JALALABAD MEDICAL JOURNAL

Original Article

# Assessment of Metered Dose Inhaler Technique among Chronic Obstructive Pulmonary Disease Patients in a Tertiary Care Hospital.

**Md. Guljar Hossain[1], Md. Enayet Hossain[2], Ferdaus Ahammed[3]**

[1]Indoor Medical officer, Department of Medicine, Sylhet MAG Osmani Medical College Hospital, Sylhet.
[2]Associate Professor, Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet.
[3]Assistant Professor, Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet.

***ABSTRACT***

*Chronic obstructive pulmonary disease (COPD) is a progressive and debilitating condition with an insidious onset, often diagnosed in the middle age or later after a history of worsening breathlessness. Metered Dose Inhalers (MDI) are the mainstay of treatment of chronic obstructive pulmonary disease, incorrect use of which may lead to decreased medication delivery and poor disease control. This descriptive cross sectional study was carried out in the medicine outpatient department in Dhaka Medical College Hospital (DMCH) over a period of 6 months from October 2013 to April 2014 to identify the gap between prescribing inhalers and practical use by COPD patients. A total of 120 patients with COPD were included in the study. Data was collected using a semi-structured questionnaire containing the variables of interest and was analyzed. Performing the correct steps of MDI was assessed by practical observation. The results showed that, among all the patients, 106 (88.3%) were male and 14 (11.7%) were female. Among 120 patients, only 10 (8.3%) patients could perform all steps of MDI correctly. At least one step was mistaken by 97 patients (80.83%). The association between age and MDI usage steps showed that maximum elderly patients in the age range of 61 to 80 had difficulty performing the steps. This study concluded that a number of patients in a tertiary care hospital were unable to use metered-dose-inhalers properly, and therefore indicates the need to make people aware of this technique, either by counseling or by arranging workshops.*

***Keywords****: Chronic obstructive pulmonary disease, Metered dose inhalers.*

**[Jalalabad Med J 2021; 18 (1): 6-10]**

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a well-characterized chronic lung disease that involves progressive airflow limitation with symptoms of dyspnoea, cough and sputum production. This airflow limitation is usually associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking. Although COPD affects the lungs, it also produces significant systemic consequences[1]. It is now the fifth leading cause of global mortality and morbidity, as well as a major public health issue in both developed and developing countries[2]. To deal with the deterioration of respiratory function in COPD patients, it is necessary to

***Address of Correspondence:***
*Dr. Md. Guljar Hossain, Indoor Medical Officer, Department of Medicine, Sylhet MAG Osmani Medical College Hospital, Sylhet. Mobile: +8801717458927, Email: guljar.mmc85@gmail.com*

gradually introduce pharmacologic, non-pharmacologic, and surgical treatments[3].

Inhalation medication is the cornerstone of therapy for patients with COPD. Inadequate instruction and poor inhalation techniques moderate the effectiveness of the medication and are a major cause of poor disease control[4]. The major advantage of inhaled therapy is that medications are delivered directly into the airways, which produces a high local concentration with a significantly lower risk of systemic adverse effects. Metered dose inhaler (MDI) is the earliest device and is the most commonly used one. MDIs are difficult to use, have a high rate of incorrect handling (71%), and require patient-device coordination. Furthermore, incorrect technique has been reported in up to 94% of patients[5,6]. Patient-related determinants like sex, age, educational level, emotional problems, severity of obstruction, and diagnosis have been associated with incorrect inhalation technique[7,8]. Some studies have demonstrated that patients using a pressured metered-dose inhaler made significantly more mistakes than users of dry powder inhalers, whereas another study showed better inhalation technique through the use of MDIs[7].

Patients with COPD are repeatedly admitted in the medicine ward with acute exacerbations and complications. COPD patients impose an enormous burden on the hospital health care system. Inefficient inhaler use is a common problem with many patients. This in turn, can result in poor drug delivery, decreased disease control and increased inhaler use. This problem obviously has cost implications, both in terms of medication, visits to the physicians, and hospital admissions. This baseline study was aimed at identifying the gap between prescribing inhalers and practical use by COPD patients.

