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IMPACT OF AN EDUCATIONAL INTERVENTION ON ASTHMA KNOWLEDGE AND METERED-DOSE INHALER TECHNIQUE AMONG NURSING STUDENTS OF GOVERNMENT COLLEGE OF NURSING, BENGALURU

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ABSTRACT: Nurses being one of the important members of the healthcare team, play a significant role in providing care and education. Current effective treatments for asthma are in the form of metered-dose inhalers. An effective control is achieved only when the patient is comfortable to use the metered-dose inhaler device correctly. This study was therefore planned to evaluate their knowledge and to assess the effect of a training programme in a tertiary healthcare facility. The aim of the study is to evaluate the effect of education intervention on nurses' knowledge of asthma and metered-dose inhaler technique. This was a pre and post intervention study which involved 45 second year B.Sc nursing students of BMCRI, Bangalore. Pre test consisted of self administered questionnaire about asthma knowledge and demonstration of inhaler technique using pMDI (pressurized metered-dose inhaler). After this, education intervention was given which was followed by a post test. The total mean percentage score of asthma knowledge increased significantly from 63% to 85.5% after education intervention. pMDI demonstration was very poor at 20% (pre intervention) which increased drastically to 86.6% (post intervention). The knowledge of asthma and metered-dose inhaler technique improved significantly after the educational intervention. Regular training programmes and workshops must be conducted to improve the nurses' knowledge on asthma and their competence in pMDI usage.

INTRODUCTION: Asthma is a chronic disease of the airways that is characterized by marked airway inflammation and exaggerated variability in airway caliber due to bronchial smooth muscle hyper responsiveness.¹ About 334 million people in the world are suffering from asthma.² According to INSEARCH (Indian Study on Epidemiology of Asthma, Respiratory symptoms and Chronic bronchitis), prevalence of asthma in India varies from 2.05% to 3.5% (17-30 million patients).

Cost of asthma treatment per year for the year 2015 was calculated as approximately 139.45 billion. 15 million Disability Adjusted Life Years (DALYs) are lost due to asthma.³

Current effective treatments for asthma are in the form of metered-dose inhalers.⁴ Inhaled medication reaches the target site in effective concentrations and has fewer side effects because of low systemic bioavailability and hence, considered as the main route of administration for asthma therapy.⁵ Incorrect usage of inhalation devices may lead to decreased efficacy, unwanted side effects and increased cost of treatment.⁶

Health care providers play an important role in imparting the knowledge of asthma and the correct usage of inhaler technique.⁷ Nurses being one of

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the important members of healthcare team and are available in all tiers of health facilities and communities, play a significant role in providing care and education to affected individuals.⁸ Nurses' knowledge on asthma and its management could positively affect the treatment outcome.⁹ Global initiative for asthma (GINA) management and prevention, 2015 updated guidelines recommend that checking and correcting the patient's inhaler technique by repeated and regular training of nurses will lead to a better asthma control.¹⁰

Nurses' knowledge of asthma and its management and their skill in correct usage of inhalation medication will raise the quality of patient care and reduce morbidity and mortality due to the disease. There is a need to train nurses for better management and quality care. This study was therefore planned to evaluate their knowledge about asthma and inhalation technique and to assess the effect of an education programme in a tertiary care hospital. The objective of our study was to evaluate the impact of educational intervention on the knowledge of asthma and metered-dose inhaler technique among nursing students.

MATERIALS AND METHODS:

This was a cross-sectional, questionnaire based, pre and post educational intervention test study which was conducted among 45 B.Sc nursing students of Government College of Nursing, Bengaluru. The Institutional Ethics Committee approval was taken prior to commencement of the study. Written informed consent was taken from the students. A convenient date was given to the students for conduction of pre and post education test at the department of Pharmacology, BMCRI.

Pre test:

Pre test involved self administration of questionnaire on asthma knowledge and demonstration of steps of metered-dose inhaler technique. The asthma knowledge questionnaire was adapted from a previously published research.¹¹ The questionnaire contained 24 questions on asthma definition, pathophysiology, etiology, precipitating factors, symptoms, prognosis, asthma medication, side effects of inhaled medications, and questions on pMDI

(pressurized metered-dose inhaler) device. The questionnaire was distributed to each student. The answers had Yes, No, or Don't know options. The students were then called one by one and asked to demonstrate the steps of inhaler technique by using a placebo pressurized metered-dose inhaler. Their accuracy in the use of the inhaler device was assessed using a standard checklist derived from Global Initiative for Asthma (GINA). The correct answers and inhaler steps correctly demonstrated were graded as 1 and wrong or don't know answers and inhaler steps omitted or demonstrated incorrectly were graded as 0.

