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Effect of Educational Module on Severity of Dyspnea and Inhalation Therapy Adherence among Patients with Bronchial Asthma

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Abstract: Background: Bronchial asthma is a common chronic inflammatory respiratory disease, involves airway inflammation and constriction. Dyspnea is a key symptom of asthma, not only signals underlying health issues but also leads to frequent hospital admissions and high mortality rates in asthma patients. So, the development of an effective educational module aimed at minimizing dyspnea episodes and improving patients' skills for managing their condition. Purpose was to evaluate the effect of educational module on severity of dyspnea and inhalation therapy adherence among patients with bronchial asthma. **Design**: A quasi-experimental research design (study and control) was utilized for this study. **Setting**: The current study was carried out at chest diseases department of Menoufia University at Shebin El-Kom, Menoufia Governorate, Egypt. **Sampling**: A consecutive sample of 80 adult patients with bronchial asthma were assigned into two equal groups, 40 patients for each group. **Instruments**: Four instruments were used for data collection: Structure interview questionnaire, Pressurized Metered Dose Inhaler Performance Observational Checklist, shortness of breath questionnaire and Morisky Medication Adherence Scale (MMAS). **Results**: It is revealed that 80% and 85% of study and control groups respectively had poor performance in using a metered dose inhaler pre- intervention, while 77.5% and 85% immediately post intervention and after 1 month of study group had good performance level compared to 25% of both in control group. There were highly statistically significant differences between both groups before, immediately post and after 1 month of educational module regarding level of severity of dyspnea and medication adherence **Conclusions**: Educational module had a positive impact on improving practicing inhaler therapy, medication adherence to inhalation and lowering dyspnea episodes and severity among study group (group I) than control group (group II). **Recommendations**: Supervised continuous educational modules should be implemented in hospitals to enhance patients' knowledge about bronchial asthma and its management. Websites that contain all relevant information about bronchial asthma should be established to improve the health status of patients.

Key words: *Bronchial asthma, Dyspnea, Educational module & Inhalation therapy adherence.*

Introduction

Asthma is a significant global health problem that affects millions of people worldwide. Bronchial asthma is a chronic respiratory condition that is characterized by inflammation and narrowing of the airways. The exact cause of bronchial asthma is not fully understood, but it is widely accepted that it is a complex, multifactorial pathology that is influenced by various factors, including genetics, personal or family history of atopy and environmental triggers which are often associated with modern lifestyle practices such as pollution and modern hygiene standards that cause different manifestation of bronchial asthma (Global Initiative for Asthma (GINA), 2023 & World Health Organization (WHO), 2023).

The manifestation of bronchial asthma includes dyspnea, cough, wheezing, chest tightness, faster breathing and heartbeat, drowsiness, confusion, dizziness, blue lips or fingers, and fainting. Dyspnea, also known as shortness of breath, is a subjective and uncomfortable breathing sensation that can include various sensations of different intensity. Dyspnea can be classified into different types based on its duration and underlying causes. The common types of dyspnea are acute and chronic (National Health Services (NHS), 2021 & National Heart, Lung and Blood Institute (NHLBI), 2023).

Acute dyspnea refers to sudden onset of difficulty breathing, over the course of minutes or hours to days, often associated with a medical emergency, it requires prompt medical attention and treatment to address the underlying cause and alleviate symptoms. Chronic dyspnea refers to persistent and ongoing difficulty breathing over a period of time which develops over weeks or months, it can significantly affect a person's quality of life, limiting their ability to perform daily activities and causing significant distress. Its management typically involves a combination of medication, oxygen therapy, pulmonary rehabilitation, and lifestyle modifications (American Thoracic Society (ATS), 2023).

Effective bronchial asthma management requires a comprehensive approach that includes both pharmacological and non-pharmacological. Pharmacological management is an essential component of bronchial asthma management, aimed at reducing airway inflammation and bronchoconstriction. The medication is divided into controller medications such as inhaled corticosteroids and long-acting beta-agonists are used to prevent and control bronchial asthma symptoms, while reliever such as short-acting beta-agonists and anticholinergics are used to relieve acute bronchial asthma symptoms. The selection of medications and dosing regimen should be individualized based on the severity of bronchial asthma and the patient's response to therapy that achieves optimal bronchial asthma control (ATS, 2023).

Bronchial asthma medications are commonly delivered through inhalers, which come in three types, each with its own advantages and disadvantages. It is the responsibility of nurses to

educate patients on the different inhaler types and their proper usage techniques. Proper inhaler technique can improve drug delivery to the lungs and reduce the risk of side effects of drugs. The extent to which patients take their medication as prescribed by physician in terms of dosage, frequency, timing, and duration refers to Adherence to bronchial asthma medication (GINA, 2021).

utilizing air filtration systems, and avoiding food chemicals and medications, such as Aspirin and Non-steroidal anti-inflammatory drugs (NSAIDs), which can worsen bronchial asthma symptoms (Pham et al., 2023).

Furthermore, the education module promotes a healthy lifestyle, which involves consuming a balanced diet rich in fresh fruits and vegetables,

quitting smoking and avoiding secondhand smoke, as these factors can exacerbate symptoms and reduce lung function. Engaging in regular physical activity is encouraged under the guidance of a healthcare professional, with specific exercises recommended that are suitable for individuals with asthma, such as swimming and Yoga.

These exercises incorporate gentle movements, deep breathing exercises like diaphragmatic breathing and pursed-lip breathing and relaxation techniques that help manage stress. Nurses also play a significant role in assisting asthma patients, administering appropriate asthma medications before engaging in physical activity and providing positions, such as sitting upright or leaning forward to alleviate breathing difficulties (Nakanishi et al., 2023& Swami et al., 2021).

