

**Impact of short-term Educational Interventions on Asthma Knowledge and metered-dose Inhaler Techniques among post basic nursing students in Ilorin, Nigeria- Result of a pilot study**

Olufemi O. Desalu<sup>1ψ\*</sup>, Aolat B. Abdurrahman<sup>2ψ</sup>, Adekunle O. Adeoti<sup>3</sup>  
Olanrewaju O. Oyedepo<sup>4ψ</sup>

**ABSTRACT**

**Background:** Nurses' knowledge of asthma and inhaler device technique could positively or negatively affect the outcome of asthma treatment. There exists paucity of data on asthma knowledge and inhaler techniques in Nigeria.

**Objective:** Our study aimed at evaluating the level of knowledge of asthma and inhaler techniques among post basic nursing students in Ilorin, Nigeria.

**Methods:** This was a pre-post intervention design study carried out among 40 post basic nursing students from September to October 2011. A pretest was conducted which involved self-administration of asthma knowledge questionnaire and demonstration of inhaler device techniques using the pressurized metered dose inhaler (pMDI). The pre-test was followed immediately by educational interventions (lecture, physical and video demonstrations), and after one month by a post test.

**Results:** Forty out of 44 nurses completed the study giving a response rate of 91%. The median years after basic nursing training was 4 (range 1-21 years). Majority (70.0%) have not had a recent training on how to use inhalers. The total mean percentage score of asthma knowledge increased significantly from 75.9 % (pre intervention) to 86.5% (post intervention). For the demonstration of pMDI, none (0%) of the respondents had percent demonstration score of 100% pre intervention and post intervention 25.0% had a demonstration score of 100%.

**Conclusion:** The knowledge of asthma was satisfactory while the demonstration of inhaler techniques was very poor pre intervention, both of which significantly improved after educational intervention. Additional studies need to be performed in larger, mixed populations of healthcare professional to confirm these findings.

**Keywords:** Asthma, inhaler techniques, nursing students, Nigeria.

**A**sthma is the most common chronic disease among children and also affects millions of adults. About 235 million people worldwide suffer from this non communicable disease<sup>1</sup>. The burden of asthma has been growing over the past 30 years, particularly in the low and middle income countries least able to absorb its impact<sup>1</sup>. There is no national standardized data on prevalence of bronchial asthma.

The prevalence of physician diagnosed asthma in Nigeria ranges from 2% to 18% in the general population<sup>2-4</sup>.

It is high among 13-14 year old children in South Western region (18.4%) and adolescent in South Eastern region (14.2%), and also among adult population in Ilorin, North Central of Nigeria (15.2%)<sup>3</sup>.

The World Health Organization (WHO) estimates that around 15 million disability adjusted life years (DALYs) are lost annually through this disease<sup>2</sup>. If untreated or inadequately treated, it can impact negatively on the productivity of the caregivers, contributing to a cycle of poverty in families and communities<sup>1,2</sup>. Asthma can also be fatal and it causes an estimated 250,000 deaths

1. Department of Medicine.

2. School of Post Basic Nursing.

3. Department of Medicine, Ekiti State University Teaching Hospital Ado-Ekiti, Nigeria

4. Department of Anaesthesia.

<sup>ψ</sup>University of Ilorin Teaching Hospital Ilorin, Nigeria.

\*Corresponding Author: +23408035025771

annually (1 in 250 deaths worldwide)<sup>1-2</sup>. This condition is incurable; however it can be controlled to reduce the associated morbidity and mortality.

The global initiative on asthma (GINA) 2011 updated guideline has recommended that doctors and other members of the healthcare team and patients should be actively involved in managing asthma to prevent problems and make patients live productive, and have physically active lives [2]. They can learn to avoid risk factors for attack, take inhaled medications correctly, understand the difference between "controller" and "reliever" medications, monitor their status using symptoms and, if available, Peak expiratory flow (PEF) could be used to recognize signs that asthma is worsening and take action<sup>1-2</sup>.