## MATERIALS AND METHOD

This six-month cross-sectional observational study was undertaken in the Department of Medicine outpatient department (OPD), Dhaka Medical College, Dhaka from October 31st to April 1st, 2014. Participants were taken by means of a purposive sampling technique. A total of 120 (One hundred twenty) willingly agreed patients from Medicine OPD diagnosed as COPD, confirmed by compatible investigations (CBC, CXR P/A View, Spirometry) fulfilling the selection criteria were included for the study. Patients aged <13 years were excluded from the study. Patients were selected who were using one or more than one metered dose inhaler given from the first time diagnosis that might be in DMCH Medicine outdoors or outside. After that, each patient was instructed to show how they were using metered dose inhalers (Inhaler were given by the investigator). Data regarding the performance of the correct steps of MDI inhalers was recorded. Data was processed manually and analyzed with the help of SPSS version 22. The mean and standard deviation were used to express quantitative data, while frequency and percentage were used to express qualitative data.

## RESULT

The result showed that the minimum age of the respondants was 54 years old and the maximum age was 79. The mean age was 63.74 years with a standard deviation of 6.08. Among the patients, 88 (73.3%) were male and 32 (26.7%) were female. The male to female ratio was 2.75:1. The majority of patients (57.5%) completed secondary school. Less than 5 years of COPD was found in 74.2% of patients, while more than 5 years was found in 25.8% of patients (Table-I).

***Table-I:*** *Baseline characters of the participants (n=120).*

| Trait | Frequency | Percentage |
|---|---|---|
| **Age (In Years)** | | |
| 50-60 | 49 | 40.8 |
| 61-70 | 50 | 41.7 |
| 71-80 | 21 | 17.5 |
| Sex | | |
| Male | 88 | 73.3 |
| Female | 32 | 26.7 |
| **Level of education** | | |
| None | 4 | 3.3 |
| Primary | 40 | 33.3 |
| Secondary | 69 | 57.5 |
| Tertiary | 7 | 5.9 |
| **Duration of COPD** | | |
| less than 5 years | 89 | 74.2 |
| More than 5 years | 31 | 25.8 |

All patients could perform step 1 correctly (100%). Correct performance was observed mostly in step 2 (89%), step 3 (87.5%) and step 8 (97.5%). Most of the patients made errors in step 5 (75.8%) and step 6 (56.7%) (Table-II).

***Table-II:*** *Distribution of the patients by performance MDI steps (n=120).*

| MDI steps | | Frequency | Percentage | p value/Z test |
|---|---|---|---|---|
| 1 | Correct | 120 | 100.0 | |
| | Incorrect | 0 | 0 | |
| 2 | Correct | 89 | 74.2 | Z = 5.23 |
| | Incorrect | 31 | 25.8 | P < 0.001 |
| 3 | Correct | 105 | 87.5 | Z =7.96 |
| | Incorrect | 15 | 12.5 | P < 0.001 |
| 4 | Correct | 66 | 55.0 | Z =1.08 |
| | Incorrect | 54 | 45.0 | P = 0.277 |
| 5 | Correct | 29 | 24.2 | Z =5.567 |
| | Incorrect | 91 | 75.8 | P < 0.001 |
| 6 | Correct | 52 | 43.3 | Z =1.45 |
| | Incorrect | 68 | 56.7 | P = 0.145 |
| 7 | Correct | 77 | 64.2 | Z =3.308 |
| | Incorrect | 43 | 35.8 | P =0.002 |
| 8 | Correct | 117 | 97.5 | Z =8.532 |
| | Incorrect | 3 | 2.5 | P < 0.001 |

Out of 120 patients, only 10 (8.3%) patients performed all eight steps correctly, whereas 13 (10.8%) patients performed seven steps correctly, 33 (27.5%) patients performed 6 steps correctly, 39 (32.5%) patients performed five steps correctly, 13 (10.8%) patients performed four steps correctly, 8 (6.7%) patients performed three steps correctly, 3 (2.5%) patients performed two steps correctly and only one step was correctly performed by 1 (0.8%) patient (Table-III).

***Table-III:*** *Distribution of the patients by completion of the MDI steps correctly as a whole (n=120).*

| Total completed steps(correctly) | Number of patients performing | Percentage among total patients |
|---|---|---|
| 1 | 1 | 0.8 |
| 2 | 3 | 2.5 |
| 3 | 8 | 6.8 |
| 4 | 13 | 10.8 |
| 5 | 39 | 32.5 |
| 6 | 33 | 27.5 |
| 7 | 13 | 10.8 |
| 8 | 10 | 8.3 |

The association between age groups and MDI steps showed poor performance in the age group of 71 to 80 years. Patients of this elderly age group showed incorrect performance mostly in steps 5 and 6 (Table-IV).

