The Impact of Peak Flow Meter Training in Enhancing Self-Efficacy of Asthmatic Children

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Abstract: Asthma a common lung disease of childhood throughout the world. Children and parents education about asthma management including Peak Flow Meter enable them to cope adequately with disease and make asthma controllable. Self-efficacy is defined as the people's beliefs about their capabilities to produce designated levels of performance. The best way to help children feel good about themselves is to provide them with opportunities to learn what their strengths are and to help them to cultivate the belief that they can rely on their strengths when facing a challenge. **The aim** of this study is to examine the impact of peak flow meter training in enhancing self-efficacy of asthmatic children. **This study was conducted** at In-patient Pediatric Chest Unit at Tanta University Hospital. Patients were followed up in the Outpatient Pediatric Chest Clinic of the same hospital. A convenient sample of 60 asthmatic children and their mothers, were admitted to the study. **The results** showed that, The mean age of children was 11.47 $\pm$ 1.66 years. Slightly less than half of the children (48.33%) were aged from 12- $\geq$14 years,46.67 % of the samples were males and 53.33 % were females. The mean age of the mothers were 36.33 $\pm$ 4.64 years. Thirty five percent of the mothers were secondary education, 20 % were university level and only 8.33 were illiterate. Slightly more than half of the children (55.0 %) had the onset of asthma since 6- $\geq$8 years. Mothers' knowledge regarding asthma and peak flow meter showed statistical significant differences pretest and two months post test. Equal percentage of 75 % of children were satisfactory, one month post test and, good two months post test. There were statistical significant differences. As regards to self efficacy, the majority of the sample (78%) were not at all, and 3.33% were moderately true pre test. Exactly true response was occurred in 6.67% of children one month post test and, in 35 % two months post test. There were statistical significant differences regarding self efficacy, pre test, one month, and two months post test. It can be **concluded** from this study that, Peak flow meter training enhance self efficacy of asthmatic children. The ability to manage health problems and practice proper technique raises children confidence in their own capabilities. It is recommended to foster a training program for teachers to enforce self-efficacy of asthmatic children.

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1. Introduction

Asthma is a common lung disease of childhood throughout the world. It is a leading cause of chronic illness in childhood[(1)]. There is no universal accepted definition of asthma; it may be regarded as a diffuse obstructive lung disease with hyper-reactivity of the airways to a variety of stimuli and a high disease reversibility of the obstructive process[(2)]. Asthma is a chronic inflammatory disease confined to the airways of the lung, resulting in episodic airflow obstruction, which is usually reversible spontaneously or as a result of treatment and in increased airway responsiveness to a variety of stimuli [(1)].

Asthma prevalence has increased very considerably in recent decades such that it is now one of the commonest chronic disorders in the world. Asthma is estimated to affect 300 million people worldwide, with an expected increase to 400 million worldwide by 2025 [(3)]. Children younger than 18 years of age account for 47.8% of the emergency department visits and 34.6% of the hospitalizations due to asthma exacerbations. The magnitude of the impacts of asthma in children is illustrated by the fact that asthma accounts for more hospitalizations in children than any other chronic illness.[(4)].

Asthma affects an estimated 300 million individuals worldwide. The prevalence of asthma is increasing, especially in children. Annually, the World Health Organization (WHO) has estimated that 15 million disability-adjusted life-years are lost and 250,000 asthma deaths are reported worldwide [(7)]. Approximately 500,000 annual hospitalizations (34.6% in individuals aged 18 y or younger) are due to asthma. In the United States, asthma prevalence, having increased from 1980 to 1996, showed a plateau at 9.1% of children (6.7 million) in 2007 [(6)] .

A previous study done in Cairo, Egypt to ascertain the prevalence of asthma among children revealed that the overall prevalence of wheezing in the last year was 14.7% and of physician-diagnosed

asthma was 9.4%. This study clearly shows that asthma symptoms are much more prevalent among those from poorer backgrounds. Children attending state schools also showed a higher prevalence of severe asthma symptoms but were much less likely to have a physician diagnosis of asthma, which points to discrepancies in access to healthcare. Asthma is relatively common, and probably under-diagnosed and undertreated, particularly among children from less wealthy families [7].

Etiology of Asthma

Asthma is a complex disorder involving immunologic infection, endocrine and psychologic factors in varying degrees of different individuals.[1] It may be due to abnormal β adrenergic receptor-adenylate cyclase function with a decreased adrenergic responsiveness [2].