Nurses are important member of the healthcare team, often the first point of call and sometimes the closest contact of people with asthma, and they play a vital role in educating the patients. The quality of asthma care will depend on the healthcare provider's knowledge, attitude and experience as well as their patients' education. Nurses as health care provider are closer in contact with the patients, at most times they are first and last contact and they are expected to educate and train the patients when inhaler devices are prescribed to these patients. Therefore nurses' management knowledge could positively or negatively impact on treatment outcome. Studies in other parts of the world have reported a very low level of knowledge of asthma and inhaler technique among nurses and concluded that there is a need for sufficient knowledge to effectively teach and participate in asthma care<sup>4-6</sup>. Poor patient asthma knowledge and inhaler techniques have been associated with poor asthma control and health outcome<sup>7-8</sup>. The data on asthma knowledge and inhaler techniques are few in the sub Saharan Africa. Therefore this study aimed at evaluating the level of knowledge of asthma and inhaler technique among post basic nursing students in Ilorin, Nigeria.

## Methods

### Study design and Setting

This was a pre and post intervention test study among post basic nursing students who had 4-6 weeks to complete their post basic (emergency, paediatric) nursing training at the School of Post Basic Nursing, University of Ilorin Teaching Hospital Ilorin, Nigeria. The post basic nursing students in this study were certified council registered nurses who have undergone three years basic nursing and one year midwifery training after high school education. This protocol was approved by the institutional ethical and research committees. Permission was also granted by the school of post basic nursing management to interview their students.

### Participants Selection

The data collection was commenced after the institutional approval from the participating school. The students were approached by one of the lecturer (ABA) of the school who asked the eligible student if they are willing to participate in the study. Thereafter, those students who were willing were informed about the study. At this time, the study information note and consent form were given to the eligible patients to acquaint them with the study procedure and to obtain their informed consent. Convenient dates were then arranged by one of the lecturers with the students for pre and post-test i.e. the self-administration of the questionnaire, demonstration of inhaler technique and the educational interventions

### Sample size

A convenient sample size of 40 comprising of all the students in class 2010/ 2011 batch of the school were eligible to participate in the study. Forty out of the 44 students in the class consented to participate in the study and were consecutively recruited to the study.

### Survey instrument

A standardized structured asthma knowledge questionnaire<sup>9, 10</sup> was self-administered by the participants in the class and was monitored by the lecturers (ABA) to ensure and prevent interactions among the participants. The asthma knowledge questionnaire composed of 17 close-ended questions, presenting yes, no or I don't know options (appendix 1). The questionnaire

contained questions on demographic and professional information, area of expertise and previous knowledge of inhalers, previous education on asthma, sources of asthma information and continuing medical education. Additional questions were on asthma etiology, pathophysiology, symptomatology, precipitant factors, medications and prognosis. Answers were graded from 0 (false answer/no answer) to 1 (true answer). Correct answers were counted and the knowledge score was determined as the total number of correct answers. If score was more than 70%, it was regarded as good, if score was 50-70% it was regarded as satisfactory and if score was less than 50% it was regarded as poor for asthma knowledge.

#### **Assessment of inhaler techniques**

All the participants were then assessed by one of the authors (DOO) who was a consultant pulmonologist to demonstrate inhaler device technique skill using the pressurized metered dose inhaler (pMDI). One researcher was used to evaluate their proficiency in inhaler device technique to reduce inter rater variability. After questionnaire administration, the participants were called one by one to prevent observation by the others and were given dummy metered-dose inhalers (GlaxoSmithKline GSK), and requested to demonstrate the use of this device. The accuracy of the participants in the use of the inhaler device was evaluated against a prepared checklist derived from Global Initiative for Asthma (GINA) and National Asthma Respiratory and Training Center (NARTC), UK educational resources and illustrations on how to use a pressurized metered dose inhaler (pMDI)<sup>11</sup>. Any of the predefined steps that was improperly done or omitted was graded as 0 and correct step was graded 1. Correct steps were counted and the inhaler demonstration score (DS) was determined as the total number of correct steps performed. The inhaler demonstration scores (DS) and percent demonstration score (DS %) were calculated for each participants. The percent demonstration score was formulated as follows: (number of correct steps/number of total steps) x 100 for each

participants. The percent demonstration scores of all the participants were used to obtain the mean percent demonstration score (DS %).

