ORIGINAL ARTICLE

ASSESSMENT OF METERED DOSE INHALER TECHNIQUE IN PATIENTS WITH CHRONIC LUNG DISEASE AT GOVERNMENT HOSPITALS OF RAWALPINDI

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Background: Metered dose inhalers (MDIs) are an affective modality of treatment for fast relief from asthma flare-ups and other symptoms, and are often used by asthmatic athletes. It has got lots of benefits and some drawbacks depending on usage technique. With proper technique and training drawbacks can be minimised. The objective of this study was to assess the metered dose inhaler technique in patients with chronic lung disease at government hospitals of Rawalpindi. **Methods:** A cross-sectional study was conducted in three government hospitals of Rawalpindi. The inhalation technique was assessed in six steps. **Results:** Clear evidence showed that only 24% patient could perform all the steps correctly. Percentages of people that followed individual steps properly were: preparation (87.5%), exhalation (53.85%), lip closure (68.27%), inhalation (56.73%), breath-holding (27.88%) and puff interval (36.54%). **Conclusion:** This study showed that a number of patients in government hospitals of Rawalpindi were unable to use metered-dose-inhaler properly and therefore indicates the need to make people aware of this technique either by counselling or arranging seminars.
KEYWORDS: chronic lung disease, asthma, metered-dose inhaler.

INTRODUCTION

Bronchial asthma and chronic obstructive airway disease are the two most common chronic lung diseases encountered in the government hospitals in Rawalpindi. The treatment usually includes the use of bronchodilators and steroids, which are best delivered through the inhalational route. Metered-dose inhalers are routinely prescribed for this purpose. However, anecdotally, it has been observed that a significant number of these patients do not employ proper technique of using this inhaler despite the fact that they are taught the technique each time they ask for. This is also reflected in other studies.[1–3]

As proper drug delivery is the first step towards effective pharmacological treatment, it is important to assess the patient's inhaler technique before establishing a drug regime. According to the Asthma Guidelines suggested by Thorax, 1997[4], assessment of the inhaler technique, together with treatment compliance and allergen avoidance, should be done before any change is made to the treatment plan.

METHODS

This study was carried out from April 2010 to June 2010 at three government hospitals of Rawalpindi, i.e., Holy Family Hospital, District Head Quarter Hospital and Benazir Bhutto Hospital. It involved patients aged 12 years and above, who were diagnosed to have bronchial asthma or chronic obstructive pulmonary disease (COPD). The diagnosis was based on documentation in the case notes and only those who had been treated with metered dose inhaler for at least 6 months were included in the study. Patients using spacer devices were excluded from this study. The assessment of inhaler technique was standardised by first breaking it down into six discrete steps.[2] An ideal correct procedure for each step was then set up by consulting various pulmonologists. The steps were:

1. Remove the cap and shake the inhaler (at least 3 times).
2. Exhale to functional residual capacity.
3. Seal the mouthpiece against closed lips.
4. Actuate and inhale slowly to total lung capacity.
5. Hold the breath for 4 to 10 seconds after maximal inhalation.
6. Check with the patient the duration between the first and second puffs. The interval is one minute.

One point was given for each correct step, with a maximum of 6 points. Weighting of the steps was not carried out as every step must be performed correctly to achieve an adequate drug delivery to the airway.

We personally interviewed 104 consecutive patients who satisfied the selection criteria. The patients' age, highest education attained, duration of disease and duration of inhaler usage were noted. The patients were then asked to demonstrate how they would normally use the inhaler. The technique employed was observed without interruption and was scored accordingly. The assessment was done when the patient gave back inhaler. For those patients having an acute exacerbation, their techniques were assessed after nebulisation was given. The data was analysed using SPSS-16.

RESULTS

The mean age of the study population was 45.20 years (SD 22.87 years). Their age profile is shown in Table-1. The length of MDI usage showed a bimodal distribution with peaks at 3–5 years and 10 years. In view of this distribution, correlation studies were not attempted with the length of MDI usage as one of the variables. The majority of the study population had no formal education. Their profile is presented in Table-2.

Only a minority (24%) of patients could perform all six steps correctly, i.e., obtained the maximum 6 points (Table-3). Of the six steps, breath holding was the weakest step with only 27.88% of patients performing it correctly. The best step was preparation with 87.5% of patients performing it correctly (Table-4). A negative correlation was noted using Spearman's rank sum test between age and total score, i.e., older patients tended to have a lower score as compared to younger patients.

On further analysis, some patterns could be discerned with respect to the possible effect of age on different steps of inhaler technique (Table-5). The percentage of patients performing steps such as preparation, lip closure and puff interval were evenly distributed among the different age groups. Younger patients especially those who were less than 30 years tend to perform better for steps such as inhalation, exhalation and breath holding. There was no association noted between educational level and total score using Chi-square test. This finding however needs to be interpreted with care as the number of educated patients is small.