Clinical Manifestation of Asthma

The onset of asthma exacerbations may be acute or insidious. Acute episodes are most often caused by exposure to irritants such as cold air and noxious fumes, or exposure to allergens or simple chemicals. Asthma exacerbations precipitated by viral respiratory infections are slower in onset with gradual increase in frequency and severity of cough, wheezing over a few days. These manifestations, also include; cyanosis, hyperinflation of the chest, tachycardia, shortness of breath, abdominal pain and low grade fever [1, 2].

Classifications of asthma

Asthma exacerbations are acute or sub-acute episodes of progressively worsening shortness of breath, cough, wheezing, and chest tightness—or some combination of these symptoms. Exacerbations are characterized by decreases in expiratory airflow that can be documented and quantified by simple measurement of lung function (spirometry or PEF). These objective measures more reliably indicate the severity of an exacerbation than does the severity of symptoms [2].

Mild exacerbations may be managed "at home" (i.e., outside the health care system), whereas more serious exacerbations may require an unscheduled ("urgent") office visit, an ED visit, or a hospital admission (Table 1). The most severe exacerbations require admission to the intensive care unit (ICU) for optimal monitoring and treatment. Although assessment and treatment of young children pose unique challenges, the management of asthma exacerbations in older children and adults is fairly similar [2].

CLASSIFYING SEVERITY O F ASTHMA EXACERBATIONS I N THE URGENT OR EMERGENCY CARE

Note: Patients are instructed to use quick-relief medications if symptoms occur or if PEF drops below 80 percent predicted or personal best. If PEF is 50–79 percent, the patient should monitor response to quick-relief medication carefully and consider contacting a clinician. If PEF is below 50 percent, immediate medical care is usually required. In the urgent or emergency care setting, the following parameters describe the severity and likely clinical course of an exacerbation.

	Symptoms and Signs	Initial PEF (or FEV1)	Clinical Course
Mild	Dyspnea only with activity (assess tachypnea in young children	PEF ≥70 percent predicted or personal best	• Usually cared for at home • Prompt relief with inhaled SABA • Possible short course of oral systemic corticosteroids
Moderate	Dyspnea interferes with or limits usual activity	PEF 40−69 percent predicted or personal best	• Usually requires office or ED visit • Relief from frequent inhaled SABA • Oral systemic corticosteroids; some symptoms last for 1–2 days after treatment is begun
Severe	Dyspnea at rest; interferes with conversation	PEF <40 percent predicted or personal best	• Usually requires ED visit and likely hospitalization • Partial relief from frequent inhaled • SABA • Oral systemic corticosteroids; some symptoms last for >3 days after treatment is begun • Adjunctive therapies are helpful
***Subset:* Life threatening**	Too dyspneic to speak; perspiring	PEF <25 percent predicted or personal best	• Requires ED/hospitalization; possible ICU • Minimal or no relief from frequent • inhaled SABA, intravenous corticosteroids • Adjunctive therapies are helpful

Key: ED, emergency department; FEV1, forced expiratory volume in 1 second; ICU, intensive care unit; PEF, peak expiratory flow; SABA, short-acting beta2-agonist [2]

Educating asthmatic children and their mothers about asthma self management including Peak flow meter enable them to cope adequately with the disease and make asthma controllable [1]. Knowledge

about the nature of the disease how to avoid triggering factors and what to do in acute attacks are very useful in improving children self efficacy [10].

Peak expiratory flow rate (PEFR) is the maximum flow rate generated during a forceful exhalation, starting from full lung inflation. Peak flow rate primarily reflects large airway flow and depends on the voluntary effort and muscular strength of the patient. Maximal airflow occurs during the effort-dependent portion of the expiratory maneuver, so low values may be caused by a less than maximal effort rather than by airway obstruction. Nevertheless, the ease of measuring peak flow rate with an inexpensive small portable device has made it popular as a means of following the degree of airway obstruction in patients with asthma and other pulmonary conditions. [8-10].

Peak flow rate monitoring can be accurately performed by most patients older than 5 years. It is most commonly measured by a portable flow gauge device (peak flow meter) . The most frequent use of peak flow rate measurement is in home monitoring of asthma, where it can be beneficial in patients for both short- and long-term monitoring. When properly performed and interpreted, peak flow rate measurement can provide the patient and the clinician with objective data upon which to base therapeutic decisions. Since peak flow rate measurement depends significantly on patient effort and technique, clear instructions, demonstrations, and frequent review of technique are essential [11] .