***Table-IV:*** *Association between age group and MDI steps completion (n=120).*

| MDI steps | | Age Group | | | Total | p value |
|---|---|---|---|---|---|---|
| | | 50-60 Years | 61-70 Years | 71-80 Years | | |
| 1 | Correct | 49 (40.8%) | 50 (41.7%) | 21 (17.5%) | 120 (100%) | - |
| | Incorrect | 0 | 0 | 0 | 0 | |
| 2 | Correct | 12 (10%) | 40 (33.3%) | 37 (30.8%) | 89 (74.2%) | 0.128 |
| | Incorrect | 9 (7.5%) | 10 (8.3%) | 12 (12.0%) | 31 (25.8%) | |
| 3 | Correct | 44 (36.7%) | 46 (38.3%) | 15 (12.5%) | 105 (87.5%) | 0.044 |
| | Incorrect | 5 (4.2%) | 4 (3.3%) | 6 (5%) | 15 (12.5%) | |
| 4 | Correct | 32 (26.7%) | 8 (6.7%) | 26 (21.7%) | 66 (55%) | 0.095 |
| | Incorrect | 17 (14.2%) | 13 (10.8%) | 24 (20.0%) | 54 (45%) | |
| 5 | Correct | 20 (16.7%) | 2 (1.7%) | 7 (5.8%) | 29 (24.2%) | 0.002 |
| | Incorrect | 29 (24.2%) | 19 (15.8%) | 43 (35.8%) | 91 (75.8%) | |
| 6 | Correct | 49 (94.2%) | 0 (0%) | 3 (2.5%) | 52 (43.3%) | 0.001 |
| | Incorrect | 0 | 21 (17.5%) | 47 (39.2%) | 68 (56.7%) | |
| 7 | Correct | 30 (25%) | 35 (29.2%) | 12(10%) | 77 (64.2%) | 0.503 |
| | Incorrect | 19 (15.8%) | 15 (12.5%) | 9(7.5%) | 43 (35.8%) | |
| 8 | Correct | 21 (17.5%) | 49 (40.8%) | 47 (39.2%) | 117 (97.5%) | 0.579 |
| | Incorrect | 0 | 1 (0.8%) | 2 (1.7%) | 3 (2.5%) | |

## DISCUSSION

Inhalation medication is the cornerstone of therapy for patients with COPD. Noncompliance with pharmacotherapy is a common reason for therapeutic failure[9]. Inadequate inhalation instruction and poor inhalation technique moderate the effectiveness of the medication and are a major cause of poor disease control. Poor drug delivery and increased inhaler use are also caused by ineffective inhaler technique[10,11]. In this current study, total of 120 COPD patients of medicine OPD, DMCH were selected as study participants. The minimum age is 54 years old and the maximum age is 79. The mean age was 63.74 years with a standard deviation of 6.08. Among the patients, 88 were male and 32 were female. The male to female ratio was 2.75:1.

Our study showed that 10 out of 120 patients (8.3%) could perform all steps correctly. A similar type of study was conducted in a government hospital in Rawalpindi, Pakistan by Baqai HZ et al. which showed that 24% of patients could perform all steps correctly[12]. In another study in Korea including 196 COPD patients, it was observed that the proportion of patients with correct inhaler use was 46.2% with MDI[13]. In another study, Press et al. in 2 urban hospitals of Chicago, showed that misuse was common (86% MDI) among COPD patients[14].

The association between age and MDI usage steps in the present study revealed poor performance in maximum elderly patients in the age range of 61 to 80 and difficulty in performing deep breaths in and breath holds (Doing correctly 43% and 47%). In the Rawalpindi study, out of all the steps followed, the weakest step was breath holding, with only 27.88% of the patients performing it correctly, and the best step was preparation of the inhaler, with 87.5% of the patients performing it correctly. The study also showed highly significant negative correlation between age and performing MDI usage steps[12]. A similar type of finding is observed by others, where evidence shows that incorrect inhaler technique is particularly common among older patients with COPD[7]. Common errors include inadequate coordination of actuation and inspiration and an inability to achieve a high inspiration flow rate[15]. This study was done in one centre (Medicine OPD of DMCH), so it was not representative of the entire population of Bangladesh. The sample size was small. Data was collected purposively, so there might be a chance of selection bias.

## CONCLUSION

The knowledge and practice level of COPD patients about the correct use of Metered Dose Inhalers is far below the desired level. The weakest step was breath holding. Older patients (Age range 61-80) had more difficulty executing the MDI technique compared to other (Age range 50-60) patients.

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