Nurses also teach techniques like postural drainage, chest

percussion, and vibration to help clear excessive mucus from the airways. Additionally, they emphasize the importance of getting an annual influenza vaccine, proper medication usage, and provide emergency response in severe cases, which may include administering supplemental

oxygen to increase oxygen levels in the blood

(Alexandre-Sousa et al., 2024).

To enhance drug delivery and reduce inhaler technique errors, nurses provide hands- on demonstrations and explain the correct steps for using inhalers. They address any concerns patients may have during clinic visits or hospital stays and offer guidance on inhaler maintenance, including cleaning techniques and device storage. Adherence to medication is crucial for the effectiveness of treatments, especially for chronic conditions where consistent and proper medication intake is essential for managing symptoms, preventing disease progression, and improving overall health outcomes (Swami et al., 2021).

Non-pharmacological interventions are useful in preventing or reducing the frequency and severity of bronchial asthma symptoms and may even decrease the need for medication. It should not replace medications but used in conjunction with it to achieve optimal bronchial asthma control, it involves bronchial asthma educational module (WHO, 2021 & GINA, 2021).

An educational module is essential for supporting patients in understanding and successfully managing their bronchial asthma. It encompasses various aspects, including the identification and avoidance of allergens that trigger asthma symptoms, minimizing exposure to occupational hazards, and utilizing personal protective equipment such as masks and gloves that are resistant to chemicals when handling. The module also emphasizes the importance of maintaining a clean environment, reducing dust accumulation, Factors influencing medication adherence include the complexity of the treatment regimen, side effects, forgetfulness, cost, lack of understanding, and other personal and environmental factors. Improving medication adherence involves a combination of patient education, simplifying regimens when possible, addressing barriers, providing reminders, and involving patients in their treatment decisions In summary, nurses play a vital role in both pharmacological and non-pharmacological management of bronchial asthma, working closely with patients to ensure they receive appropriate education, medication, and support for effective asthma management (Swami et al., 2021).

Therefore, the current study aimed to evaluate the effect of educational module on severity of dyspnea and inhalation therapy adherence among patients with bronchial asthma.

Significance of the Study

Asthma burden is on rise, affecting more than 339 million patients worldwide, with a prevalence of 12.6% and current trends suggest that an additional 100 million people may be living with bronchial asthma by 2025. Annually, the World Health Organization reports that 15 million disability-adjusted life- years are lost Annually. In 2019, asthma- related mortality exceeded 461,000 deaths. In Egypt, the overall estimated prevalence of adult bronchial asthma was 6.7% of the general population (around 6.85 million) (Hosny et al., 2022). In 2023, it was reported that approximately 21% of the cases or patients in the chest department of Menoufia University Hospital had bronchial asthma (Statistical record of Menoufia University Hospital of chest department, 2023).

Growing research has shown that providing proper inhaler instruction and education to patients is vital in controlling symptoms and improving inhalation therapy adherence among patients with asthma. This remains a significant challenge for healthcare providers including nurses that enhanced by following bronchial asthma educational module which can be addressed through the implementation of effective bronchial asthma educational modules and training programs (Volerman et al., 2021).

It is hoped that the current study opens the door for evidence-based practice to determine the effect, as well as a reduction in patients' complications, hospital stay, nurse's workload, and the cost burden on both patients and society associated with complications management. Thus, this study was

conducted to evaluate the effect of the educational module on the severity of dyspnea and inhalation therapy adherence among patients with bronchial asthma.

Purpose of the Study

The purpose of the current study was to evaluate the effect of educational module on severity of dyspnea and inhalation therapy adherence among patients with bronchial asthma.

Research Hypothesis:

The following research hypotheses were formulated in an attempt to achieve the purpose of the study:

- Patients with bronchial asthma who receive educational module (study group) will have less dyspnea score than those patients who don't receive it (control group).
- Patients with bronchial asthma who receive educational module (study group) will have higher level of practicing inhaler treatment than those patients who don't receive it (control group).
- Patients with bronchial asthma who receive educational module (study group) will adhere to inhalation therapy (study group) more than those patients who don't receive it (control group).

Research design:

A quasi-experimental research design (study and control) was utilized for this study.

Research Setting:

The current study was carried out in the chest department of Menoufia University Hospital in Shebin El-Kom, Menoufia Governorate, Egypt. The chest department is located on the sixth floor in Menoufia University Hospital and contains six rooms, with each room containing three beds.

Sampling:

A consecutive sample of 80 adult male and female patients with bronchial asthma from the previously mentioned setting was selected. Patients who fulfilled the inclusion criteria were selected and divided into equal groups (study and control), 40 patients for each group:

- **Study group (I)**: who received the educational module along with routine hospital care.
- **Control group (II)**: patients received routine hospital care only, including regular checkups, [lab investigations, x- rays and treatment.

Sampling Technique:

The sample is calculated by using Taro Yamane (Yamane, 1973) formula. The flow rate of the target population with the specific inclusion and exclusion criteria at the study setting was about 784 patients per year with 89% confidence level and error 11%.

Sample size was determined based on the following equation:

$$n = \frac{N}{1 + N(e)^2} = \frac{784}{1 + 784(0.11)^2} = \frac{784}{10.4864} = 74.76 \approx 75$$

75 patients, researcher increased to 80 patients,
40 patients for each group.

Where:

- n= sample size required
- N = number of people in

the population
- e = allowable error (%)

Patients of both groups were selected according to the following criteria: -

Inclusion criteria: -

Subject was considered eligible for the study if they have the following criteria:

- Adult conscious patients aged from 21 to 60 years.
- Under inhalation therapy.
- Complaining of dyspnea.

Exclusion criteria

- Patients with myocardial infarction or other diseases causing dyspnea to ensure that the study focuses specifically on asthma-related dyspnea and its management, without the interference of other conditions that could complicate the interpretation of results.

