

Effect of an Educational Nursing Program on Patients' Adherence to Drugs, Nicotine Dependency and Degree of Asthma Control among Asthmatic Patients

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Received November 03, 2019; Revised December 05, 2019; Accepted December 18, 2019

Abstract Background: To effectively control chronic diseases such as asthma, it is important to provide patients with education and skills. Aim of the study: To evaluate the effect of an educational nursing program on patients' adherence to drugs, nicotine dependency and degree of asthma control among asthmatic patients. Patients and Methods: A quazi experimental (pre/ post-test) research design, the study was conducted in Chest diseases department and its outpatient clinic at Assiut university hospital, a purposive sample of sixty adult male asthmatic patients, their age ranged from 18 – 65 years were selected. Unconscious or comatose patients and patients with co-morbid diseases as COPD or sleep apnea were excluded from the study. Five tools were used, Tool I: patients interview questionnaire sheet that included, demographic patient variables, medical assessment, and patient's knowledge about asthma, Tool II: Fagerstrom Tolerance Questionnaire, Tool III: Morisky Medication Adherence Scale, Tool IV: Asthma Control Test (ACT) for people 12 yrs and older, and Tool V: Educational Nursing program. Results: There were statistically significant differences pre & post the educational nursing program regarding Patients' knowledge about asthma, adherence to medications and degree of asthma control with ($p < 0.001$), ($p < 0.001$) and ($p < 0.01$) respectively. Also, there was a decrease in the number of patients regarding nicotine dependency post-implementation of the educational nursing program than before but unfortunately not reached a statistically significant difference. Conclusions: An improvement in patients' adherence to drugs, and their control over asthma disease were observed among the patients after applying the educational nursing program. Recommendation: Asthmatic patients should be provided by continuous education and nursing instructions to help them control their chronic disease.

Keywords: adherence, asthma, nicotine dependency, educational nursing program

Cite This Article: Wafaa Ramadan Ahmed, Ghada Thabet Mohammed, and Esmat Sayed Abd Elmageed, "Effect of an Educational Nursing Program on Patients' Adherence to Drugs, Nicotine Dependency and Degree of Asthma Control among Asthmatic Patients." *American Journal of Nursing Research*, vol. 8, no. 1 (2020): 82-90. doi: 10.12691/ajnr-8-1-9.

1. Introduction

Asthma is a common chronic inflammatory disease of the airways. It is marked by different and recurring symptoms, reversible obstruction of the airflow, and bronchospasm. Asthma is caused by a combination of genetic and environmental factors. Its diagnosis is usually based on the pattern of symptoms, response to therapy over time and spirometry. Symptoms include episodes of shortness of breath, coughing, wheezing, and chest tightness. These episodes can occur several times a day or several times per week [1].

Asthma symptoms usually occur in response to a trigger. Common triggers include: infections like colds and flu, medications; particularly anti-inflammatory painkillers like ibuprofen and aspirin, allergies such as smoke, dust

mites, fumes, pollen, animal feathers or fur, and pollution, weather such as cold air, wind, thunderstorms, heat and humidity, sudden changes in temperature, mold or damp, emotions; as stress, and exercise [2].

In both developed and developing countries, asthma has dramatically increased incidence over the past fifteen years. Asthma's global burden is considerable. Its effects include lower quality of life, loss of productivity, missed school days, increased cost of health care, risk of hospitalization and even death [3].

Nurses play a key role to take care and educate asthmatic patients because they are always the first professional staff to contact with them. As a health care provider, normally, asthma nurses start getting information from patients about what is the patient's perception of asthma, through a conversation; the nurse would assess the patient's knowledge about asthma. According to the patient's condition, education is based on

the updated evidence to suggest the behavior changing during the patient's daily life. Guide patients about self-management plan, help them to achieve the appropriate self-monitoring, and able to manage asthma attack are also important parts of nurses' role [4].

Education of patients is the foundation to promote compliance and efficient self-management. Assessing and understanding patient adherence to asthma management needs an appreciation of adherence behavior's diversity and complexity. Adherence to medication is described as the degree to which the use of medication by the patient corresponds to the prescribed regimen. Patients who frequently and continuously follow the prescribed regimen demonstrate adherence. However, adherence to medication is not a dichotomy; patients can show a broad range of medication usage patterns [5].

