

## Original Article

# Assessment of the Level of Knowledge and Skills Pertaining to Self-management among Adult Patients of Bronchial Asthma and COPD

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**Background** : A large proportion of patients prescribed inhaled medications do not use their inhalers correctly. Hence in this backdrop, our study was done to assess the level of knowledge about the condition as well as skills for using inhaler devices.

**Materials and Methods** : It was a cross-sectional study with consecutive 80 eligible patients diagnosed either with asthma or COPD, were recruited after taking informed consent and their skill and inhaler use technique was captured in data collection form. Knowledge about the disease the patient was suffering was assessed using pre-structured questionnaire and expressed as percentage of patients of asthma or COPD, answering the questions positive or negative. Skills pertaining to self-management were checked using structured checklist (taking reference from previous studies and guidelines and modified) and asking the patient to demonstrate the technique of using inhalational medication. The total score obtained by summing up scores for different steps were named as Device Appropriateness Index (DAI).

**Results** : Certain steps in proper device technique were commonly omitted. Among MDI users, the steps least often optimally completed were exhalation to residual volume prior to putting the inhaler in the mouth (46.16%), shaking the device before use (41.03%) and holding the breath for 5-10s after removal of the inhaler (33.33%). Among DPI users, the steps least often completed were exhalation to residual volume prior to putting the inhaler in the mouth (44.44%), to inhale forcefully and deeply from the inhaler (37.04%) and holding the breath for 5-10s after removal of the inhaler (29.63%).

**Conclusion** : The inappropriate use of inhalers and knowledge about their own conditions can lead to suboptimal adherence, poor clinical control, dissatisfaction and consequently high economic burden in patients suffering from asthma and COPD. The misuse of inhalers has been an important roadblock to both patients and clinicians for years.

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**Key words** : Self-management, Knowledge, Skills, Bronchial Asthma, COPD.

**B**ronchial Asthma and COPD are common multi-component diseases that impose an enormous burden on the patient, medical professionals as well as society at large in terms of morbidity, mortality, healthcare resource utilization and cost. Chronic

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### Editor's Comment :

- There are often inappropriate skills in usage of various inhaler devices as well as suboptimal patient knowledge about the conditions- asthma or COPD, which should be checked by Clinicians in each visit.
- This may need educational intervention to patients, which may improve adherence to medication and optimal treatment outcome for these chronic conditions.

diseases are the main cause of death and disability worldwide and as the population ages, prevalence of chronic conditions will increase<sup>1</sup>. Asthma affects people of all ages whereas COPD mainly affects older people. These are chronic diseases and therefore treatment is likely to continue over many years. A World Health Organization (WHO) report suggests that 50% of patients from developed countries with chronic disease do not use their medications as recommended<sup>2</sup>. While a variety of effective treatment options exist for patients with asthma and COPD, long-term adherence to medications tends to be sub-optimal, with the reported rates of non-adherence

ranging from 30% to 70%<sup>3</sup>. This has adverse effects on disease control and treatment costs. The reasons behind non-adherence revolve around patient knowledge or education, inhaler device convenience and satisfaction, age, adverse effects and medication costs. Although patients may adhere to the dosing schedule, they may use the inhaler improperly. Patient technique is a process that encompasses an individual's previous experiences, education, abilities and the teaching received on the specific device. These factors may interact to various degrees with the different types of inhaler devices to influence eventual technique and adherence. 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 (MDIs)<sup>4,5</sup> or Dry-powder Inhalers (DPIs)<sup>6</sup>. Hence in this backdrop, our study was done to assess the level of knowledge about the condition as well as skills for using inhaler devices.

#### MATERIALS AND METHODS

##### Study Setting and Population :

The study was conducted at Medication Reconciliation Clinic (MRC) under Department of Clinical and Experimental Pharmacology at School of Tropical Medicine, Kolkata. The subjects were drawn from among the adult patients diagnosed with asthma and COPD who were referred to the MRC from two neighbouring public hospital OPDs, (1) Medical College, Kolkata, (2) Kolkata Municipal Corporation OPD Dispensary under Borough V at Baithakkhana. Screen-eligible adult patients (18-65 years) of both sexes, willing to participate in the study, were considered for enrolment. Pre-set inclusion-exclusion criteria were used to screen the study participants.