Instruments:

Four instruments were utilized in this study to collect the necessary data. These instruments are:

Instrument one: Characteristics of Patients Structured interview questionnaire.

This instrument was developed by researcher based on literature review of Weheida et al., (2017), Winn et al., (2018) & Alith et al., (2020) to assess baseline sociodemographic data and patient's medical data. It included two parts:

- **Part 1: Sociodemographic Data:** This part consists of ten questions and includes information about the patient's age, gender, marital status, level of education, occupation, work hours, number of rooms in the house, sunlight exposure inside the house, presence of rooms with good ventilation, and sewage facilities.
- **Part 2: Medical data**: This part comprises seventeen questions. Nine questions pertain to past medical history, covering topics such as smoking habits, years of smoking, types of smoking, duration of asthma per year, number of hospital admissions, reasons for hospital admissions, previous inhaler training, follow-up on inhaler training, and family history of asthma. The remaining eight questions focus on present medical history, including the patient's current symptoms, factors that exacerbate or alleviate symptoms, pulmonary function, oxygen therapy, type of inhaler device used for treatment, annual duration of inhaler use, and frequency of inhaler use per day.

Instrument two: Pressurized Metered Dose Inhaler Performance Observational Checklist

It was developed by Weheida et al., (2017) and modified by the researcher according to the guidelines of the inhaler manufacture to assess patient's performance of inhaler, it includes eleven steps such as wash the hands and remove cap, hold the hands and remove cap, hold the inhaler upright and shake well, breathe out gently, put mouthpiece between teeth without biting and close lips to form good seal, start to breathe in slowly through mouth and press down firmly on canister, continue to breathe in slowly then deeply, hold breath for about 10

seconds or as long as comfortable, while holding breath, remove inhaler from mouth, breathe out gently away from mouthpiece, if an extra dose is needed, wait 1 minute and then repeat steps 2 to 9 and replace cap.

Scoring system:

The number of checklist's steps is eleven. The researcher gave one degree for each step that was correctly done or zero for that was incorrectly done technique or skipped step, then all degrees was summed and categorized into two categories: Good performance: (≥7) and poor performance:(< 7).

Instrument three: Shortness of breath Questionnaire

It was developed by Eakin et al., (1998) and modified by the researcher to rate patient's dyspnea level and assess which physical activities may precipitate dyspnea. The questionnaire consists of twenty-four listed physical activities that were assessed to determine whether they precipitated dyspnea or not. It includes the following activities: How dyspnea do you get? at rest, walking on level ground at your own pace, walking on level ground with others your age walking up a high place, at walking upstairs, while eating food, standing up from a chair, brushing the teeth, shaving and/or brushing the hair, showering/bathing, dressing, picking up and straightening, washing dishes, sweeping/vacuuming, making a bed, shopping, doing laundry, washing the car, mowing the lawn, watering the lawn and engaging in sexual activities.

As for the second part of the questions, the effect of dyspnea and associated fears on daily activities: Dyspnea, fear of dyspnea and fear of 'hurting myself' from overexerting. This questionnaire was multiple-choice question with six-point Likert scale rated from zero to five as the following: Not at all breathlessness score zero, very mild breathlessness score one, mild breathlessness score two, average breathlessness score three, severe breathlessness score four and maximum breathlessness or unable to do score five.

Scoring system:

The total score ranged from zero to one hundred twenty, with higher scores indicating inability to do any activity due to breathlessness.

Instrument four: Morisky Medication Adherence Scale (MMAS).

It was developed by Morisky et al., (1986) and used by the researcher to assess patient's adherence to the prescribed inhaled medications. It consists of eight questions about adherence to prescribed medications such as missing of taking medication due to forgetfulness, missing of taking medication due to other reasons than forgetfulness, stopping of taking medication due to its side effects, missing of taking medication due to travelling or leaving home, taking medication yesterday because harassment about sticking to medication plan and difficulty in remembering taking medication.

Scoring system:

A structured, self-report measure of medication-taking behavior, each item was given a score of zero if patients adhered to prescribed medications and one for no adherence, degree of adherence as the following: High adherences score 0, medium adherences score 1-2 and low adherences score 3-8. The total score ranged from zero to eight, with a higher score indicating no adherence to the patient's prescribed medications.

Validity:

All instruments were tested for face and content validity by five academic staff in the field of Medical Surgical Nursing. Modifications were done accordingly to ascertain relevance and completeness.

Reliability:

All instruments were tested using a test re-test method and a Pearson correlation coefficient formula was used. Its value was 0.91 for the first instrument and 0.94 for the second instrument (Weheida et al., 2017) while 0.86 for third tool (Tabberer, et al., 2015) and the fourth instrument was 0.94 (Moharamazad, et al., 2015).

Pilot study:

Prior to the actual study, a pilot study was conducted on 10% of the sample, involving 8 patients, to assess the constructed instruments. These patients were excluded from the main study collection to test the feasibility, clarity, and applicability of the instruments

Ethical consideration:

Approval of the Ethical and Research Committee of the Faculty of Nursing, Menoufia University was obtained in January 2022, with code no 865. All patients were informed about the purpose and benefits of the study then a written consent to carry out the study was obtained from the patients. Participation in the study was voluntary and the patients could withdraw from the study at any time without penalty. Confidentiality and anonymity of patients was assured through coding all data. They were told that instruments will not cause any physical or emotional harm to patients.

Procedure:

- An official letter was submitted from the Dean of the Faculty of Nursing, Menoufia University to the director of Menoufia University Hospital in Shebin El Kom including purpose of the study and gain a written approval to conduct the study after explaining the purpose of the study and methods of data collection
- Data collection was extended over a period of 6 months from April 2023 to September 2023. Patients who agreed to participate in the study and fulfilled the inclusion criteria were divided randomly into two equal groups: study group (I) and control group (II) (40 patients for each group). Each patient of both groups was interviewed individually by the researcher in the chest department of Menoufia University Hospital.