Poor adherence to guidelines for asthma management contributes to increased morbidity and asthma mortality. Increased symptoms, more frequent bursts of oral steroids, and health care use were associated with non-adherence to medication. Second-hand smoke exposure was associated with lower life scores, lower lung function, increased use of rescue inhalers and increased risk of visits to emergency rooms, hospitalization and admission to the intensive care unit [6].

Effective control of asthma depends on asthma-based guideline therapies. Asthma management demands patients to engage actively in multiple self-management behaviors, as symptoms self-monitoring, the use of an asthma action plan, practices of environmental control and regular adherence to pharmacotherapy using suitable device techniques. There is strong evidence that asthma can be very effectively controlled when patients adhere to these multiple recommendations [7].

1.1. Significance of the Study

Asthma is a common chronic respiratory disease that leads to morbidity, impaired quality of life and death worldwide. Asthma affects around three hundred million people around the world and causes 250,000 deaths annually [8]. At Assiut University Hospital around 280 cases of asthmatic patients were admitted to the chest disease department because of exacerbation of their asthma [9]. Assessment of the patients' knowledge, nicotine dependency and medication adherence is crucial for increasing the patients' improvements, wellbeing, and control of asthma as well as preventing them from disease complications.

1.2. Aim of the Study

To evaluate the effect of an educational nursing program on patients' adherence to drugs, nicotine dependency and degree of asthma control among asthmatic patients

1.3. Hypothesis

Patients will experience an increase in their adherence to asthma drugs, decrease nicotine dependency and increase the ability to control asthma after applying the educational nursing program than before.

2. Patients and Methods

Research design: A quazi experimental (pre/ post-test) research design was utilized to carry out this study.

Study variables: The independent variable in this study was the educational nursing program while the dependent variables were: patients' adherence to asthma drugs, nicotine dependency and degree of asthma control.

Setting: The study was conducted in Chest diseases department and its outpatient's clinic at Assiut University Hospital.

Sample: A purposive sample of sixty adult male asthmatic patients, their age ranged from 18 – 65 years were included in the study. Unconscious, comatose patients or patients with co-morbid diseases as COPD or sleep apnea were excluded from the study.

2.1. Sample Size

The sample size was determined statistically by power analysis. The calculation was done considering the following: type I error with significant level (α) = 0.5, type II error by power test (1-B) = 80% [10]. It was found that the minimum sample size was 55 patients. Although the minimum number of 55 patients was required by power analysis, the researchers decided that 60 patients will be more proper because the non-response rate was expected to be lost from the subjects.

2.2. Tools

Tool I: Patients interview questionnaire sheet

It was designed by the researchers based on the literature review. It composed of three parts:

- **Part 1: Demographic data.** It included: Patient's name, age, marital status, level of education, and occupation.
- **Part 2: Medical assessment:** It included assessment of risk factors for developing asthma, chronic disease, body mass index, smoking index, and previous family history of the disease.
- **Part 3: Patients' knowledge about asthma:** It included definition, signs and symptoms, causes, asthma triggers, how to prevent exposing to asthmatic attack, how to control asthma, and how to use a single-dose asthma sprayer.

Scoring system:

The total number of questions was 15 list questions. Each right answer was given one score and zero for the wrong answer. The total scores were 75 degrees.

Tool II: Fagerstrom Tolerance Questionnaire: it was created by Fagerstrom [11] to measure the severity of physical nicotine addiction. It was developed to provide an ordinal cigarette-related indicator of nicotine dependence. It contains six questions that assess the amount of cigarette consumption, the compulsion to use, and dependence. The physician may use the clinic's Fagerstrom test to record nicotine withdrawal drug prescriptions. Researchers implemented it to evaluate the dependence on nicotine in asthmatic patients.

Scoring system:

Yes / no items are scored from zero to one and multiple-choice items are scored from zero to three. The items are summed to a total score of 0-10. The higher total Fagerstrom score, the more intense is the patient's physical dependence on nicotine. One - two = low dependence, three - four = low to moderate dependence, five - seven = moderate dependence, and 8+ = high dependence.