##### Inclusion Criteria :

- Adult patients (18-65 years) diagnosed as suffering from asthma or COPD
- Patients of either gender
- Ambulatory patients, on treatment for at least 6 months
- Patients on inhalational medication
- Willingness to participate

##### Exclusion Criteria :

- Pregnant and lactating females
- Suffering from any serious disease such as unstable coronary heart disease, heart failure, advanced kidney or liver failure
- Age group <18 years or >65 years
- Audio visually impaired patients

##### Study Design :

It was a cross-sectional study with consecutive 80 eligible patients diagnosed either with asthma or COPD, according to inclusion-exclusion criteria, were recruited after taking informed consent and their skill and inhaler use technique were captured in data collection form. Knowledge about the disease the patient was suffering was assessed using pre-structured questionnaire and expressed as percentage of patients of asthma or COPD, answering the questions positive or negative.

Skills pertaining to self-management were checked using structured checklist (taking reference from previous studies and guidelines<sup>7,8</sup> and modified) and asking the patient to demonstrate the technique of using inhalational medication. Each step was given 1 score for patient performing the step correctly and 0 score for incorrect technique. General pre-requisites were common for all patients and other steps were specific for patients using that specific inhaler device. The total score obtained by summing up scores for different steps were named as Device Appropriateness Index (DAI). Thus, maximum score for the index was 14 for each patient [6 (General Prerequisites) + 8 (Specific steps as per inhaler device)] and minimum score is 0. Thus, the following is calculated: Device appropriateness Index scores of the patients.

#### RESULTS

Out of 80 patients, 55 were asthma patients and 25 were of COPD. It was seen that, in the Intervention group, there were 28 asthma patients and 11 COPD patients while in Non-intervention group, there were 27 asthma patients and 14 COPD patients (Table 1). Most of the patients with asthma or COPD were male and means age of asthma patients ( $42.86 \pm 14.3$  years) was lower than that of COPD ( $51.12 \pm 8.6$  years).

Among patients with asthma or COPD, 49 patients used Metered Dose Inhaler (MDI), 24 Dry Powder Inhaler (DPI) and rest 17 Metered Dose Inhaler with Spacer (MDI+S) according to their physicians' advice. Socio-economic status of the patients was calculated using Modified Kuppaswamy's socio-economic status scale, from their education, occupation and income. According to the type of inhaler use, majority of patients (49%) used pressurised Metered Dose Inhaler (MDI) than Dry Powder Inhaler (DPI) (30%) and Metered Dose Inhaler with Spacer (MDI+S) (21%) (Fig 1).

As expected, the patients under study predominantly (73%) belonged to upper lower Socio-economic status according to modified Kuppaswamy's Socio-economic status scale (Fig 2). Patients'

**Table 1 — Descriptive statistics for numerical demographic parameters in the study population**

Characteristics	Asthma (n=55)	COPD (n=25)
Male, % Total	52.73	72
Age, Mean ± SD	42.86±14.3	51.12±8.6
Smokers (past or current), % Total	47.27	64
ER visit / Hospital Admission in past 1 year for the disease, % Total	11.3	16.3
Presence of co-morbid conditions, % Total	15	22.5
Duration of disease (years) Mean±SD	5.55±5.46	11.19±7.81
Treatment duration (years) Mean±SD	3.75±3.5	7.7±4.64
Positive family history of disease, % Total	60	36

**Table 2 — Knowledge about the disease the patient was suffering**

Knowledge about	% of patients with optimum awareness	
	Asthma (n=55)	COPD (n=25)
Name of disease patient was suffering	92.7	80
Idea about causation of the disease	70.9	52
Idea about symptoms of the disease	89	92
Severity assessment	76.4	76
Inhalation technique or the way using inhaled medication is important for optimum benefit	63.6	60
How to use inhaled medication prescribed	90.9	88
Idea about detrimental effect of smoking	85.5	80