- Each patient of both groups was assessed for sociodemographic data, medical data using part one and two of instrument one to collect data. It took about 10 to 20 minutes. All patients of both groups were assessed for administration of inhaler according to the guidelines of the inhaler manufacture, using instrument two. It took about 10 to 15 minutes. Each patient of both groups was assessed for which physical activity precipitating to dyspnea using instrument three. It took about 5 to 10 minutes.
- Each patient of both groups was assessed for adherence to the prescribed inhaled medications using instrument (IV). It took about 5 to 10 minutes.
- The researcher took the patients' telephone's number at the first contact (during hospitalization) to determine the time of appointments in order to complete data collection process. The study group (I) received the educational module that followed along with routine hospital care. The control group (II) received routine hospital care only, including regular checkups, tests, x-rays and treatment. The study group was divided into 5 subgroups. Each subgroup contained 8 patients who were taught on the appointed day.
- An instructional booklet with colored illustrative pictures was prepared by the researcher and containing brief overview of bronchial asthma (definition, risk factors, manifestations, complications, diagnostic studies, preventions and how to manage it by inhaled medications as MDIs guidelines to minimize bronchial inhalation technique.
- The previously prepared booklet was distributed by the researcher at the beginning of the first session. Lectures, group discussion, video, demonstration and re demonstration were used for illustration. The educational module conducted throughout the following sessions:
- During the first session, at the beginning of the session, the researcher provided each subgroup in the study group, brief simple information about anatomy, function of respiratory system and bronchial asthma to each group. The information covered various aspects of the condition, including its definition, risk factors, signs and symptoms, complications, and management to assess the patient's understanding of bronchial asthma, at the end of this session, the researcher allowed each patient to ask questions and provided them with question's answers, this session took about 30 minutes.
- During the second session, at the beginning of the second session, the researcher reinforced the received information then explained to the study group dyspnea on patients with asthma, characteristics of dyspnea with symptoms as chest tightness and physical activity that may precipitate (as walking upstairs and eating) and the management strategies that, include pharmacological as inhaled bronchodilators, and non-pharmacological, such as smoking

cessation, regular physical exercise, balanced, healthy diet, weight loss, positioning, oxygen therapy, mucus clearance strategies, getting an annual influenza vaccination, breathing exercises and allergen avoidance, it took about 30 minutes.

- During the third session, at the beginning of the third session, the researcher reinforced the received learning knowledge and answered any question or solved any problem that might arise, then explained to the study group (I) about performance of inhaler according to the guidelines of the inhaler manufacture such as removing the cap, holding inhaler uprightly, breathing out gently, putting mouthpiece between teeth and breathing etc. Then allowed all patients to re-demonstrate inhaler technique. This session took about 30 minutes.
- During the fourth session, at the beginning of the fourth session, the researcher summarized the received instructions and allowed all patients to ask questions and answered it. Then the researcher demonstrated the importance of adherence to inhalation therapy and the factors of poor adherence as forgetting, misunderstanding instructions, absence of a daily routine and cost, and solved these factors to achieve good adherence then sharing patient decision-making for medication dose choice, inhaler reminders for missed doses. This session took about 30 minutes.
- Direct teaching methods such as discussion and lecture are used during teaching sessions. Also, demonstration and re-demonstration for the educational module was done to study group. Post-test was conducted for both groups immediately post fourth session to highlight the effect of educational module using second, third and fourth instruments.
- During the follow-up period, which occurred three months after the last session, the researcher contacted the patients by phone to reinforce adherence to the instructed guidelines for using the metered dose inhaler and monitoring their adherence and the incidence of bronchial asthma symptoms on alternating days at home using specific instruments. This follow-up aimed to ensure that patients from the study group (I) were following the instructions provided. Both study groups' patients were assessed twice: first immediately after the fourth educational session and then again after three months had elapsed.

Statistical Analysis

Data was entered and analyzed by SPSS (Statistical Package for Social Science) statistical package version 22. Qualitative data were presented as number and percentage and compared utilizing chi-square ($\chi 2$) test. Quantitative data were presented as mean and standard deviation (SD) and compared utilizing student t test and ANOVA (F) test. A statistically significant difference was considered if $P < 0.05$.

The level of significance was set as the following:

- P-value ≤ 0.001 was very highly statistically significance difference.
- P-value ≤ 0.01 was highly statistically significance difference
- P-value ≤ 0.05 was statistically significance difference.

Results

Table 1 reveals distribution of studied groups according to their sociodemographic data. This table shows that there were no statistically significant differences between both groups regarding most sociodemographic characteristics.

Figure 1 reveals distribution of studied groups according to their level of administration of the pressurized metered dose inhaler. This figure shows that one fifth of patients in the study group (20%) and (15%) of control group had a good performance level regarding the use of a metered dose inhaler pre intervention, the level of performance significantly improved in the study group immediately after the intervention (77.5%) and after one month (85%) compared to the control group in both immediately post intervention and after one month (25 %).

Table 2 reveals mean score of studied patient's performances pressurized metered dose inhaler in the study and control groups. This table shows that, the study group had significantly higher total mean performance score regarding metered dose inhaler immediately post intervention and after one month (10.40 ± 1.72 & 10.20 ± 2.07) respectively) compared to pre-intervention (3.52 ± 1.97). In contrast, the control group maintained relatively consistent total mean performance score across the three time points: pre-intervention (3.65 ± 2.33), immediately post-intervention (3.52 ± 2.26), and after one month (3.47 ± 2.06), with a p-value > 0.05.