#### **Educational interventions**

The educational interventions was designed by two authors who were pulmonologists (OOD) and (AOA) and delivered by one OOD of the two pulmonologist with local support from one of the lecturers (ABA). The educational interventions involved class lecture on general knowledge of asthma aetiology, pathophysiology, investigations, asthma medications and use of inhaler devices, treatment, and prognosis and myths. In addition, the subjects also had a physical demonstration and video demonstration of metered dose inhaler technique device. The subjects were also given a compact disk (CD) that contained the lectures and video demonstration for their personal study at home. Educational intervention comprising of physical and video demonstrations have been documented to be more effective than verbal and written instruction<sup>12-15</sup>.

#### **Posttest**

One month after the pretest, the same asthma knowledge questionnaire used in the pretest was self-administered by the participants in the class and was monitored by the one lecturer (ABA) to prevent interactions among the participants. After the post-test questionnaire administration, the participants were called one by one and one of the authors (DOO) gave them dummy metered-dose inhalers, and requested them to demonstrate the use of this device.

#### **Data collection**

The asthma knowledge questionnaire was answered by all the participating subjects before (pre intervention) and one month after (post) educational intervention. The accuracy of the subjects in the use of the inhaler device was also evaluated pre intervention and one month after the educational intervention.

#### **Statistical analysis**

Data were analyzed using the Statistical Package for the Social Sciences (Version 15.0; SPSS, Chicago, IL, USA). Descriptive and frequency statistics were performed to

determine the subjects distribution according to demographic and nursing practice information, previous education on asthma , sources of asthma information and continuing medical education. Pre and post intervention mean of asthma knowledge score were calculated from the individual knowledge score. The total and mean scores for all the subjects were obtained from the number of correct steps of inhaler performed by the subjects. The difference in the mean score of the asthma knowledge and the inhaler use for both pre and post educational intervention were calculated and the level of significance was determined by paired t- test for normally distributed variables and by wilcoxin signed rank test for the skewed continuous variables.

**Results**

Forty out of 44 subjects completed the study giving a response rate of 91%. The mean age ± (SD) of the subjects was 29±6 years and median years after basic nursing training was 4 (range 1-21 years). The majority of the participants were females (M: F =1:7) (Table 1).

Table1: General characteristics of the subjects

Characteristics	Mean /n (%)
Mean age(SD)in years	29(6)
Median Year after basic nursing training	4(range 1-21)
Male :Female ratio	1:7
<b>Position in hospital</b>	
Nursing Officer	34(85.0)
Senior Nursing Officer	5(12.5)
Principal Nursing Officer	1(2.5)
<b>Type of hospital</b>	
Teaching	8(20.0)
FMC/State specialist	7(17.5)
District /General	5(12.5)
PHC	1(2.5)
Private	19(47.5)
<b>Qualification</b>	
SRN	36(90.0)
SRM	3(7.5)
B.Sc.	1(2.5)

Majority 28(70.0%) have not had a recent training on how to use inhalers and 85.0% want more emphasis on inhaler methods/technique in their asthma lectures.

There was a marked improvement in the asthma knowledge of the participants after educational intervention. The assessment of asthma knowledge showed that before educational intervention 15(37.5%) of the subjects knew asthma to be an inflammatory disease of the airways and 15 (37.5%) also were aware that aspirin, some rheumatism drugs, and some antihypertensive drugs cause asthma symptoms. These increased to 39(95.0%) and 28(70.0%) respectively after education intervention (Table 2).

The most common errors regarding inhaler technique before intervention were the inability to coordinate breathing with pressing of inhaler canister, failure to remove inhaler from mouth after actuation and failure to breathe out slowly after the removal of inhaler from the mouth. After the intervention, there was a marked improvement in most steps of the inhaler technique (Table 3). The total mean % score of asthma knowledge increased from 75.9% pre intervention to 86.5% post intervention. The impact of the educational intervention was significant as there was a statistically significant improvement in the asthma knowledge of 10%. Similarly before the intervention, none of the subjects could correctly demonstrate all the 10 steps of inhaler device and after 25.0% of them could demonstrate the entire steps after a period of one month (Figure 1)

