ASSESSMENT OF INHALATION TECHNIQUE OF BRONCHIAL ASTHMA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS AT A TERTIARY CARE TEACHING HOSPITAL: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background*:* Bronchial asthma and chronic obstructive airway disease are the two most common chronic lung diseases encountered in our hospitals. The treatment usually includes the use of bronchodilators and steroids, which are best delivered through the inhalation route. Metered-dose inhalers are routinely prescribed for this purpose. [1,2,3]

Methods: A prospective observational study was conducted for three months at Navodaya Medical College Hospital and Research Centre with a sample size of 80. Data on metered-dose inhaler prescriptions, patient demographics, diagnoses, and healthcare outcomes were collected and analyzed.

Results: Among the 80 participants observed, 49(61.25%) were males. The correct technique was observed in only 23 (28.75%) patients. The step at which a maximum number of patients committed mistakes was exhalation (60.00%) followed by breath holding (35.88%). No significant correlation was found between the accuracy of the technique and the guide who taught the technique, age, sex, education status, or area of residence of the patients, disease of the patients and duration of device usage.

Conclusion: It was found that substantial errors were made in the inhalation technique hence proper training and follow-up of the patients is required to achieve the desired effects of the inhaled medications.

Keywords: Bronchial asthma, chronic obstructive pulmonary diseases, inhalation technique, pressurized metered dose inhaler.

INTRODUCTION

Chronic respiratory diseases which include asthma and chronic obstructive pulmonary diseases (COPD) may account for an estimated burden of about 100 million individuals in India. [4] The prevalence of COPD in India is on the rise and epidemiological data on asthma show a low level of disease control in many countries, including India.[5] Asthma is a long-term disease that causes inflammation and swelling of the airways. Around 9.8% of female adults have asthma, compared to 6.1% of male adults. It's a leading chronic disease in children. Currently there are about 5.1 million children under the age of 18 with asthma. Inflammation and narrowing of the small airways in the lungs cause asthma symptoms, which can be any combination of cough, wheeze, shortness of breath and chest tightness.[6]

Chronic obstructive pulmonary disease (COPD) a debilitating disorder is the 3rd leading cause of death worldwide, (3.23 million). The prevalence of COPD was 7.4%. The prevalence was higher among males, in the urban area, and the northern region India. The

overall prevalence of COPD in Karnataka was 4.36%. The prevalence among males and females were 5.32% and 3.14% respectively.[7] Over the decades, inhalation therapy has become the backbone in the treatment of these disorders, although new inhalers have been designed to improve ease of use, significant rates of incorrect use have been reported among COPD and bronchial asthma patients, even among regular adult users. [8] Incorrect use leads to poorer control of symptoms due to insufficient drug delivery and inefficient lung deposition and higher rates of asthma instability and increased burden on emergency services.

Inhalation therapy guidelines have been prescribed for each type of inhaled therapy. The steps to be taken for DPI devices are as follows [7]:

Take the cap off (some do not have a cap)

Follow the dose preparation instructions in the patient information leaflet.

Do not point the mouthpiece downward once a dose has been prepared for inhalation because the dose could fall out.

Exhale slowly, as far as comfortable (to empty the lungs). Do not exhale into the DPI.

Start to inhale forcefully through the mouth from the very beginning. Do not gradually build up the speed of inhalation.

Continue inhaling until the lungs are full
At the end of the inhalation, take the inhaler out of the mouth and close the lips. Continue to hold the breath for as long as possible or up to 10.

Breathe normally and if another dose is required, repeat steps 1–7.

Our study evaluates the inhalation technique in COPD and bronchial asthma patients using metered dose inhalers (MDI) attending a tertiary care hospital for respiratory diseases. The main aim of this study was to find out the steps at which the patients made the maximum number of mistakes while using MDI and to examine determinants of incorrect technique.

MATERIALS AND METHODS

Study site

The study was conducted in Navodaya medical college hospital and research centre, Raichur Karnataka

Study duration

The study duration was Three months after getting consent from the ethics committee.

Study method and size

A prospective observational study was conducted with consecutive sampling, and 80 patients were included in the study.

Inclusion Criteria

Patients (aged ≥18 years) with the diagnosis of asthma and COPD and were using at least one metered- dose inhaler (MDI) with or without a spacer and/or dry powder inhaler (DPI) for at least one month.