Tool III: Morisky Medication Adherence Scale (MMAS 8): It is a scale of adherence to self-reported medication, measured by Morisky et al [12]. It used to evaluate the adherence level of the patient to their drugs. 8 Questions were used to evaluate the patient's forgetfulness, understanding the need for continued medication, and adhering to the daily treatment plan. **Scoring system:**

A score of 0 was given for a positive response while a score of 1 was given for a negative response for questions 1, 2, 3, 4, 6, and 7 (yes =0, No =1). Contrariwise, for item 5, a score of zero was given for a negative response while a score of one was given for a positive response (yes =1, No =0). The last item contributes a score between zero and one in 0.25- point increments on a 5-point scale assessing the frequency patients forget to take medications (never =1, once in a while =0.75, sometimes =0.5, usually =0.25, and all the time =0).

The total score is a summation of all MMAS-8 items and ranges between zero and eight, with a score of 8 considered as high adherence, 7 or 6 considered as medium adherence, and < 6 considered as low adherence.

Tool IV: Asthma Control Test (ACT) for people 12 yrs and older: A quick test that provides a numerical score to evaluate the degree of asthma control [13]. The Asthma Control Test will provide patients with a snapshot of how well asthma was controlled in the past month, providing a simple score of 25. Asthma symptoms may vary month after month, so the test should be handy to see if the score changes. In fact, the findings should be discussed with the doctor or asthma nurse to help explain how asthma affects the patient.

Scoring system:

Less than 20 = off-target; asthma may not have been controlled during the past month. A doctor or nurse can recommend an asthma action plan to help improve a patient's asthma control.

20 to 24 – On target; asthma appears to have been reasonably well controlled during the past month. A doctor or nurse can recommend an asthma action plan to help improve the patient's asthma control.

25 = Well done; asthma appears to have been under control over the last month. However, if the patient is experiencing any problems with asthma, he should see his doctor or nurse.

Tool V: Educational Nursing program:

This tool was developed by the researchers based on the review of the relevant literature and research results to provide asthmatic patients with the needed knowledge and skills to increase patients' control over asthma. The nursing educational booklet included two parts (theoretical and practical):

The theoretical part included:

- Definition of asthma, signs and symptoms of asthma, and asthma triggers.

- Nursing instructions for controlling asthma as: recognize and avoid irritants, take the medications regularly, do not smoke, and do not exist in places that emit smoke, wipe the dust with a damp cloth, and do not take aspirin or any other medication without consulting the doctor. Avoid exposure to strong odors, air fresheners, car smoke, factories, pollen, and dust. Refrain from buying pets with hair and feather-like cats and birds at home or at least keeping them away from the infected person. Combating cockroaches with insecticides and cleaning continuously, disposal of carpets and the use of erasable floors by wiping, do not use pillows or covers made of feathers and replace them with polyester pillows, disposal of games made of cotton or fur or washed at least weekly. Additionally, symptoms and signs that require urgent seeking medical advice as difficulty catching a breath or talking, flaring nostrils while breathing, cyanosis of lips and nails, or difficulty walking.
- Nursing instructions for reducing or giving up smoking as: Find the reason, prepare before you go, consider nicotine replacement therapy, learn about prescription pills, lean on the loved ones, give yourself a break, clean house, try and try again, get moving, eat fruits and vegetables, choose your reward, and remember that time is on your side.
- **The practical part** of the educational nursing program included steps of using a single-dose asthma sprayer.

2.3. Ethical Considerations

- The study was approved by the Faculty of Nursing ethics committee, an oral agreement was obtained from patients to participate in the study after explaining the aim and nature of the study to them. Data confidentiality and anonymity was assured and patients were informed that their participation in the study is voluntary and will not affect the care they receive if they decided to withdraw from the study.

2.4. Validity and Reliability

- The tools were tested for content validity by 5 experts (2 academic internal Medicine (chest diseases) staff and 3 nursing staff from Faculty of Nursing) at Assiut University who reviewed the tools for clarity, relevance, comprehensiveness, and understanding. Minor modifications were required and the correction was carried out accordingly.
- The final form of the tool was designed and tested for reliability by using internal consistency for the tools measured using Cronbach's alpha (tau-equivalent reliability) coefficient for tools (I, II, III, and IV) ($r = 0.817, 0.794, 0.870, \text{ and } 0.894$ respectively).