Figure 2 reveals distribution of studied groups regarding their total level of shortness of breath during daily activities. This figure shows that more than one-third (37.5%) of the study group complained of severe shortness of breath pre-intervention. The level of shortness of breath significantly decreased in the study group immediately post- intervention to (12.5%)and (10 %)after one month. In comparison (32.5%)of patients in the control group complained of severe shortness of breath pre-intervention, with (29.5%) still reporting severe shortness of breath immediately post-intervention and (28.5%) after one month. Moreover, there were highly statistically significant differences between the study and control groups regarding the level of shortness of breath immediately post-intervention and after one month ($p < 0.01$).

Table 3 reveals mean score of studied patient's shortness of breath in the study and control groups during daily activities. This table shows that, the patients in the study group had higher total mean score of shortness of breath in pre intervention (51.60 ± 9.36) but significantly decreased total mean score of shortness of breath immediately post intervention to be (18.87 ± 1.50) and after one month (22.57 ± 2.10), While total mean score

of shortness of breath in the control group was in pre intervention (46.62 ± 3.42) and still had higher total mean score of shortness of breath immediately post intervention (50.15 ± 5.26) and (52.07 ± 5.57) after one month. There was a highly statistically significant difference between the study and control groups regarding total mean score of shortness of breath immediately post intervention and after one month where ($p < 0.001$).

Figure 3 reveals distribution of studied groups regarding their total level of medication adherence. This table shows that the majority of patients in the study group (80%) had a low medication adherence level pre intervention. This percentage significantly decreased to (25%) immediately post-intervention and (30%) after one month, indicating a higher level of medication adherence compared to the control group, where (70%) had a low medication adherence level pre-intervention, with (60%) immediately post-intervention and (57.5%) after one month.

Table 4 reveals mean score of studied patient's medication adherence in the study and control groups. This table illustrates that the total mean score of medication adherence in the study group was (6.02 ± 2.14) pre-intervention. However, it significantly improved immediately post-intervention, reaching (1.55 ± 2.69) and continued to show improvement after one month to (1.92 ± 2.92). In contrast, the control group relatively consistent in the total mean score of medication adherence pre-intervention, with a score of (5.42 ± 2.66), immediately post-intervention, with a score of (5.70 ± 2.58) and after one month, with a score of (5.87 ± 2.39).

Part (I): Sociodemographic characteristics of both study and control groups.

Table (1): Distribution of studied groups according to their sociodemographic data (n= 80).

Sociodemographic data	Study group (n=40)		Control group (n=40)		X^2	P- value
	No	%	No	%		
Age						
< 40 years	9	22.5	9	22.5	0.60	0.740 ns
40-< 50 years	11	27.5	14	35		
50-< 60 years	20	50	17	42.5		
M±SD	47.10 ± 8.90		45.82 ± 7.77		t = .682	0.497 ns
Gender						
Male	29	72.5	24	60	1.39	0.237 ns
Female	11	27.5	16	40		
Marital status						
Single	1	2.5	4	10	2.81	0.421 ns
Married	34	85	33	82.5		
Widowed	3	7.5	1	2.5		
Divorced	2	5	2	5		
Occupation						
Manual work	20	50	16	40	5.04	0.168 ns
Administrative work	8	20	15	37.5		
House Wife	11	27.5	6	15		
Don't work	1	2.5	3	7.5		
Work hours	(n= 28)		(n= 31)		0.57	0.902 ns
6 hours	2	7.1	1	3.1		
8 hours	15	53.6	16	51.7		
10 hours	7	25	9	29.1		
12 hours	4	14.3	5	16.1		
Number of house rooms						
One	20	50	7	17.5	21.95	0.000 hs
Two	13	32.5	33	82.5		
Three	4	10	0	0.0		
Four	3	7.5	0	0.0		
Entrance of sun inside house						
Yes	15	37.5	17	42.5	0.20	0.648 ns
No	25	62.5	23	57.5		
Rooms with good ventilation						
Yes	10	25	10	25	0.00	1.000 ns
No	30	75	30	75		
Sewage						
Yes	7	17.5	10	25	0.67	0.412 ns
No	33	82.5	30	75		

Note: **hs:** high significant (p value ≤ 0.01).
s: significant (p value ≤ 0.05).
ns: not significant (p value > 0.05).

Figure (1): Distribution of studied groups according to their level of administration of pressurized metered dose inhaler throughout the study period (n=80).