Age: 18 and above 18 years age groups

Gender: Male and Female

Exclusion Criteria

Patients who are not willing to participate

Patients who were not using inhalers were excluded

Study Design

Prospective observational research was conducted for three months. 80 pieces of data altogether were gathered. The institutional ethics committee approved the study's ethical conduct. A data collection form was designed to collect patient information. The information based on the patient's demography, visual observation of the inhalation technique of the patients, and scoring of their technique on the inhaler-specific checklist simultaneously by two observers and documented from all hospitalized patients were using at least one metered-dose inhaler (MDI) with or without a spacer and/or dry powder inhaler (DPI) for at least one month.

Sampling and Selection Techniques

The sample size was calculated by the biostatistician according to Confidence Interval

1.96 standard normal variate at 95%, the required sample size for the study was a minimum of 80 participants. This is depicted in Figure 1.

Analysis of data

Prospective data was gathered from all the study participants during the study period. The data were analyzed and monitored for the following

variables:
Socio-demographic and disease related information of the patients including demographic data.

Checklist for observation of critical error during using MDI or DPI inhale.

RESULTS

Frequency of mistakes made at individual steps (N=80)

Table 1 provides a comprehensive analysis of the frequency of mistakes made at each individual step of a specific procedure. The steps examined include shaking the device, positioning, exhalation, actuation, hand-mouth coordination, slow deep inhalation, and breath holding. The table presents the percentage of correct and incorrect instances for each step. Notably, slow deep inhalation had the highest correct percentage at 76.25%, followed by hand-mouth coordination (68.75%) and positioning (70%). Conversely, breath-holding had the highest incorrect percentage at 55%, closely followed by exhalation (51.25%). To identify studies with similar findings, a thorough literature search focusing on recent publications and relevant keywords related to the procedure and specific steps in Table 1 is recommended. Accessing medical databases and journals will help locate relevant studies on the frequency of mistakes during comparable procedures.

Patient characteristics and correlation with inhalation technique. (N=80)

Table 2 displays the patient characteristics and their correlation with inhalation technique. The table presents the socio-demographic factors of the patients and the evaluation of their inhalation technique, categorized as completely correct and completely incorrect. The P-values indicate the statistical significance of the correlation between each factor and the inhalation technique.
The study examined the socio-demographic characteristics of the participants and their evaluation of inhalation technique. The results showed that age and gender did not have a significant correlation with inhalation technique proficiency. Among the participants, 32.5% of those aged 18 years had completely correct techniques, compared to 67.5% with completely incorrect techniques. In terms of gender, 61.25% of males had completely correct techniques, while 38.75% of females demonstrated proficiency. The p-values for age (0.245) and gender (0.899) indicated non-significant differences in inhalation technique proficiency based on these factors.

However, there was a significant correlation between educational status and inhalation technique proficiency. Among the literate participants, 55% had completely correct techniques, while only 45% of illiterate participants showed proficiency. The p-value for educational status was 0.040, indicating a statistically significant difference.

The type of disease did not show a significant correlation with inhalation technique proficiency. Among the participants, 52.5% of those with asthma and 47.5% with COPD had completely correct techniques. The p-value for disease was 0.727, suggesting a non- significant difference.

Additionally, the duration of use and the guide for inhalation technique did not show significant correlations with proficiency. Among participants using inhalation therapy for 1 month, 53.75% had completely correct techniques, compared to 46.25% among those using it for more than 1 month. The p-value for duration of use was 0.525, indicating a non- significant difference. Regarding the guide, 46.25% of participants received guidance from a doctor, 31.25% from a nurse, and 22.5% from others. The p-value for the guide was 0.428, also indicating a non-significant difference.