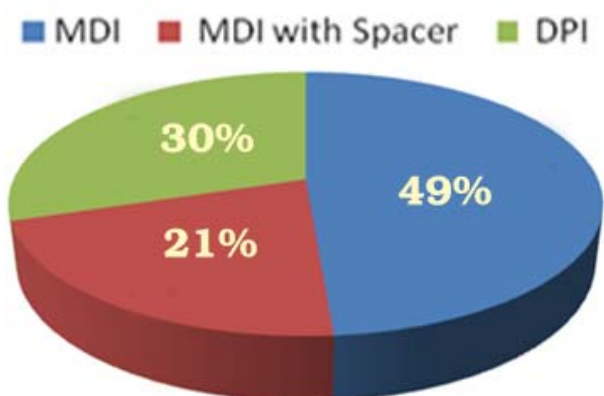


Fig 1 — Pie chart showing usage of different inhalation devices by the patients

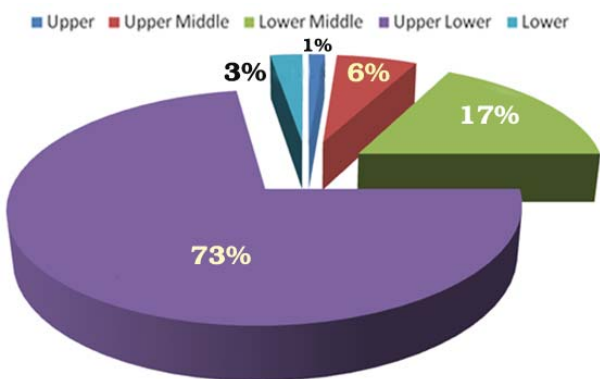


Fig 2 — Pie chart showing the distribution of patients in different Socio-economic strata according to the Modified Kuppuswamy's Socio-economic status scale

knowledge about the disease they were suffering (asthma or COPD) was assessed using structured questionnaire, which is depicted in the following tables (Tables 2 & 3).

**Assessment of Skills for Using Inhaler :**

Certain steps in proper device technique were commonly omitted. Among MDI users, the steps least often optimally completed were exhalation to residual volume prior to putting the inhaler in the mouth (46.16%), shaking the device before use (41.03%) and

**Table 3 — Counselling gap about use of inhalers**

Question items	% of patients in whom the given item was complied	
	Asthma (n=55)	COPD (n=25)
Care giver demonstrated during prescribing encounter how to use the inhaled medication	87.3	88
Care giver observed the patient using inhaled medication	78.2	76
Care giver re-evaluated the inhaled medication (and device) usage technique by the patient at every medical visit	40	44

holding the breath for 5-10s after removal of the inhaler (33.33%). Among DPI users, the steps least often completed were exhalation to residual volume prior to putting the inhaler in the mouth (44.44%), to inhale forcefully and deeply from the inhaler (37.04%) and holding the breath for 5-10s after removal of the inhaler (29.63%). Among MDI with Spacer users, the skills were suboptimal in steps like shaking the inhaler before use (44.45%), to breath out gently before pressing inhaler (42.86%) and in case of general pre-requisites for inhaler use, cleanliness of the device were not satisfactory in 40% patients, about 33% forgot to wipe saliva off mouthpiece and 31% to rinse out mouth after their inhaler use (Figs 3-6).

Mean of Device Appropriateness Index: 10.9 (Optimal score: 14)

**DISCUSSION**

The most decisive factor with regards to the efficiency of management is that the patient should use the inhaler in appropriate manner with optimal knowledge about the condition, he or she is suffering, so as to optimize the therapeutic response. Poor inhaler technique is associated with a reduced asthma control, deteriorating COPD outcomes and wastage of economic resources<sup>9</sup>. The use of inhaler devices can be challenging and this may involve critical errors