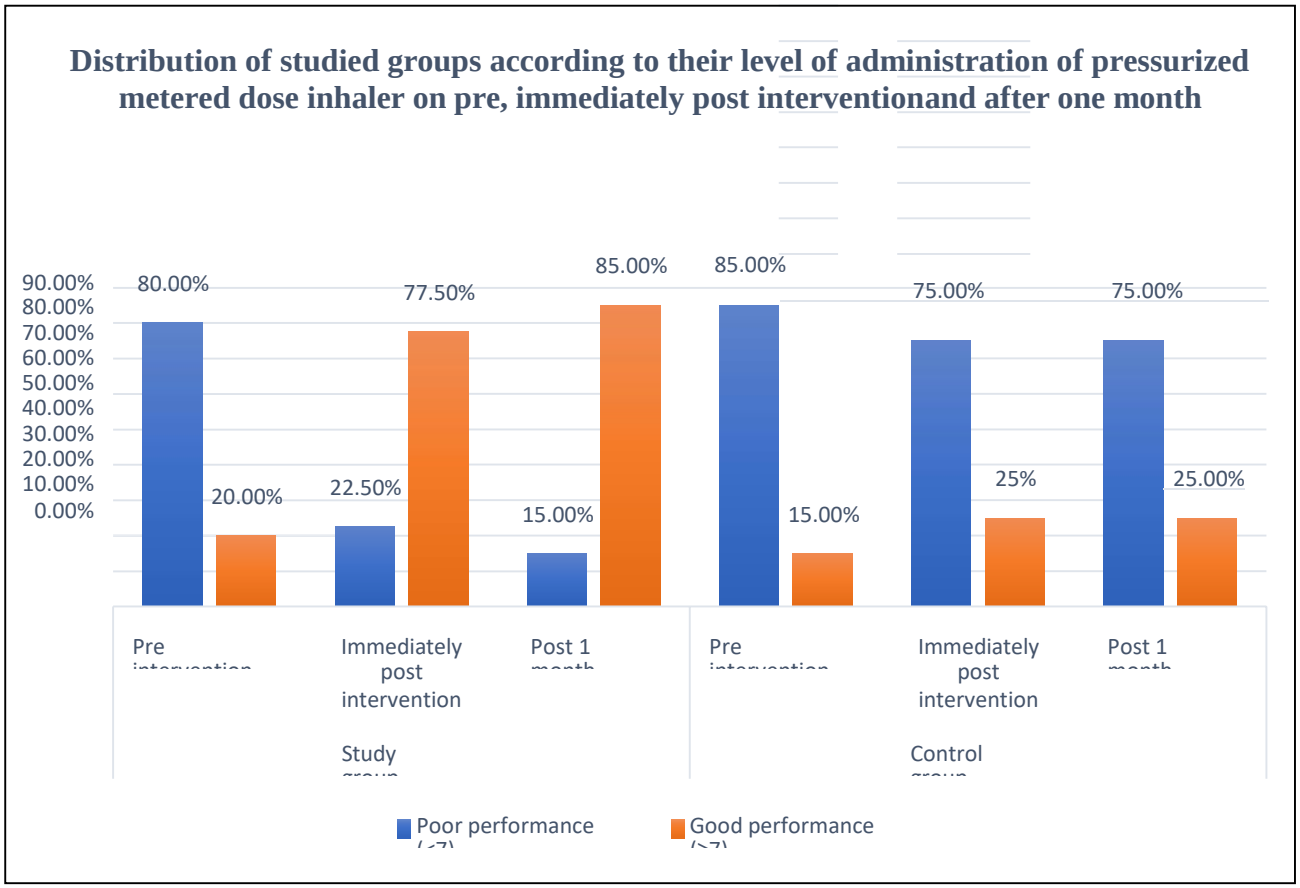

Table (2): Mean score of studied patient's performances pressurized metered dose inhaler in the study and control groups throughout the study period (n=80).

Performance score	Study group			Control group			Independent t test (P-value)
	Pre intervention	Immediately post intervention	Post 1 month	Pre intervention	Immediately post intervention	Post 1 month	
X ± SD	3.52 ± 0.97	10.40 ± 1.72	10.20 ± 1.07	3.65 ± 0.33	3.52 ± 0.26	3.47 ± 0.06	15.286 (0.000) hs
ANOVA test	164.348			0.066			
P-value	0.000 hs			0.936 ns			

Note: hs: high significant (p value ≤ 0.01). **s:** significant (p value ≤ 0.05). **ns:** not significant (p value > 0.05).
T test: represents comparison between the study and control groups on immediate post intervention.
ANOVA test: represents comparison between pre-intervention, immediate and 1month post intervention among the study and control groups.

Figure (2): Distribution of studied groups regarding their total level of shortness of breath during daily activities throughout the study period (n=80).