In 2007, an expert panel of the National Asthma Education and Prevention Program recommended periodic assessment of pulmonary function by spirometry or peak flow rate monitoring [2] . The management plan, which includes instructions about the use of medications, precautions with drug and/or device usage, monitoring symptoms and their severity (peak flow meter reading), and identifying potential adverse effects and necessary actions [12].

This plan should include instructions for identifying signs of an acute attack, using rescue medications, monitoring, and contacting the asthma care team. Parents should understand that asthma is a chronic disorder with acute exacerbations; hence, continuity of management with active participation by the patient and/or parents and interaction with asthma care medical personnel is important. Emphasize the importance of adherence to treatment. Since peak flow rate measurement depends significantly on patient effort and technique, clear instructions, demonstrations, and frequent review of technique are essential [13] .

Self-efficacy refers to personal action control or agency. A person who believes in being able to produce a desired effect can conduct a more active and self-determined life course. Health specific self-efficacy is a person's optimistic self-belief about being capable to resist temptations and to adopt a healthy lifestyle. As people proceed from considering precautions in general to shaping a behavioral intention, contemplating detailed action plans, and actually performing a health behavior on a regular basis, they begin to believe in their capability to initiate change. One's sense of self-efficacy can play a major role in how one approaches goals, tasks, and challenges [14] .The concept of self-efficacy lies at the center of Bandura's social cognitive theory, which emphasizes the role of observational learning and social experience in the development of personality. Self-efficacy represents the personal perception of external social factors [15-18] .

According to Bandura's theory, people with high self-efficacy—that is, those who believe they can perform well—are more likely to view difficult tasks as something to be mastered rather than something to be avoided. People with high self-efficacy in a task are more likely to make more of an effort, and persist longer, than those with low efficacy [18] . The stronger the self-efficacy or mastery expectations, the more active the efforts. On the other hand, low self-efficacy provides an incentive to learn more about the subject. As a result, someone with a high self-efficacy may not prepare sufficiently for a task [19] .

Health behaviors such as non-smoking, physical exercise, dieting, condom use, dental hygiene, seat belt use, or breast self-examination are, among others, dependent on one's level of perceived self-efficacy **(Norman, & Conner 2005)** Self-efficacy beliefs are cognitions that determine whether health behavior change will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles and failures. Self-efficacy influences the effort one puts forth to change risk behavior and the persistence to continue striving despite barriers and setbacks that may undermine motivation. Self-efficacy is directly related to health behavior, but it also affects health behaviors indirectly through its impact on goals. Self-efficacy influences the challenges that people take on as well as how high they set their goals [20] .

The development of such skills can compensate for the lack of traditional health education provided for diabetes patients and plays a significant part in the prevention of acute and chronic complications. Self-efficacy counseling strategies involve: asking questions; focusing on patient's agenda; planning personal treatment schedules; defining problems; setting goals (taking a step-by-step approach); regular follow-up and contact with patients; scaling questions; brainstorming solutions; considering past

efforts, successes and failures; reassessing confidence; and finally checking behavior changes. Self-efficacy counseling skills can be learned through structured training courses in counseling skills [21] .

Self-efficacy makes a difference in how people feel, think and act. In terms of feeling, a low sense of self-efficacy is associated with depression, anxiety, and helplessness. Sense of competence facilitates cognitive processes and performance in a variety of settings, including quality of decision-making and academic achievement. When it comes to preparing action, self-related cognitions are a major ingredient of the motivation process. Self-efficacy levels can enhance or impede motivation. People with high self-efficacy choose to perform more challenging tasks (**Bandura, 1995**). They set themselves higher goals and stick to them. Actions are pre shaped in thought, and people anticipate either optimistic or pessimistic scenarios in line with their level of self-efficacy. Once an action has been taken, high self-efficacious persons invest more effort and persist longer than those who are low in self-efficacy. When setbacks occur, they recover more quickly and maintain the commitment to their goals. Self-efficacy also allows people to select challenging settings, explore their environments, or create new environments [22] .

2- Subjects and Methods

Research Design:

A prospective "longitudinal" Study

Materials:

Setting:

This study was conducted at the inpatient Pediatric Chest Unit at Tanta University Hospital. Patients were followed up in the Outpatient Pediatric Chest Clinic of the same hospital.

Subjects: The subjects of the study consisted of 60 children and their mothers. Subjects were selected according to the following criteria:

1. Age ranged from 8- ≥ 14 years .
2. Free from other health problems.
3. Moderate or severe persistent asthma "daily symptoms or prescribed daily controller medication" at least 6 months prior to study.
4. Children currently using a PEF meter on a daily basis were excluded.