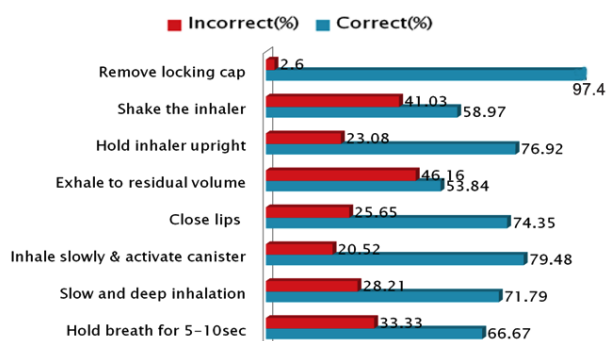


Fig 3 — Appropriateness in steps of MDI use

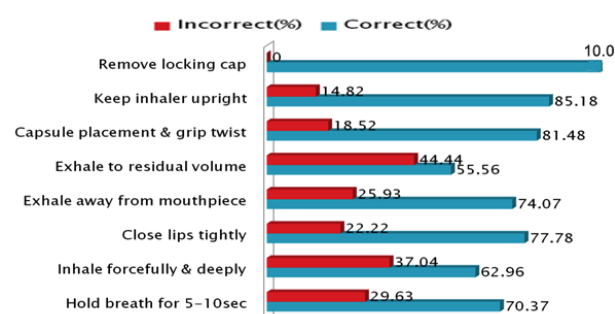


Fig 4 — Appropriateness in steps of DPI use

in handling, thus, reducing significantly the targeted delivery of drugs into the lungs, consequently increasing the risk of potential adverse effects<sup>10</sup>.

Most of the patients with asthma or COPD were male and means age of asthma patients (42.86± 14.3 years) was lower than that of COPD (51.12 ± 8.6 years). As expected, the patients under study predominantly (73%) belonged to upper lower Socio-economic status according to modified Kuppuswamy’s Socio-economic status scale. This was no surprise as the study setting was Government Hospital. Regarding the occupation, most of the study participants were either running small business or manual worker, thus reflecting their poor economic status.

According to the type of inhaler use, majority of patients (49%) used pressurised Metered Dose Inhaler (MDI) than Dry Powder Inhaler (DPI) (30%) and Metered Dose Inhaler with Spacer (MDI+S) (21%).

None of the subjects were provided with any educational material about the disease process in their routine care settings. Knowledge regarding the disease they were suffering was less evident in patients suffering from COPD than asthma. Majority (about 88%) of patients reported that they had been given demonstration of inhalation technique for use of their medication by physician or another health care professional at the time of prescribing but only about

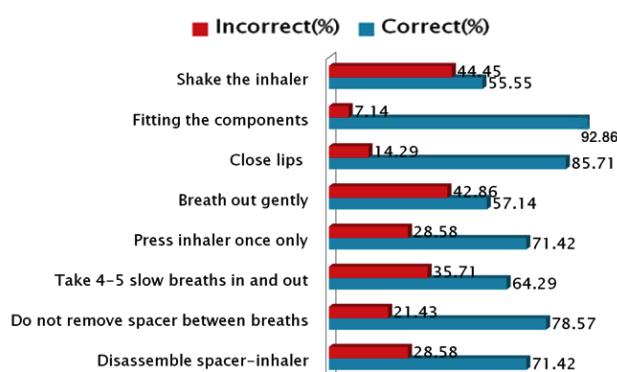


Fig 5 — Appropriateness in steps of MDI with Spacer use

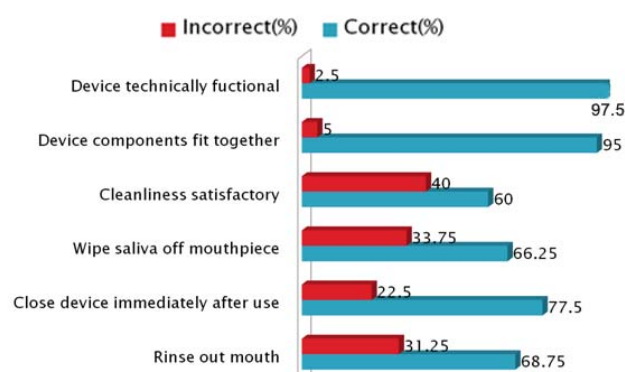


Fig 6 — Appropriateness in general pre-requisites of inhaler use

76-78% patients were actually observed to take inhalational medication ever in front of prescribing physicians. Findings were worse (only 40-44%) for both asthma and COPD patients regarding re-evaluation of their inhalation technique at every medical visit.

Certain steps in proper device technique were commonly omitted. Among MDI users, the steps least often optimally completed were exhalation to residual volume prior to putting the inhaler in the mouth (46.16%), shaking the device before use (41.03%) and holding the breath for 5-10s after removal of the inhaler (33.33%). Among DPI users, the steps least often completed were exhalation to residual volume prior to putting the inhaler in the mouth (44.44%), to inhale forcefully and deeply from the inhaler (37.04%) and holding the breath for 5–10 s after removal of the inhaler (29.63%). Among MDI with Spacer users, the skills were suboptimal in steps like shaking the inhaler before use (44.45%), to breath out gently before pressing inhaler (42.86%) and in case of general pre-requisites for inhaler use, cleanliness of the device were not satisfactory in 40% patients, about 33% forgot to wipe saliva off mouthpiece and 31% to rinse out mouth after their inhaler use.