2.5. Procedure

- Official permission to conduct the proposed study was obtained from the head of the chest disease

department and its outpatient clinics at Assiut University Hospital. At the initial interview, the researchers introduced themselves to initiate a line of communication and explain the nature and purpose of the study. A pilot study to test the research tools' feasibility, objectivity, validity, and applicability were performed on 10 percent of the sample. No changes were made; the pilot study sample was included in the study.

- Data were collected from October 2018 to March 2019. Data were collected from 60 patients through an interviewing questionnaire sheet before applying the educational nursing program using tools (I, II, III, and IV). The total time for collecting the data was about 30 minutes for every patient. The educational program (tool V) was administered to the patients in three sessions; the duration of each session was about 45 minutes, including 15 minutes for discussion and feedback by using lecture for knowledge and videos for practice. The study was carried out in the morning and afternoon shifts. Patients divided into small groups (2- 3 patients).
- **First session:** The researchers started by introducing themselves to the patients, telling them the aim of the meeting, and orient patients regarding the educational program. The contents of this session include a definition of asthma, signs, and symptoms of asthma, asthma triggers, and nursing instructions for controlling asthma.
- **Second session:** It started with a summary of what has been discussed in the previous session, objectives of the new session, and contents of this session (nursing instructions for reducing or giving up smoking which included 12 devices). The session ended with a summary of its content and feedback from the patients. Many patients were cooperative and interested in a given topic and asked to continue.
- **Third session:** It started with a summary about what has been discussed in a previous two sessions, objectives of the new session, and contents of this session (steps of using a single-dose asthma sprayer). After completing the sessions, every patient was given a hard copy of the educational booklet to help them to remember at home. The researchers ensured the commitment of the patients to implement the program weekly by telephone.
- An evaluation was carried out after four weeks at the outpatients' clinic to evaluate the effect of the educational nursing program using the same tools (I part 3, II, III, and IV). The meeting took approximately 30 minutes to fill the tools.

2.6. Statistical Design

Using the Anderson-Darling test, the data were checked for normality and for variances in homogeneity before further statistical analysis. Categorical variables were defined by number and percentage (N & percent), where the mean and standard deviation (Mean, SD)

were described as continuous variables. Chi-square test and Fisher exact test used to compare categorical variables, t-test, Pearson, and Spearman correlation coefficients were applied to continuous variables, a two - tailed $p < 0.05$ was deemed statistically significant. All analyses were performed with the IBM SPSS 20.0 software.

3. Results

Table 1. Distribution of the study sample related to demographic data

Demographic data	N= 60	%
Age in years:		
18 < 35.	6	10.0%
35 < 50.	32	53.3%
50 ≥ 65	22	36.7%
Mean±SD	47.2±10.0	
Marital status:		
Single	0	0.0%
Married	54	90.0%
Divorced	2	3.3%
Widow	4	6.7%
Level of education:		
Illiterate	20	33.3%
Primary	18	30.0%
Secondary	22	36.6%
University	0	0.0%
Occupation:		
Farmer	16	26.7%
Carpenter	18	30.0%
Painter	16	26.7%
Employee	10	16.6%

Table 1: shows that more than half of patients their age were between 35 < 50 years with mean & SD 47.2±10.0, the majority of them (90.0%) were married. All of them were nearly equally divided into three groups between illiterates, primary and secondary education levels. According to occupation most of the patients were unemployed as farmers, carpenter, and painter which considered risky jobs.

Table 2: clarifies that the most common risk factors of developing asthma were exposure to house dust met (80%), cigarette smoke (56.7%), sinusitis, or allergic rhinitis (46.7%), aspirin (43.3%), wood and vegetable dust as an occupational exposure (50%), exercise and exposure to cold, dry air (50%), and stress (50%). Also, more than one-third of patients were diabetics and hypertension and overweight or obese. Additionally, more than half of the patients were moderate smokers. Finally, more than one-third of patients have a previous family history of asthma.