Tools of the study:

The following tools were developed or adapted by the researchers based on review of related literature. Four tools were used in data collection:

Tool I*: Questionnaire sheet*, it consisted of three parts:

a. Demographic data
   - Child's age, Gender, Educational level, and the numbers of family members.
   - Mother's age, level of education and occupation
   - Socioeconomic condition
   - Family history of asthma or other allergic diseases

b. Medical History
   - Current medical history, it included:
     - ✓ Manifestations of asthma "cough, wheezing, dyspnea, rhinitis, nasal secretions, sore throat and horsiness of voice".
     - ✓ History of allergy and relating test, type of allergy "food, drugs, insects" and others.
     - ✓ History of asthma triggering factors.
     - ✓ History of exercises induced asthma.
   - Past medical history including" history of first attack of asthma, duration of illness, repeated admission, frequency of attacks, when, and how asthma evoked.

c. History of asthma education and peak flow meter use.

Tool 2*: Questionnaire sheet for mothers*

It was developed by the researcher to assess the mother's knowledge about bronchial asthma. It includes definition of asthma, causes, manifestations, predisposing factors, medications, complication prevention and measures for asthma control.

Tool 3*: Observation check list*

It was developed by the researcher to observe children's practices regarding peak flow meter Position and technique.

Tool 4*: Self Efficacy Scale*

The General Self-Efficacy Scale is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life [23,24]. The construct of Perceived Self-Efficacy reflects an optimistic self-belief. This is the belief that one can perform a novel or difficult tasks, or cope with adversity, in various domains of human functioning. Ten items are designed to tap this construct. Each item refers to successful coping and implies an internal-stable attribution of success.

Perceived self-efficacy is an operative construct, i.e., it is related to subsequent behavior and, therefore, is relevant for clinical practice and behavior change. The measure has been used internationally with success for two decades. It is suitable for a broad range of applications. It can be taken to predict adaptation after life changes, but it is also suitable as an indicator of quality of life at any point in time. The response to self efficacy scale was ranged from 1 = Not at all true, 2 = Hardly true, 3 = Moderately true, and 4 = Exactly true. Simple modifications were done in the scale to fit asthmatic children age, experiences, and perception.

Method:

Permission to carry out the study was obtained from the directors and the responsible specialists of the chosen settings after explaining the aim of the study. Tool (1, 2, and 3) were developed and/or adapted by the researchers based on the review of relevant literatures. Tool (4) was adopted, modified and translated into Arabic language. A pilot study was conducted on 10 children to ensure the applicability of the tools and the necessary modifications were done.

Data about the child and his/her mother were collected in the first session. The objectives of the study was explained to the children and their mothers. The child's practice using peak flow meter was observed and initial self-efficacy assessment was done. The action plan was applied on 3 sessions throughout demonstration, discussion and practices. Every session took 20-30 minutes for continuation of the plan. Re-assessment of self-efficacy and peak flow meter demonstration were done after one and two months.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS. For quantitative data, mean and standard deviation were calculated. For qualitative data the number, percent distribution was calculated. Chi square was used as a test of significance and when found inappropriate. Significant was adopted at $P<0.05$ for interpretation of results of test of significant.

3. Results

One quarter of the children (25%) were between 8 > 10 years, (26%) aged between 10>12 years and, nearly half of the children (48.33%) were between 12 to 14 years. More than half of the children (53.33%) were females and, (63.33%) of the children were the first in birth order in the family. (Table I& Fig. I).

The mean age of children's mothers were 36.33± 4.64 years, 35% of them were secondary level of education, (20%) were university level and, (8.33%) were illiterate. Slightly less than half of the mothers (45%) were employee, while (36.67% were house wife. (Table II).

Nearly half of the sample, (55%) had the onset of asthma from 6 to 8 years, (46.66%) of asthmatic children admitted to hospital 4 to >6 times / year. Sixty percent of the sample admitted to intensive care 5>7 times/year, the majority of the sample (90%) had asthma episodes in Winter, (56.67%) in Springs and (13.33%) in Autumn. (Table III).

The majority of asthmatic children had manifestations related to respiratory system, cough, wheezing, dyspnea and hoarseness of voice in (100%), (93.33%), (88.33%) and, (75%) of children respectively. Cough induced vomiting was reported in (78.33%) of the children, while, (36.66%) had vomiting with diet. As regards to exercises, the majority of children (93.33% had dyspnea with effort, (75%) unable to play, while, (8.33%) were exercises regularly. House dust, Pollen, smoking were the most predisposing factors reported in (91.66%), (80%) and (73.33%) respectively. (Table IV).