Educational intervention:

The educational intervention involved lecture on asthma and its management and verbal, physical and video demonstration of inhaler technique. This was followed by a post test.

Post test:

During post test, the same questionnaire on asthma knowledge was self-administered by the students. The students were then called one by one and asked to demonstrate the steps of inhaler technique. Mean percentage scores in asthma knowledge and inhaler demonstration before and after educational intervention was analyzed using descriptive and frequency statistics. Number of pMDI steps performed correctly was taken as the demonstration score (DS) and the percentage demonstration score (DS%) was calculated as (Number of correct steps/ Number of Total steps) X 100 for each student. Statistical significance was determined by using paired 't' test. *p* value of <0.05 was considered as statistically significant.

RESULTS:

45 nursing students participated in the study. Among them, 40 were females (88.9%) and 5 were males (11.1%).

The knowledge of asthma was at 63% (pre test) which improved to 85.5% after educational intervention. All the students (100%) were aware of the symptoms of asthma, 70% knew about prognosis and 63% knew about asthma medication before educational intervention. These increased to 100%, 85%, and 75% respectively after educational intervention. 52% of the students were aware of the

side effects of inhaled medications like sore throat, hoarseness of voice and oral thrush before educational intervention which increased to 82% after educational intervention. Only 37.8% of the students knew that pMDI was used with a spacer in children and elderly patients before educational intervention. After educational intervention, 97.8% gave the correct answer. (**Table 1**). There was a statistically significant improvement in asthma knowledge by 22.5% (p value < 0.001).

Metered-dose inhaler demonstration was very poor at 20% before educational intervention which increased drastically to 86.6% after educational intervention. (**Table 2**). Only 39% of the students demonstrated steps 1-3 correctly, 27.4% of them demonstrated steps 4-6 and none of them demonstrated steps 7-10. After educational

intervention, 91% of the students demonstrated steps 0-3, 84.4% demonstrated steps 4-6, 81% demonstrated steps 7-9 correctly and 98% of the students became aware that if an extra dose is needed, wait for 1 minute and then repeat steps 2-9. 26.7% of the students showed 100% of pMDI demonstration score. (**Fig. 1**).

The mean percentage scores of asthma knowledge and metered-dose inhaler technique increased significantly from 63% (pre test) to 85.5% (post test), and 20% (pre test) to 86.6% (post test) respectively. The educational intervention was successful as there was a statistically significant improvement in asthma knowledge by 22.5% and metered-dose inhaler technique by 66.6% with a p value <0.001. (**Table 3**)