Table 3: reflects that there was a highly statistically significant difference between pre & post-application of the educational nursing program regarding patients' knowledge about asthma.

Table 2. Distribution of the study sample related to medical data:

Medical data assessment	N= 60	%
A. Risk factors		
Allergen inhalation:		
• Animal Dander	28	46.6%
• House dust mite	48	80%
• Cockroaches	0	0%
• Pollens	24	40%
• Molds	18	30%
Air pollutants:		
• Exhaust fumes	32	53.3%
• Perfumes	16	26.7%
• Cigarette smoke	34	56.7%
• Aerosol sprays	0	0%
Inflammation and infection:		
• Viral upper respiratory tract infection	26	43.3%
• Sinusitis, allergic rhinitis	28	46.7%
Drugs:		
• Aspirin	26	43.3%
• Nonsteroidal anti-inflammatory drugs (NSAIDs)	14	23.3%
• β -Adrenergic blockers	16	26.7%
Occupational exposure:		
• Agriculture, farming	22	36.7%
• Paints, solvents	16	26.7%
• Metal Salts	8	13.3%
• Wood and vegetable dust	30	50%
• Industrial chemicals and plastics	16	26.7%
• Pharmaceutical agents	6	10%
Other factors:		
• Exercise and cold, dry air	50	83.3%
• Stress	50	83.3%
• Gastroesophageal reflux disease (GERD)	0	0%
B. Chronic diseases:		
• Diabetes mellitus	26	43.3%
• Hypertension	18	30%
• Coronary heart disease	0	0%
• Stroke	0	0%
C. Body mass index(BMI):		
• Low weight (< 20 kg/m ²)	0	0%
• Standard level of weight (20 < 26 kg/m ²)	14	23.3%
• Overweight (26 < 30 kg/m ²)	26	43.3%
• Obese (30 < 40 kg/m ²)	20	33.3%
• Morbid obesity (> 40 kg/m ²)	0	0%
D. Smoking index: No. of cigarettes/day \times No of years		
• Mild \leq 200	16	26.7%
• Moderate 200 – 400	36	60%
• Severe \geq 400	8	13.3%
E. Previous family member history of the disease:	22	36.7%

Table 3. The mean knowledge score of the study sample pre & post-application of the educational nursing program

Knowledge level	Pre (n=60)	Post (n=60)	P. value
Mean \pm SD	36.6 \pm 8.8	64.0 \pm 10.6	0.0001**

** Statistically significant at p. value<0.001.

Table 4. Comparison between pre & post-application of the educational nursing program regarding nicotine dependency scale

Nicotine dependency scale.	Pre (n=60)		Post (n=60)		P.value
	N.	%	N.	%	
• Low dependence	0	0.0%	0	0.0%	0.409
• Low to moderate dependence	0	0.0%	3	8.8%	
• Moderate dependence	0	0.0%	5	14.7%	
• High dependence	34	100.0	26	76.5%	

Table 4: illustrates that there was no statistically significant difference between pre & post-application of the educational nursing program regarding nicotine dependency.

Table 5. Comparison between pre & post application of the educational nursing program regarding the Morisky Medication Adherence Scale

Nicotine dependency scale.	Pre (n=60)		Post (n=60)		P.value
	N.	%	N.	%	
• Low adherence	46	76.7%	14	23.3%	0.0001**
• Medium adherence	14	23.3%	40	66.7%	
• High adherence	0	0.0%	6	10.0	

** Statistically significant at p. value<0.001.

Table 5: reflects that a highly statistically significant difference was found between pre & post - application of the educational nursing program regarding the Morisky Medication Adherence Scale.

Table 6. Comparison between pre & post the educational nursing program application regarding Asthma Control Test

Asthma Control Test	Pre (n=60)		Post (n=60)		P.value
	N.	%	N.	%	
• Off-target	58	96.7%	46	63.3%	0.005*
• On target	2	3.3%	14	23.3%	

* Statistically Significant at p. value< 0.01.

Table 6: reflects that there was a statistically significant improvement among the studied patients after the application of the educational nursing program regarding Asthma Control Test.