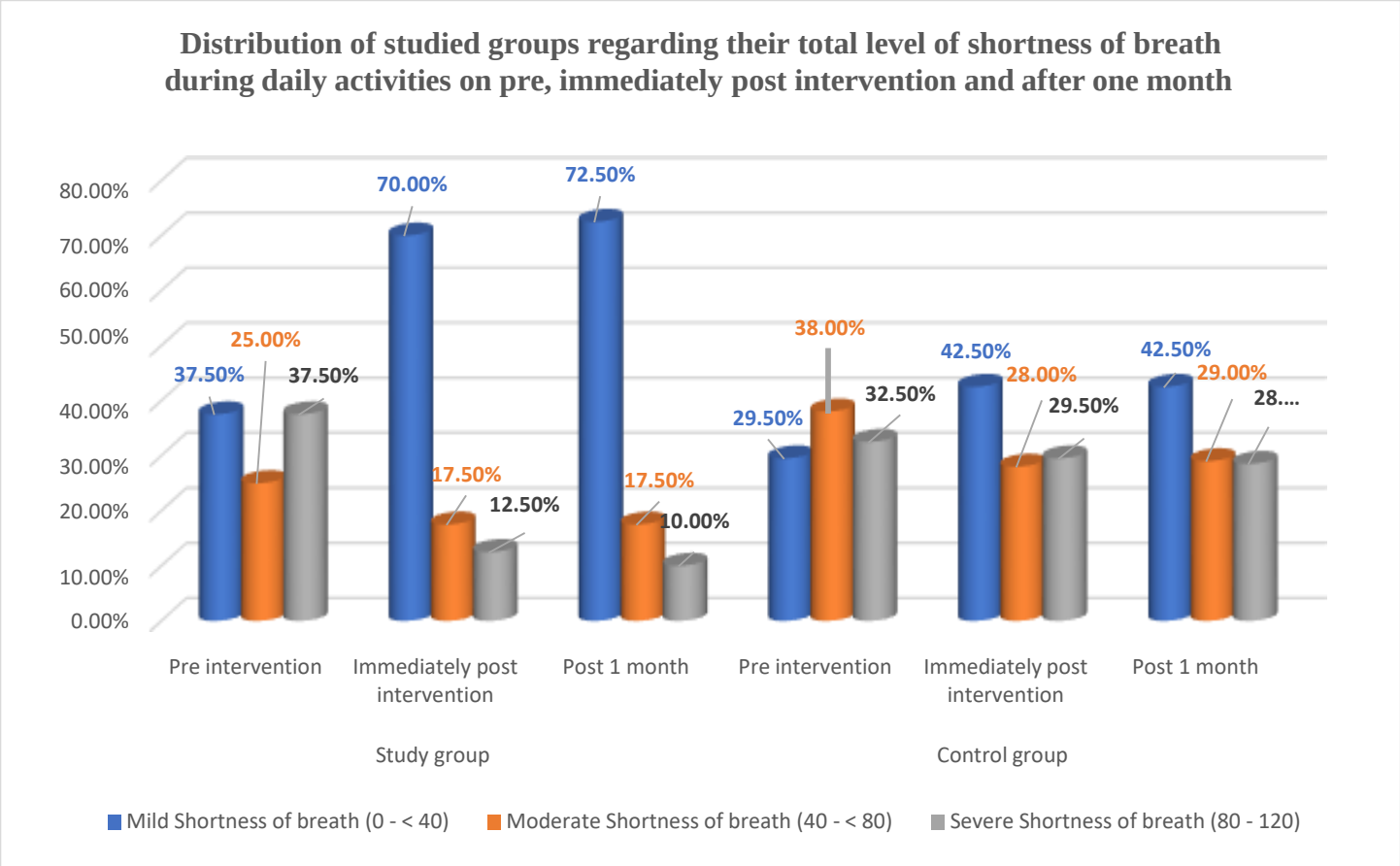

Table (3): Mean score of studied patient's shortness of breath in the study and control groups during daily activities throughout the study period (n=80).

Shortness ofbreath score	Study group			Control group			Independent ttest (P-value)
	Pre intervention	Immediately post intervention	Post 1 month	Pre intervention	Immediately post intervention	Post 1 month	
X ± SD	51.60 ± 9.36	18.87 ± 1.50	22.57 ± 2.10	46.62 ± 3.42	50.15 ± 5.26	52.07 ± 5.57	-6.584 (0.000) hs
ANOVA test	68.088			0.585			
P-value	0.000 hs			0.624 ns			

Note: hs: high significant (p value ≤ 0.01). **s:** significant (p value **≤ 0.05). ns: not significant (p value > 0.05).**
ttest: represents comparison between the study and control groups on immediate post intervention.
ANOVA test: represents comparison between pre-intervention, immediate and 1month post intervention amongthe study and control groups.

Figure (3): Distribution of studied groups regarding their total level of medication adherence throughout the study period (n=80).

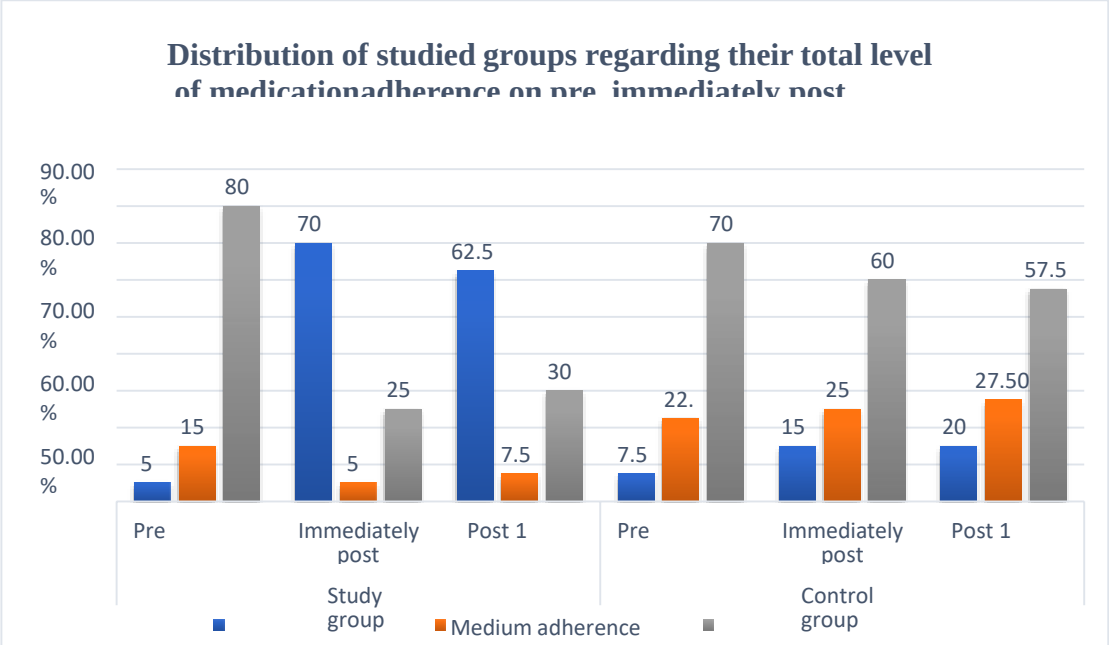

Table (4): Mean score of studied patient's medication adherence in the study and control groups throughout the study period (n=80).

Medication adherence	Study group			Control group			Independent t test (P-value)
	Pre intervention	Immediately post intervention	Post 1 month	Pre intervention	Immediately post intervention	Post 1 month	
X ± SD	6.02 ± 1.14	1.55 ± 0.36	1.92 ± 0.42	5.42 ± 1.26	5.70 ± 1.58	5.87 ± 1.39	-7.026 (0.000) hs
ANOVA test	36.158			0.316			
P-value	0.000 hs			0.730 ns			

Discussion

Bronchial asthma is often triggered by exposure to allergens, irritants, exercise, or respiratory infections. Therefore, it is important to identify and avoid these triggers to prevent exacerbations in patients with bronchial asthma. Patients should work closely with their healthcare providers to receive a comprehensive educational module. This module aims to educate patients with asthma and their families about asthma triggers, proper inhaler techniques, recognizing early signs of asthma exacerbations, as well as lifestyle modifications such as smoking cessation and environmental control measures (Hashmi et al., 2023).