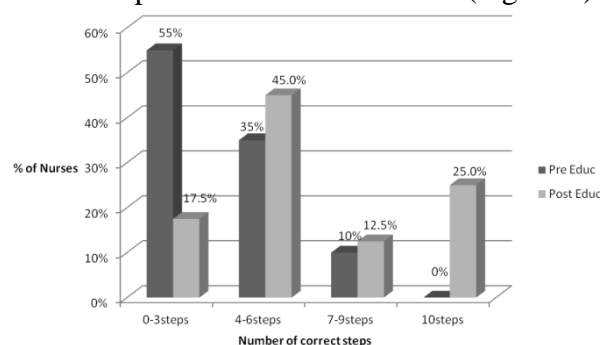


Figure 1: Steps of inhaler technique correctly done pre and post intervention

Table 2: Distribution of the correct responses to questions related to the knowledge of asthma before and after educational intervention

Questions on asthma knowledge (responses are in True , false or don't know	Model Answers	Pre Education	Post Education
Is asthma an inflammatory disease of the airways?	T	37.5	95.0
Is asthma a contagious disease?	F	97.5	97.5
Is asthma a hereditary disease?	T	95.0	97.5
Does asthma inflammation cause constriction in the airways?	T	95.0	97.5
Are there symptoms such as coughing, wheezing dyspnoea, chest tightness in asthmatic patients?	T	97.5	97.5
Do aspirin, some rheumatism drugs, and some antihypertensive drugs cause asthma symptoms?	T	37.5	70.0
Is asthma a disease that cannot be treated and which continues throughout one's life?	F	67.5	90.0
Could asthma be completely controlled with a continuous and regular treatment and can the patient continue a normal life?	T	82.5	90.0
Should asthmatic patients use the prophylactic treatment regularly even if they feel well?	T	72.5	85.0
If an asthmatic patient does not use the treatment regularly, do asthma attacks threaten life?	T	90.0	100.0
Are inhaled medications the most effective delivery method for the treatment of asthma?	T	70.0	100.0
Do inhaled drugs reach the airways directly?	T	97.5	100.0
Do the effects of inhaled drugs disappear quickly and enter the circulation system in very small amounts?	T	52.5	70.0
Are there any harmful side effects of inhaled medications?	T	52.5	37.5
Do inhaled medications cause addiction?	F	47.5	50.0
Can asthmatic patients do sports?	T	100.0	95.0
Can asthmatic patients become pregnant?	T	100.0	95.0

\*Values expressed in %, Total number of subjects n=40

Table 3: Distribution of the MDI steps performed correctly by the Subjects before and after educational intervention.

Steps	MDI Steps Correctly done	Pre Educat.	Post ducat.
1.	Remove cap	55.0	82.5
2.	Shake well and Hold inhaler upright	55.0	87.5
3.	Breathe out gently and fully	42.5	60.0
4.	Put mouthpiece between teeth without biting and close lips to form good seal and tilt your head backward or chin upright	57.5	57.5
5.	Start to breathe in slowly through mouth and press down firmly on the canister to release 1 puff of medication	15.0	50.0
6.	Continue to breathe in slowly and deeply	25.0	50.0
7.	Hold breath for about 10 seconds or as long as comfortable	20.0	47.5
8.	While holding breath, remove inhaler from mouth and lip kept close	20.0	27.5
9.	Breathe out slowly and fully	17.5	27.5
10	If an extra dose is needed, wait 1 minute and then repeat steps 2 to 9	30.0	47.5

\*Values expressed in %, Total number of subjects n=40



Table 4: The mean percent scores in asthma knowledge and inhaler demonstration of the respondents before and after educational intervention.

Score	<i>Pre- education</i>		<i>Post – education</i>		Range (%)	Pvalues
	Mean score	(%)	Range score	(%)		
<i>Asthma Knowledge</i>	12.9±1.4 (75.9±0.1)	10-16	14.7±1.1(86.5±0.1)	13-17	10.6	0.008
<i>Inhaler technique</i>	3.3±2.4 (33.0±0.2)*	0-9	5.4±2.7(54.0±0.1)*	1-10	21.0	0.012

\*Skewed distribution.

after educational intervention improved significantly by 21 %.(Table4).

**Discussion**

Nurses as health care provider, are an important member of healthcare system and they play a vital role in educating the patients and assisting the doctors especially in busy clinical practice settings. They will save the attending physicians’ time to see other patients and ultimately help in the control of asthma. The nurses are closer in contact with the patients, at most time they are first and last contact and they are expected to educate and train the patients when inhaler devices are prescribed to these patients. The role of nurses is pivotal in the management of asthma as they are often needed in the dissemination of information as well as demonstration of how patients should use their medications. This was also observed in our study which revealed the knowledge gap in the training on asthma and inhaler technique among the nurses.