Table 7. Relation between Asthma Control Test & Medication adherence scale among the studied patients' post-application of the educational nursing program

Asthma Control Test Score	Medication adherence scale			P.value
	low adherence	Medium adherence	high adherence	
Off-target	8	38	0	0.003*
On target	0	8	6	

* Statistically Significant at p. value< 0.01.

Table 7: reflects that there was a significant statistical relation between the Asthma Control Test & Medication adherence scale post educational nursing program applications.

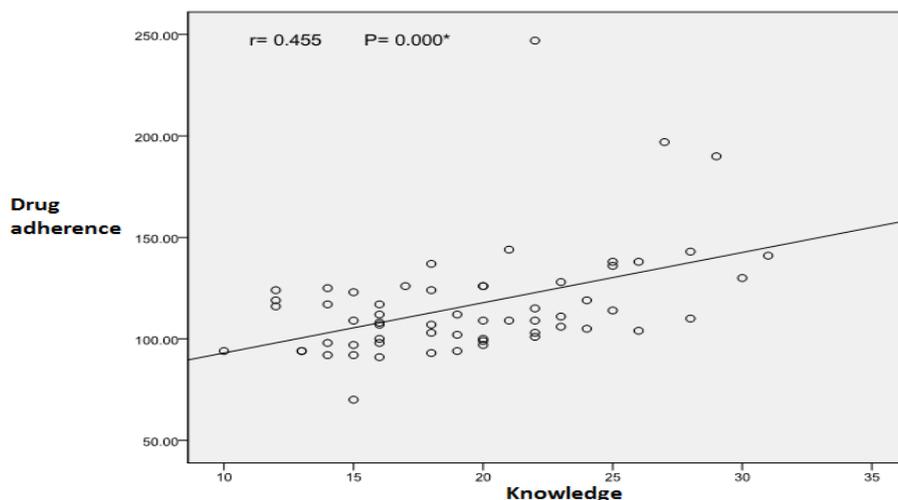


Figure 1. Correlation between patients' knowledge and adherence to drugs post-application of the educational nursing program

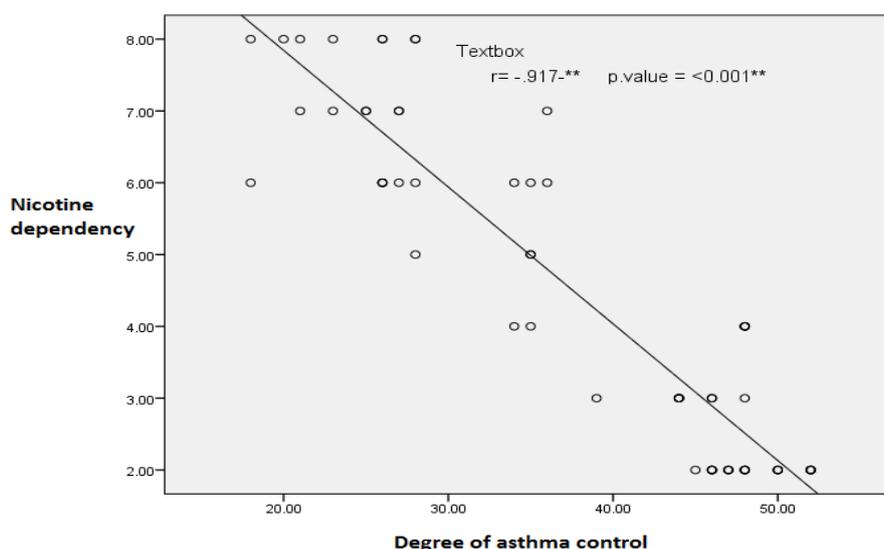


Figure 2. Correlation between nicotine dependency and degree of asthma control post the educational nursing program application

Figure 1 shows a positive correlation between patients' knowledge and adherence to drugs post-application of the educational nursing program which means that as the patients' knowledge increased the degree of patients' drug adherence increased.

Figure 2 shows a negative correlation between nicotine dependency and degree of asthma control post the educational nursing program application which means as the patients' nicotine dependency increased the patients' degree of asthma control decreased.