TABLE 1: PERCENTAGE SCORES OF CORRECT RESPONSES TO QUESTIONS ON ASTHMA KNOWLEDGE BEFORE AND

Questions on asthma knowledge (responses in Yes, No and Don't know)	Model Answers	Pre Education (%)	Post Education (%)
Is asthma an inflammatory disease of the airways ?	Y	42 (93.3)	45 (100)
Is asthma a hereditary disease ?	Y	40 (88.9)	45 (100)
Does asthma inflammation cause constriction in the airways ?	Y	42 (93.3)	45 (100)
Is asthma a contagious disease ?	N	27 (60)	28 (62.2)
Do aspirin and some antihypertensive drugs cause asthma symptoms ?	Y	9 (20)	35 (77.8)
Does active or passive smoking precipitate asthma ?	Y	40 (88.9)	43 (95.6)
Do respiratory infections precipitate asthma ?	Y	39 (86.7)	45 (100)
Asthma attacks are more common in winter.	Y	36 (80)	39 (86.7)
Are there symptoms such as cough, wheeze, dyspnoea, chest tightness seen in asthmatic patients ?	Y	45 (100)	45 (100)
Can asthmatic patients take part in sports ?	Y	2 (4.4)	32 (71.1)
Can asthmatic patients become pregnant ?	Y	29 (64.4)	43 (95.6)
Do inhaled medications cause addiction?	N	8 (17.8)	32 (71.1)
Is asthma a disease that cannot be cured but can be controlled ?	Y	35 (77.8)	43 (95.6)
Could asthma be completely controlled with a continuous and regular treatment ?	Y	27 (60)	29 (64.4)
Can these patients continue a normal life ?	Y	28 (62.2)	43 (95.6)
If an asthmatic patient does not use the treatment regularly, do asthma attacks threaten life ?	Y	36 (80)	38 (84.4)
Are inhaled medications the most effective delivery method for the treatment of asthma ?	Y	34 (75.6)	40 (88.9)
Do inhaled drugs reach the airways directly ?	Y	35 (77.8)	44 (97.8)
Do the effects of inhaled drugs disappear quickly ?	Y	16 (35.6)	18 (40)
Do the inhaled drugs enter the systemic circulation in small amounts ?	Y	28 (62.2)	33 (73.3)
Are there any harmful side effects of inhaled medications ?	Y	28 (62.2)	40 (88.9)
Can these side effects be avoided ?	Y	19 (42.2)	34 (75.6)
MDI device is used with a spacer in children and elderly patients.	Y	17 (37.8)	44 (97.8)
MDI device should be cleaned at least once in a week.	Y	20 (44.4)	40 (88.9)

AFTER EDUCATIONAL INTERVENTION

Total number of students n = 45,

TABLE 2: PERCENTAGE SCORES OF METERED-DOSE INHALER STEPS DEMONSTRATED CORRECTLY BEFORE AND AFTER EDUCATIONAL INTERVENTION

MDI Steps	Pre Education(%)	Post Education(%)
Remove cap	41 (91.1)	44 (97.8)
Shake well and hold inhaler upright	4 (8.9)	36 (80)
Breathe out gently and fully	8 (17.8)	43 (95.6)
Put mouthpiece between teeth without biting and close lips to form good seal and tilt your head backward or chin upright	22 (48.9)	43 (95.6)
Start to breath in slowly through mouth and press down firmly on the canister to release 1 puff of medication	15 (33.3)	36 (80)
Continue to breath in slowly and deeply	0	35 (77.8)
Hold breath for about 10 seconds or as long as comfortable	0	23 (51.1)
While holding breath, remove inhaler from mouth and lip kept close	0	42 (93.3)
Breathe out slowly and fully	0	44 (97.8)
If an extra dose is needed, wait 1 minute and then repeat steps 2 to 9	0	44 (97.8)

Total number of students n = 45,

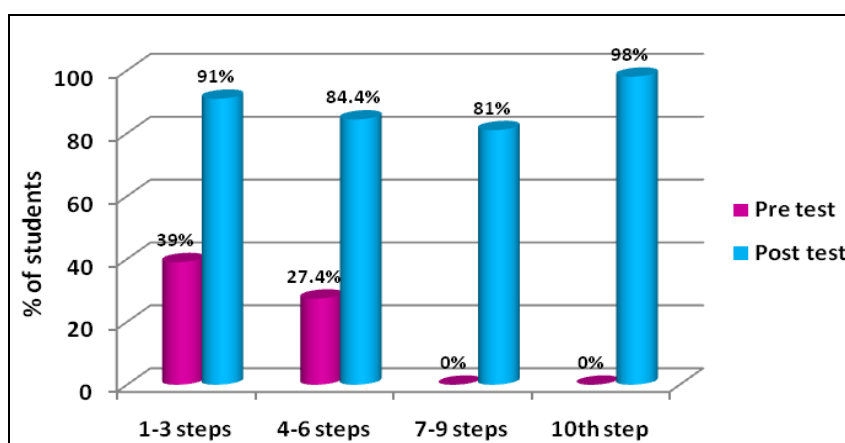


FIG. 1: STEPS OF INHALER TECHNIQUE DEMONSTRATED CORRECTLY BEFORE AND AFTER EDUCATIONAL INTERVENTION

TABLE 3: THE MEAN PERCENTAGE SCORES IN ASTHMA KNOWLEDGE AND INHALER DEMONSTRATION BEFORE AND AFTER EDUCATIONAL INTERVENTION