Table-1: Age distribution of the subjects

Age Group	Number	%
12–19	3	2.88
20–29	12	11.54
30–39	16	15.38
40–49	25	24.04
50–59	21	20.19
60–69	18	17.31
70–79	7	6.73
80–89	2	1.92

Table-2: Educational profile

Education Status	Number	%
No formal education	49	47.12
Primary	26	25.0
Secondary	20	19.2
Matriculation standard	7	6.73
Above matriculation standard	2	1.92

Table-3: Distribution of total score

Points	Number	%
0	13	12.50
1	16	15.38
2	15	14.42
3	6	5.77
4	15	14.42
5	14	13.46
6	25	24.0

Table-4: Percentage of patients performing each step correctly

Step	% Successful
Preparation	87.5
Exhalation	53.85
Lip Closure	68.27
Inhalation	56.73
Breath Holding	27.88
Puff duration	36.54

Table-5: Percentage of patients by age groups performing each step correctly

Age Group	n	1	2	3	4	5	6
12–19	3	100	100	100	50	50	0
20–29	12	100	58.33	83.33	66.66	41.6	58.32
30–39	16	93.75	62.5	68.75	56.25	37.5	25
40–49	25	88	60	88	56	24	28
50–59	21	80.95	42.86	47.6	57.14	28.57	28.57
60–69	18	83.33	44.44	61.11	50	11.11	50
70–79	7	71.43	42.86	42.86	71.43	28.57	57.14
80–89	2	100	50	100	0	0	50

n= no. of patients, 1= Preparation step, 2= Exhalation 3= Lip closure, 4= Inhalation, 5= Breath holding, 6= Puff interval

DISCUSSION

The introduction of metered dose inhalers is a major innovation in the therapeutic management of bronchial asthma and chronic obstructive airway disease. These devices enable the direct delivery of medication to the respiratory system, hence reducing the first pass effect while minimising systemic side effects. However as only 8.8% of the aerosolised dose reaches the small conducting airway and alveoli even with the proper use of the MDIs[5], it is important that the patient performs the MDI technique correctly. The results of this survey show that MDI technique among patients is not ideal as only 24% of patients have a perfect score of 6. Consequently, many patients may not be receiving the optimal dose of medication. This study also shows a highly significant negative correlation between age and total score. This can be due to the better efficiency of body and mind in young age. This is supported by the finding that younger patients tend to perform steps such as inhalation, breath holding and exhalation better than older patients. Diminishing learning capacity and memory due to increased age are possible attributing factors. Therefore, MDI should remain as the preferred method of delivery of medication for young patients. However in the elderly, we may need to consider using the MDI with a spacer device even at the initial stage. There is much work to be done by the government hospital doctors, nurses and also pharmacists in Rawalpindi in educating patients on the proper techniques in using MDIs. Patient education should be emphasised at the first consultation as it has been shown that the quality of initial instruction has an impact on the outcome of inhalation therapy.[6] Education should include verbal instruction and demonstration of proper use of MDI by the health care provider.[7,8] Patients

should also be encouraged to demonstrate their proficiency in MDI usage regularly. Breaking up the procedure into the six steps as identified in this study may help the health care provider to better communicate, identify and rectify any deficiencies in MDI technique. Additional studies would be needed however, to confirm this hypothesis.

CONCLUSION

This study highlighted the high incidence of incorrect usage of MDIs amongst patients attending government hospitals of Rawalpindi. The weakest step was breath holding. Older patients had more difficulty executing MDI technique compared to younger patients.

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REFERENCES

1. Hilton S. An audit of inhaler technique among asthma patients of 34 general practitioners. Bri J Gen Pract 1990;40:505–96.
2. Liam CK, Lo YL, Yap BH, Low SH, Ariwalagam M. Use of pressurised aerosol inhalers among patients attending the chest clinic and primary department of University Hospital, Kuala Lumpur. Med J Mal 1993;48:273–9.
3. Thompson J, Irvine T, Grathwohl K, Roth B. Misuse of metered-dose inhalers in hospitalised patients. Chest 1994;105:715–7.
4. The British Guidelines on Asthma Management 1995. Review and Position Statement. Thorax 1997;52(Suppl-1).
5. Newman SP, Pavia A, Moren F, Sheahan NF, Clarke SW. Deposition of pressurised aerosols in the human respiratory tract. Thorax 1981;36:52–5.
6. Pederson S, Frost L, Arnfred T. Errors in inhalation technique and efficacy in inhaler use in asthmatic children. Allergy 1986;41:118–24.
7. De Blaquiere P, Christiansen DB, Carter WB, Martin TR. Use and misuse of metered-dose inhalers by patients with chronic lung disease–a controlled randomised trial of two instruction methods. Am Rev Resp Dis 1984;140:910–6.
8. Guidry GG, Brown WD, Stogner SW, George RB. Incorrect use of metered dose inhalers by medical personnel. Chest 1992;101:31–3.

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