The result of this study showed that the student nurses had satisfactory knowledge of asthma and there was a remarkable improvement in asthma knowledge after intervention. Despite the satisfactory knowledge, the findings with respect to knowledge of asthma initially showed poor understanding of some of the core areas in bronchial asthma with the least marks in questions like “asthma as an inflammatory disease” and “common drug-induced triggers of asthma”. It is worrisome as this portends dearth in information that will be passed on to patients as it relates to the use of inhaled corticosteroid therapy in the control of

asthma. Several studies have shown that nurses and other medical personnel may lack the required knowledge about asthma<sup>4,5</sup> and inhaler technique<sup>6,16,17</sup>. This is contrary to what Pinnock et al<sup>18</sup> reported, where specialist nurses in primary and secondary care had a good knowledge of asthma. After the educational intervention, they had better response to these questions especially in those core areas which could be as a result of the repeated exposure to resource materials and the emphasis during the training.

This study also revealed the knowledge gap on the inhaler technique among the post basic nursing students. None of the respondents could correctly demonstrate all the step before the intervention and this finding is almost similar to the 1% documented by Valarmathi et al in Pakistan<sup>19</sup>, but it is less than the 23% reported by Yilmaz et al in Turkey<sup>20</sup>, 29% by DÃ-az-LÃ-pez et al in Spain<sup>21</sup> and 68% by Scarpaci et al in the USA<sup>22</sup>.

The common errors were due to the inability to coordinate breathing with pressing of inhaler canister, failure to remove inhaler from mouth after actuation and failure to breathe out slowly after the removal of inhaler from the mouth. About half of the subjects correctly demonstrated the initial steps 1-4. This pattern of performance is similar to studies among the nurses in previous studies<sup>16, 17</sup>, and non-medical subjects<sup>23-25</sup>. These findings could be a result of the instinctiveness of these steps. Most of the respondents could successfully demonstrate the 1st four steps even before the training and thereafter following the training showed considerable improvement. However,

with increase in the number of steps and the need to coordinate with breathing, more individual might find it complex. Inability to correctly demonstrate the latter steps could be due to the numerous steps that the respondents had to carefully memorize and follow, to demonstrate proficiency in this skill. We also discovered that after the educational intervention, the number of steps correctly done remarkably improved in majority of respondents with the exception of step 8 and 9 (8=while holding breath, remove inhaler from mouth and lip kept close 9=Breathe out slowly and fully).

Overall the impact of the educational intervention was significant as there was a statistically significant improvement in the asthma knowledge (10%) and inhaler technique (21%) after educational intervention. Although the level of improvement in the use of inhaler may appeared to be small after one month, repeated training will lead scaling up of their inhaler technique skills. Satisfactory knowledge of asthma and incorrect use of inhalers is a common finding in our study, and an adequate education was associated with improvement of nurses' skills with use of these devices.

The health personnel must have an adequate level of training in order to correctly instruct their patients, because the efficacy of inhaled treatment greatly depends on the adequacy of the technique. The physicians do not always have the opportunity to conduct asthma education and instruct patients in correct inhaler technique. Therefore it is imperative not to neglect the nurses in asthma care and to introduce these areas of deficiencies into nurses' training curriculum and to create avenue for training and retraining of nurses on correct inhaler technique and fundamentals of asthma. Retraining of health care worker on inhaler device techniques is necessary as retention of knowledge of correct technique tend deteriorate by 2-6 weeks after education<sup>13, 27</sup>.

### Conclusion

The knowledge of asthma was satisfactory while the demonstration of inhaler techniques

was very poor in this study, both of which significantly improved after educational intervention. This result has highlighted the need for the asthma care providers to have regular refresher courses as treatment outcome depends on the patients and care provider asthma knowledge and proficiency of their inhaler technique. Additional studies need to be performed in larger, mixed populations of healthcare professional to confirm these findings.

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**Authors' contributions:** OOD conceived and designed the study, conducted data collection and analysis and wrote the first draft of the manuscript. ABA conducted data collection and contributed to final draft of the manuscript. AOA & OOO contributed to final draft of the manuscript.

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