Our study supported various studies documenting problems patients have using aerosol devices and thus, common patient errors, particularly with MDIs<sup>11-14</sup>. Despite advancements in technology, which have permitted the introduction of more user-friendly devices, our study has shown that inhaler mishandling remains a serious issue for currently available inhalers. Unfortunately, in real life, as our study has confirmed, many patients did not receive any inhaler education. We found that the rate of critical errors for DPIs was not lower than that of MDIs. This result has to be evaluated cautiously, as our survey was not designed to compare different devices and our choice of critical errors was not balanced between inhalers.

In a study done at Brazil<sup>15</sup>, it was shown that although the majority of the patients claimed to know how to use inhalation devices, the fact that 94.2% committed at least one error shows that their technique was inappropriate and reveals a discrepancy between understanding and practice. In our study, about 89% asthma and 92% COPD patients demonstrated suboptimal skill in at least one step of their inhaler use. About 40% patients were not aware of the fact that inhaler technique was important for optimum benefit. In a recent study investigating 300 patients, 70.2% used their inhaler drugs incorrectly and the rate of misuse among MDI users was significantly higher than those using DPIs (77.6% versus 64%;  $p=0.002$ )<sup>16</sup>.

When these steps were scored and Device Appropriateness Index (DAI) was calculated, our study showed significant gap between mean score and optimal score, whereas optimal score for each patient is must for appropriate use of inhalers. In a study by Vitacca, *et al*<sup>17</sup>, in outpatient settings, mistakes using inhaler devices has been found in a range of 6 to 71%, with 40% of patients presenting at least one vital mistake and patients' mean level of knowledge and skills were 73% and 58%, respectively with significant difference in level of skills ( $p=0.046$ ) among device families, DPIs resulting worst and MDIs best. In another study by Ahn JH, *et al*<sup>18</sup>, 43.2% of COPD patients (133/308) showed at least one critical while handling inhaler device. In the study by Pothirat C, *et al*<sup>19</sup> 74.8% of 103 COPD patients, who were investigated, performed at least one step incorrectly, where low education level was the single most important factor related to incorrect technique. All these studies corroborate our findings.

As asthma and COPD are chronic conditions, the therapeutic adherence of inhaler and their routine use with the correct techniques are the cornerstones in

the optimal management, which is lacking in many patients, as evidenced in our study. Correct inhaler technique maintenance is related to patient's psychosocial factors, like motivation and personality traits intrinsically linked to overall medication taking and there is substantial evidence that inhaler technique and health behaviours such as poor adherence co-exist<sup>20</sup>. It is imperative to understand and quantify device-use errors so that patient interventions can be effectively introduced and new devices designed to avoid common errors in usage of inhalers and to complete appropriate delivery of inhaled medication. Further, it is important to recognize these particular factors and errors which are complex, but yet evidence suggests that these challenges can be addressed<sup>21</sup>.

### CONCLUSION

The inappropriate use of inhalers and knowledge about their own conditions can lead to suboptimal adherence, poor clinical control, dissatisfaction and consequently high economic burden in patients suffering from asthma and COPD. The misuse of inhalers has been an important roadblock to both patients and clinicians for years. Therefore, we investigated the inhaler misuse and it was clear that there were many areas where the inhaler usage technique as well as patients' knowledge and perception about the disease or its management strategies, that needed more proactive intervention and co-ordination. Strong educational initiatives involving regular inhaler-specific training of patients and caregivers in the correct inhaler preparation and use enable patients to respond optimally to the prescribed therapeutic regimens and this is an essential component in the process towards achieving reliable and repeatable medication delivery. Improving efforts by the physicians to increase health literacy about the illness and the management options and algorithms along with the inclusion of counselling and monitoring reinforcement may be beneficial in improving adherence to therapy in patients with asthma and COPD who find every day a challenge to adhere to their therapeutic regimen.

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**Conflict of Interest :** The authors have no conflict of interest to declare.

**Ethical Approval :** This study was approved by the Clinical Research Ethics Committee of Calcutta School of Tropical Medicine-CREC-STM Ref: 15/2013 dated 09.02.2013.

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