Score	Pre Education Mean Score (%)	Range	Post Education Mean Score (%)	Range	p value
Asthma Knowledge	15.2±2.1(63.0±0.1)	10-20	20.4±1.9(85.5±0.1)	17-24	<0.001
Inhaler Technique	2.0±1.2(20.0±0.1)	0-4	8.6±1.2(86.6±0.1)	6-10	<0.001

DISCUSSION: A disease management begins with the doctor providing care and treatment while the nurses provide supplementary education and reviewing.¹² To correctly teach pMDI use, healthcare professionals including doctors should have adequate knowledge about the correct usage of pMDI technique which would enable the patients to learn proper inhaler technique that would lead to a better control of asthma.¹³

The treatment of bronchial asthma usually includes the use of bronchodilators and steroids, which are best delivered through inhalational route. Metered-

dose inhalers are routinely prescribed for this purpose. Proper drug delivery is the first step towards effective management of asthma.¹⁴ A major limitation to the effective use of these inhaled medications is the inability of many patients to use inhaler devices correctly.¹⁵ Safe and effective drug therapy occurs only when the patients are well informed about their medications.¹⁶ Incorrect inhaler technique can result in suboptimal disease control which in turn increase the risk of absence from work or school, unnecessary increase in medication dosage,

exacerbations requiring oral corticosteroid treatment, and potential side-effects.¹⁷

Inhaler technique if not practiced repeatedly, will deteriorate over time. pMDI devices are difficult to use and even with repeated demonstrations some patients still find the coordinating of the whole technique challenging.^{18, 19}

Patients require appropriate education in the correct handling of inhaled medications. The prescribing physician bears the primary responsibility of teaching the patients about the correct usage of inhaled medications. However, nurses and other healthcare providers should be conversant with the correct use of inhalers as they are required to check and recheck the correctness of the technique during patients initial and subsequent follow-up visits.¹⁵

In a study from Nigeria, conducted among post basic nursing students, reported that there was a satisfactory improvement in the asthma knowledge (10%) and inhaler technique (21%) after educational intervention.⁹ In our study we found that the asthma knowledge was satisfactory (63%) during pre test as the students had a routine teaching program on asthma and its management prior to the commencement of the study. After educational intervention the knowledge on asthma further improved to 85.5%. The effect of educational intervention was statistically significant in asthma knowledge by 22.5%.

The physical and video demonstration of the correct inhaler steps had a great impact on nursing students' learning and understanding the various steps of inhaler techniques. Especially, essential steps like 5, 6, and 7 which none of the students performed correctly before educational intervention, the education intervention in the form of physical and video demonstration helped the students to understand the technique as well as importance of these steps. These essential steps if performed incorrectly, can deposit the medication in the oral cavity and can lead to wastage of the drug and result in exacerbations of asthma.¹³

In a study from Iran, conducted among healthcare providers, only 6.93% could demonstrate inhaler technique correctly.²⁰ In our study, the result of

inhaler technique demonstration was better as 39% of students demonstrated steps 1-3 correctly, 27.4% demonstrated steps 4-6, but, none (0%) of the students knew steps 7-10. In another study from Oman, only 15% of the participants performed all the steps of inhaler technique correctly.²¹ But the results of our study indicated a better response with 26.7% of the students showing a 100% demonstration score after educational intervention. A study from Nepal, reported poor knowledge among the nursing practitioners on the use of pMDIs. Duration of experience, worksite, or age of the nurses did not influence their knowledge but educational qualification influenced their knowledge of asthma and inhaler technique.²²

Another study from Nepal which included healthcare professionals, reported that none of them could demonstrate all the ten steps correctly during pre-intervention period. After educational intervention, 1 doctor, 4 interns, and 8 nurses demonstrated all the steps correctly.¹³ These results indicate that the educational programmes would definitely improve the nurses' knowledge of asthma and their inhaler technique.

CONCLUSION: The educational intervention was successful as there was a statistically significant improvement in asthma knowledge by 22.5% and pMDI demonstration by 66.6%. Nurses being in constant touch with the patients, the knowledge of asthma care and usage of various inhaler devices must be included in their teaching curriculum and regular training programmes and workshops must be conducted to improve the nurses' knowledge on asthma and their competence in pMDI usage, which would positively affect the outcome of asthma management.

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CONFLICT OF INTEREST: None

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