4. Discussion

Regarding the demographic data, the current study revealed that more than half of patients their age was between 35 < 50 years with mean & SD 47.2±10.0 years. The majority of them were married. All of them nearly were equally divided into three groups between illiterates, primary and secondary education levels. Tarraf et al, [14] were disagreeing with the current study results and mentioned that "nearly half of Egyptian asthmatic patients their age ranged between 18-34 years, three-quarters of them were married. Also, Jindal et al, [15] and Shamkuwar et al, [16]

found that" more than half of asthmatic patients in their study were of advancing age (≥50 years).

Concerning the risk factors of developing asthma, the present study clarified that the majority of patients were farmers, carpenters, and painters which considered risky jobs. Also, the most common risk factors of developing asthma were exposure to house dust met, cigarette smoke, sinusitis, or allergic rhinitis, aspirin, wood and vegetable dust as occupational exposure, exercise and exposure to cold, dry air, and stress. Additionally, more than two-thirds of patients were moderate smokers.

From the researchers' point of view, this finding was fairly and accepted as nearly two-thirds of patients were farmers and carpenters who deal continuously with dust, aerosols in addition to exposure to fur and feathers when they contact their farm animals and small woody particles in case of carpenters. Also, the other one-third of them was painters who deal continuously with chemicals, dust, and sprays. Additionally, according to our culture especially in rural areas, smoking is a sign of maturity and some youths smoke at the early stage for curiosity. Also, their occupations can formulate a very strong risk and triggers that increased their chance of developing asthma at a young age group.

Anuradha et al, [17] were agreeing with the study results as they reported that housewives, employees, and labors (daily wages workers) were the foremost affected patients in this category, this could be the major risk factors for occupational asthma for working population. Also, Tovey et al. [18] added that house dust mite allergy is a significant risk factor for asthma in many countries and high exposure to the allergens contributes to airway inflammation and asthma exacerbation.

Similarly, Kelly et al, [19] stated that "A pet cat in the home is associated with high levels of allergen exposure and increases in nonspecific airway hyperreactivity". Also, Lemiere and Vandenplas, [1] reported that "The most common triggers are wood dust, animal dander, grain dust, fungi, or chemicals. They added that the following workers are at higher risk: farmers, bakers, drug manufacturers, detergent manufacturers, grain elevator workers, laboratory workers (especially those working with laboratory animals), plastics workers, metal workers, millers, and woodworkers".

Sears, [20] mentioned that "Smoking plays an important role since the asthma group has special characteristics compared to non-smokers (e.g. increased morbidity and mortality, more severe symptoms, much more difficult control of asthma, higher frequency of exacerbations, poorer quality of life, and an increased number of life-threatening asthma attacks. Also, Schlunssen et al, [21] found that smokers were more often asthmatic; the relationship between smoking and occupational asthma is complex and contradictory. However, various studies have shown that smokers are at increased risk of developing sensitization due to agents that cause asthma through an IgE-mediated mechanism".

Jarvis et al, [22] were agreeing with the study results as they reported that bacterial and viral infections are a common asthma trigger. Viral infections, such as colds and flu, tend to trigger asthma episodes more frequently than bacterial infections, such as strep throat or sinus infections. Though these types of infections mostly affect the upper airways in the nose, throat, and sinuses, the lower airways may also become irritated if patients have asthma. The association with asthma was stronger in those reporting both chronic rhinosinusitis (CRS) and allergic rhinitis.

Oxford Health Plans, [23] mentioned that "The most common activities that can cause an asthma episode are aerobic activities, such as jogging or cross-country skiing. During those kinds of activities, the air is breathed in through the mouth. This air is colder and drier when it reaches the lungs than air that is inhaled through the nose. In those with exercise-induced asthma, the colder, drier air acts as an irritant to the lower airways, causing them to spasm". In case of our study, the matter is different as our patients are farmers and skilled workers who get up early, exposed to cold air at early morning, in addition, they are working all year especially at fall and winter period that increase their risk for developing asthma for a long period across the year. Asthma Respiratory Foundation, [24] reported that aspirin and other NSAIDs act as triggers in a small percentage of people with asthma. Because aspirin-induced asthma episodes can be severe and come on very quickly, patients should avoid taking aspirin and other NSAIDs if they have aspirin-sensitive asthma.