This discussion covered the following aspects: performance regarding the use of pressurized metered-dose inhalers, assessment of dyspnea severity, and medication adherence among the studied groups.

Regarding patients' performance of pressurized metered dose inhaler level pre and post educational nursing intervention, the findings of the present

study indicate that both the study group and control group pre-intervention had poor levels of performance in using pressurized metered dose inhalers. However, immediately post-intervention, as the majority of the study group showed a significant improvement in their inhaler technique and was sustained even after one month compared to the control group. These findings are consistent with the study conducted by Guzenda et al., (2024) who demonstrated that, the percentage of significant improvement after the training program was more than three-quarters of the studied patients.

Also, Choomuang et al., (2022) found that, a significant proportion, three quarters of studied patients were performing essential steps incorrectly before the training. However, after receiving the large group demonstration training, there was a statistically significant increase, more than two thirds in the correct technique.

Similarly, in the study conducted by Abd El Hamid & Amer, (2023) revealed that, there was significant improvement in study group regarding inhaler technique training program from one quarter to more than three-quarters.

On the same point, Raghavendran & Sheila, (2021) showed that the majority of patients had inappropriate practice in the pretest, but after the intervention, the majority demonstrated appropriate practice. Also, Karle et al., (2020) found that the correct response rate significantly increased from the pretest, approximately half to three quarters in the posttest. In addition, Elboraey et al., (2019) reported that around three-quarters had good skills related to inhaler use, with a small percentage, about one quarter considered average or poor.

These findings from previous studies generally support the acceptance of the first study hypothesis, which stated that the study group that received the educational module had a higher level of practicing inhaler treatment compared to those patients in the control group who did not receive it.

From the researcher's point of view, the significant improvement in the study group's performance of the pressurized metered dose inhaler compared to the control group, emphasizes the importance of the guidelines and learning instructions supported by the illustrative colored booklet that was given by the researcher to the study group during sessions, while the low awareness level before the intervention demonstrates the patient's need for educational module.

Regarding mean score of shortness of breath, the findings of the current study indicate that, the mean score of severity of dyspnea for the study group was high before the intervention that was statistically significant decreased immediately post intervention. These findings are consistent with a study conducted by Budiman & Garnewi, (2021) who reported that a significant improvement in level of dyspnea of the studied group post-intervention compared to pre-intervention. Additionally, Kumar et al., (2020) revealed that both studied groups showed a significant improvement post-intervention. Also, Mohamed, (2019) demonstrated that, there was statistically significant improvement in mean score

after intervention of program in the study group than pre intervention.

These results from previous studies generally support the second study hypothesis that implementing an educational module led to a positive impact on reducing dyspnea episodes and their severity grade among the study group compared to the control group.

From the researcher's point of view, the results of the study indicate that the educational module had a positive effect on reducing dyspnea in the study group post intervention as evidenced by the significant improvement in mean score observed among the patients who received it.

Regarding Medication adherence pre and post educational intervention, the current study results showed a highly significant improvement in medication adherence in the study group after the educational intervention. This finding aligns with the study conducted by Hassan et al., (2024) reported that approximately two-thirds of the adolescents in the study group had a high level of medication adherence post-intervention. These differences were statistically significant when compared to the control group. Similarly, El Abed et al., (2023) demonstrated an improvement in medication adherence score, with a significant increase in the proportion of studied patients with good adherence three months after the educational intervention. Furthermore, Blervaque et al., (2021) demonstrated that the rate of adherence to pulmonary rehabilitation maintenance program had significant benefits for patients participating in this program. In the same point, Paoletti et al., (2020) indicated that a targeted educational intervention by clinical pharmacists effectively improved therapy adherence.

Additionally, Weheida et al., (2017) found that the majority of studied patients had higher adherence to medication after the intervention compared to before.

These results from previous studies generally support the third study hypothesis of implementing an educational module that leads to a positive impact on adherence to inhalation therapy of patients in the study group compared to those patients in the control group who did not receive it.

From the researcher's point of view, the results of this study stress the importance of the educational module was given to the study group by the researcher that overcome gab between knowledge and practical application, ultimately resulting in improved adherence to inhalation therapy among the study group in comparison to control group.

Conclusions

Based on the findings of the current study, it can be concluded that the educational module had a positive impact on reducing dyspnea episodes and their severity grade in the study group (group I) compared to the control group (group II). Moreover, the educational module demonstrated a significant effect on enhancing the level of practicing inhaler treatment in the study group (group I) in comparison to the control group (group II). Additionally, the educational module exhibited a high significant effect on improving adherence to inhalation

therapy in the study group (group I) compared to the control group (group II).

Recommendations

Recommendations for patients with bronchial asthma include implementing supervised continuous educational modules in hospitals to enhance patients' knowledge and awareness about bronchial asthma and its management. Developing and implementing strategies to enhance and sustain adherence levels among patients with bronchial asthma, including providing counseling services to patients experiencing periodic exacerbation of symptoms. Distributing colored, illustrated, comprehensive, and Arabic booklets to patients with bronchial asthma and their family members, especially those who are newly admitted.

Establishing a comprehensive website containing all relevant information about bronchial asthma, including various educational materials, media resources, and audio-visual aids, to improve patients' health status. Additionally, utilizing digital tools such as specialized mobile apps and telehealth platforms can enhance patient education.

Recommendation for further research include similar study be replicated in various settings, including different healthcare facilities like chest clinics or diverse geographical locations, utilizing a larger probability sample to validate and generalize the findings. Additionally, a study should incorporate seasonal variation to assess disparities in the effectiveness of the educational module between winter and summer, considering the seasonal triggers and challenges experienced by patients with bronchial asthma. This approach can provide valuable insights into the impact of seasonal factors on educational interventions for asthma management, aiding in the development of more tailored and effective strategies for different times of the year.

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