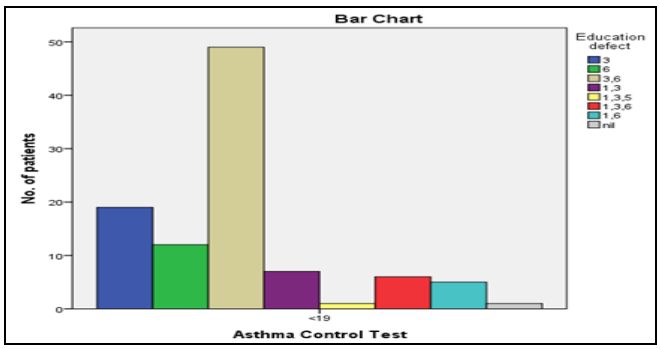


**FIG. 6: EDUC. DEFECT. *ASTHMA CONTROL TEST**
P value=0.00

**DISCUSSION:** Previous studies have shown that the improper use of inhaler devices decreases drug delivery, patient's regimen adherence and drug effectiveness contributes to uncontrolled asthma and multiple the respiratory clinic visits [9, 10, 11, 12]. Importantly, we found that 68% of the patients did not receive any formal education by any health care professionals regarding the proper use of inhaler devices. In this study, approximately 32% of the patients received education about how to use the inhaler devices.

This study have shown that good educational practice results in the proper use of MDI which will be more cost effective in the long-term [13, 14, 15]. This was mostly due to a lack of asthma education programs. This same finding in AL-Jahdali *et al.* [16] The major avoidable factors for improper device use were a lack of education regarding asthma as a disease and how the patient use inhaler device correctly. Takemura M *et al.*, have shown that standardized asthma education programs, education focused on self-management and behavioral change improves inhaler device use, adherence to treatment and asthma control [17, 18]. There was significant difference in the appropriate use of device stratified by patient age or gender (P value <0.05), this against other study by Larsen JS *et al.*, [there was no difference in the appropriate use of device stratified by patient age or gender] [19]. In addition to Al-Jahdali HH *et al.* [20, 21] The rate of correct use significantly increased as the level of education increased (p = 0.00) significant. This same finding in Yusuf Aydemir [22]. The rate of correct use significantly increased with a longer duration of disease than those who had been recently diagnosed (P value = 0.03). This same finding in Yusuf Aydemir [22].

**CONCLUSION:** The study reveals improper asthma inhaler technique is common among asthma patient and is associated poor asthma control. The lack of appropriate asthma education is likely a major cause of improper device use.

**ACKNOWLEDGEMENT:** I thank God for helping me to improve the life of ills and for improving my knowledge about their illness. I would like to present my thanks to all seniors in the department of respiratory medicine for their kind support and invaluable notes about this study.

**CONFLICT OF INTEREST:** Nil

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