Regarding patients' knowledge about the asthma disease, the current study found that there was a highly statistically significant difference between pre & post-application of the educational nursing program. These results were in accordance with Wang et al, [25] who mentioned that "Asthma knowledge increased significantly in the intervention group as compared with the control group". Also, Mishra et al, [26] reported that a comprehensive asthma education program in an urban asthma group reduced the use of hospital and emergency room (ER) and improved asthma control as assessed by the ACT. Dürr et al, [27] added that although in both groups a change of asthma control was detected; the improvement in trained patients was higher, indicating a positive effect of patient education on asthma control.

In the same regard, a study by Plaza et al. [28] suggested that simplified educational interventions can be effective if they offer the essential elements of effective educational intervention, such as key information on asthma management, provision of a personalized but easy to understand action plan and inhaler technique training. Elbanna et al [29] reported that the educational intervention significantly improved the level of asthma knowledge and level of asthma control, which has led to fewer visits to the ER, hospitalization, and referral to a specialist.

Regarding adherence to asthma drugs, the current study clarified that there was a statistically significant difference between pre & post the educational nursing program application as more than three-quarters of patients have low adherence level to their medications pre-application of the educational program while, their adherence improved as more than two-thirds of patient experience an intermediate adherence to their medications post educational program application. From the researchers' point of view, it could be because of increasing the patients' knowledge about the disease and realizing the importance of taking medication regularly as an important part of asthma management.

These findings were in the same line with Gamble et al. [7] who mentioned at their study that more than one third of study sample who were initially non-adherent to asthma drugs, significantly improved adherence after concordance interview, poor adherence in difficult-to-control asthma is common, but when identified and targeted can be improved. Also, Petrie et al, [30] reported that "The intervention group increased their perceived need for preventive medication, their belief in the long-term nature of their asthma, and control of their asthma relative to the control group. The intervention group also significantly improved compliance over the follow-up period compared to the control group.

Concerning the nicotine dependency, it was detected that there was a decrease in the number of patients who have a high level of nicotine dependency but they didn't reach a statistically significant difference pre & post educational nursing program application. From the researchers' point of view this can be attributed to patients' false beliefs, and misconceptions, educational short period as one session was not enough to make an obvious change, patients' fear of experiencing the nicotine withdrawal symptoms, and lack of patients' desire to reduce or give up smoking. There is a need for more information about smoking treatments in asthmatic patients.

Regarding asthma control, the present study revealed that there was a statistically significant difference between pre & post-application of the educational program regarding the asthma control test. From the researchers' point of view, these results were accepted because of increasing the patients' knowledge about the diseases, increasing their adherence to taking their medications, and ensuring the commitment of the nursing instructions by telephone at home, all these causes can influence positively on the patients' ability to control their disease.

Congruent with the current study Yu-Qin et al. [31] clarified that "Asthma education is a major component of asthma management. Educational sessions carried out in the outpatient pulmonary clinic, had been effective in asthma control. With the educational intervention during the clinic visit, most patients had higher ACT scores compared to the usual clinic care".

Finally, there was a positive correlation between the patients' knowledge and degree of adherence to asthma medications and patients' control over asthma as the patient's knowledge about his disease increase, their adherence to taking their medications regularly increased, and their control over asthma increased also.

5. Conclusions

An improvement in patient's knowledge about asthma, adherence to drugs, and control over asthma were observed among studied patients after receiving the educational nursing program. But, an obvious decrease in the nicotine dependency was not detected.

6. Recommendations:

- Relevant written and visual information to facilitate educating asthma patients should be available and provided to every asthmatic patient.
- Developing smoking giving up classes as it can be very helpful in increasing the patient's control over asthma.
- Further researches should be done on the effect of different replacement therapies on decreasing the nicotine dependency of smokers' asthmatic patients.

Strength Points

- An improvement has been achieved at increasing the patients' knowledge about their disease.
- An obvious increase in the number of patients regarding the degree of adherence to their asthma drugs posts receiving the instructions than before.
- A remarkable increase in the patients' control over their disease post receiving the instructions than before.

Weak Points

The instructions cannot make an obvious decrease in the degree of nicotine dependency which is considered as a new challenge that should be met.

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