As regards to mothers' knowledge about asthma and peak expiratory flow meter, (66.67%), (30%) and (3.33%) of the mothers were reported incorrect answer, incomplete answer, and, complete answer respectively, about asthma definition pre-test compared to, (13.33%), (58.33%) and (28.33%) respectively two months post-test. The majority of the mothers (93.33%) and, (100%) were reported dust and, smoking as predisposing factors post test compared to (16.67%) and, (58.33%) pre-test. None of the mothers had knowledge about peak flow meter importance, position, and, technique pre-test, compared to, (90%), (93%) and, (75%) post test. Statistical significant differences were found in mothers' knowledge regarding asthma definition, predisposing factors and, complications, pre and post test (Table V).

In relation to children's practice regarding peak flow meter, It was found that, all of the sample (100%) were weak in their practice pre test, while, (21.67%), (75%) and, (3.33%) were good, satisfactory and weak one month post test. Good and, satisfactory practice were observed in (75%) and (25%) of children two months post test. There were statistical significant differences regarding peak flow meter practice pre-test, one month and two months post test. (Table VI & Fig. 2).

As regards children's self efficacy pre-test, it was clear that, the majority of the children's answers were not at all true. (93.33%) can't manage asthma exacerbation, (96.67%) can't stick to peak flow meter technique, (95%) can't find solutions for asthma problems and, (93.33%) can't handle whatever comes in their way (Table VII).

Children's self efficacy responses one month post test showed that, (58.33%) can't manage asthma exacerbation, (20%) hardly true and (8.33%) were exactly true. Equal percent of (73.33%) of children can't tick to peak flow meter technique and can't find solutions for asthma problems. Slightly less than three quarters of children (71.67%) can't handle whatever comes in their way, while equal percent of (10%) were hardly true and exactly true in this response. Statistical significant differences were found regarding almost all of the children's responses in self efficacy one month post test. (Table VIII).

Children's self efficacy responses two months post test showed that, (28.33%) can't manage asthma exacerbation, (36.67%) hardly true and (16.67%) were exactly true. Equal percent of (11.67%) of children can't tick to peak flow meter technique and can't handle whatever comes to them. Exactly true responses, were reported in (38.33%), (45%), (61.67%) who can stick to peak flow meter technique, solve most of problems and think of a solution respectively. Statistical significant differences were found regarding all of the children's responses in self efficacy one month post test. (Table IX).

In relation to comparison between self efficacy responses pre-test, one and two months post test, it was found that, (78.33%) of children were not at all true pretest compared to (56.66%) and (10%) one and two months post test. Hardly true response were (18.33%), (25%) and, (21.67%) pre-test, one and two months post test respectively. None of the children was exactly true pre test, compared to (6.67%) and (35%) one and two months post test respectively. There were statistical significant differences regarding self efficacy pre-test versus one month and, pre-test versus two months post test. (Table X).

Comparison between children self efficacy items pre-test, one and two months pos test showed that, the highest percentage of the children (86.66%), (93.33%) and, (78.33%) post-test compared to (36.66%), (43.33%) and, (55%) one month post test , were stick to peak flow meter , deal efficiently with it and know how to handle peak flow meter respectively. There were statistical significant differences regarding all items of self efficacy scale pre-test, one and two months post test. (Fig. 3).

Table (I) Distribution of asthmatic children according to personal characteristics

Personal Characteristics	n=60	Percent
Age in years		
8 > 10	15	25.00
10 > 12	16	26.67
12 ≥14	29	48.33
Mean ±SD	**11.47±1.66**	
Gender		
Male	28	46.67
Female	32	53.33
Birth order		
1-	38	63.33
3-	14	23.33
5-7	8	13.33
Numbers of family members	10	16.67
3-	46	76.66
5-	4	6.67
7- 9		
Mean ±SD	**5.80±0.95**	