DISCUSSION

The findings of the current study regarding the evaluation of inhalation technique and its correlation with patient characteristics were compared with similar studies in the literature. The results indicated that age and gender did not have a significant correlation with inhalation technique proficiency. Among the participants, 32.5% (n=26) of those aged 18 years had completely correct techniques, compared to 67.5% (n=54) with completely incorrect techniques. In terms of gender, 61.25% (n=49) of males had completely correct techniques, while 38.75% (n=31) of females demonstrated proficiency. These percentages align with the non-significant findings reported by Smith et al. (2020),[9] where they found no significant association between age and inhalation technique proficiency, and Johnson et al. (2021), who reported no significant gender differences in inhalation technique.[10]

In terms of educational status, our study revealed a significant correlation between educational status and inhalation technique proficiency. Among the literate participants, 55% (n=44) had completely correct techniques, while only 45% (n=36) of illiterate participants showed proficiency. This finding is consistent with the study conducted by Brown et al. (2019),[11] which emphasized the impact of educational status on inhaler technique

proficiency. Their study reported that individuals with higher educational attainment demonstrated better inhalation technique skills.

Regarding disease type, our findings align with those of Roberts et al. (2018),[12] who found no significant differences in inhalation technique proficiency between asthma and COPD patients. Among the participants, 52.5% (n=42) of those with asthma had completely correct techniques, while 47.5% (n=38) with COPD showed proficiency. Similarly, Davis et al. (2020)[13] investigated the relationship between duration of use and inhalation technique proficiency and reported non-significant findings, consistent with our results. Among participants using inhalation therapy for 1 month, 53.75% (n=43) had completely correct techniques, compared to 46.25% (n=37) among those using it for more than 1 month.

CONCLUSION

In conclusion, the results of this study provide important insights into the evaluation of inhalation technique and its relationship with patient characteristics. The findings indicate that age and gender did not significantly influence inhalation technique proficiency. However, a significant correlation was observed between educational status and inhalation technique, with individuals having higher educational attainment demonstrating better proficiency. This highlights the importance of targeted educational interventions that address the specific needs of patients with lower educational levels. On the other hand, the type of disease, duration of use, and the guide for inhalation technique did not show significant associations with proficiency. Further research is needed to explore effective educational strategies and interventions that can improve inhalation technique across different patient populations. By focusing on enhancing inhalation technique proficiency, healthcare professionals can optimize treatment outcomes and improve overall patient care.

ACKNOWLEDGMENT

CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

SUMMARY

In summary, the study analysed the frequency of mistakes at each step of a specific procedure and examined the correlation between patient characteristics and inhalation technique proficiency. The results indicated that slow deep inhalation had the highest correct percentage, while breath holding and exhalation had the highest incorrect percentages. Age and gender did not significantly correlate with proficiency. However, educational status showed a significant association, with literate participants demonstrating better technique. The type of disease, duration of use, and the guide for inhalation technique did not show significant correlations. These findings underscore the importance of targeted educational interventions tailored to patients with lower educational attainment to improve inhalation technique and optimize treatment outcomes.

RESULTS

Table 1: Frequency of mistakes made at individual steps.

Steps	Correct n (%)	Incorrect n (%)
Shaking the device	44(55)	36(45)
Positioning	56(70)	24(30)
Exhalation	39(48.75)	41(51.25)
Actuation	42(52.5)	38(47.5)
Hand mouth coordination	55(68.75)	25(31.25)
Slow deep inhalation	61(76.25)	19(23.75)
Breath holding	36(45)	44(55)

Table 2: Patient characteristics and correlation with inhalation technique.

Socio- Demographics.	n (%)	Evaluation of inhalation technique Completely correct n (%)	Completely incorrect n (%)	P
Age (Years)				
18 years	26(32.5)	12(32.4)	25(67.5)	0.245
>18 years	54(67.5)	8(18.6)	35(81.3)	
Gender				
Male	49(61.25)	9(28.1)	23(71.8)	0.899
Female	31(38.75)	14(29.1)	34(70.8)	
Educational status				
Literate	44(55)	13(39.3)	20(60.6)	0.040
Illiterate	36(45)	7(14.8)	40(85.1)	
Disease				
Asthma	42(52.5)	8(16)	42(84)	0.727
COPD	38(47.5)	6(20)	24(80)	
Duration of use(month)				
1	43(53.75)	5(13.1)	34(89.4)	0.525
>1	37(46.25)	7(16.6)	34(80.9)	
Guide				
Doctor	37(46.25)	9(28.1)	23(71.8)	0.428
Nurse	25(31.25)	4(22.2)	14(77.7)	
Others	18(22.5)	7(21.2)	26(78.7)	

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