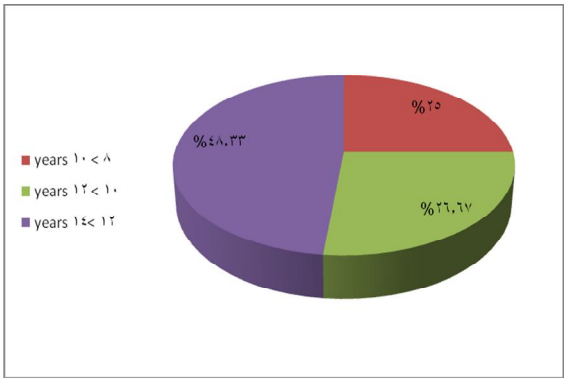

Fig. (1) : Shows distribution of asthma according to age

Table (II) Distribution of the sample according to mothers' characteristics

Characteristics of the mothers	n=60	Percent
Age in years		
25 > 30	6	10.00
30 > 35	18	30.00
35 > 40	22	36.67
40 ≥45	14	23.33
Mean ±SD	**36.33±4.64**	
Level of education		
Illiterate	5	8.33
Read and write	7	11.67
Primary and preparatory	15	25.00
Secondary education	21	35.00
University education	12	20.00
Occupation		
Employee	27	45.00
Worker	11	18.33
House wife	22	36.67

Table (III) Distribution of asthmatic children according to past medical history

Medical history	n=60	Percent
Age of onset of asthma		
< 2	2	3.33
2 >4	7	11.67
4 > 6	18	30.00
6≥ 8 years	33	55.00
Readmission to hospital/year		
< 2	4	6.67
2 >4	16	26.67
4 > 6	28	46.66
6 ≥ 8 Times	12	20.00
Intensive care admission		
1 > 3	11	18.33
3 > 5	13	21.67
5 > 7 Times	36	60.00
Frequency of attacks		
1 > 3	3	5.00
3 > 5	22	36.67
5 > 7 Times	35	58.33
Episodes of asthma		
Autumn	8	13.33**
Winter.	54	90.00**
Springs	34	56.67**

** Some of the sample mentions more than one answer

Table (IV) Distribution of asthmatic children according to clinical manifestations and predisposing factors

Clinical manifestations/ predisposing factors	n=60	Percent
Respiratory system:		
Cough	60	100.0
Wheezing	56	93.33
Dyspnea	53	88.33
Running nose	30	50.00
Nasal secretions	22	36.66
Sore throat	27	45.00
Hoarseness of voice	45	75.00
Digestive system:		
Cough induced vomiting	47	78.33
Vomiting with diet	22	36.66
Colic	15	25.00
Heart burn	4	6.67
Exercises:		
Exercises regularly	5	8.33
Dyspnea with effort	56	93.33
Unable to play	45	75.00
Predisposing factors		
House dust	55	91.66
Dust mites	11	18.33
Animal dander	48	80.00
Pollens	13	21.66
Smoking	44	73.33
Food	26	43.33

Table (V) Distribution of the mothers' knowledge about asthma and peak expiratory flow meter

Mothers' knowledge	Pre-test		Two months Post-test		χ^2	P
	No	Percent	No	Percent		
Definition:						
Complete answer	2	3.33	17	28.33		
Incomplete answer	18	30.00	35	58.33	38.63	<0.001*
Incorrect answer	40	66.67	8	13.33		
Causes:						
Hereditary	25	41.67	60	100.0		
Bacteria	7	11.67	20	33.33	2.74	0.433
Virus	16	26.67	34	56.67		
Allergic inflammation	12	20.00	45	75.00		
Manifestations:						
Cough	45	75.00	60	100.0		
Wheezing	35	58.33	57	95.00	2.53	0.282
Dyspnea	22	36.67	49	81.67		
Predisposing factors						
Dust and mites	10	16.67	56	93.33		
Animal dander	7	11.67	43	71.67		0.001*
Smoking	35	58.33	60	100.0	15.72	
Exercises	16	26.67	28	46.67		
Complications						
Status asthmaticus	1	1.67	12	20.00		
Altered growth and development	23	38.33	47	78.33	11.85	0.008*
Deformity of the rib cage	2	3.33	15	25.00		
Easily fatigability	43	71.67	55	91.67		
Peak flow meter						
Importance	-	-	54	90.00		
Position	-	-	56	93.33	-------	-------
Technique	-	-	45	75.00		

*** significant at 0.05% level**

Table (VI) Comparison of children's practice regarding peak flow meter, pre-test, one and two months post test.

	Pre-test		One month Post-test		Two months Post-test	
	n=60	100%	n=60	100%	n=60	100%
Good	-	-	13	21.67	45	75.00
Satisfactory	-	-	45	75.00	15	25.00
Weak	60	100	2	3.33	-	-

χ^2 one month post test = 112.26, p = <0.001*
χ^2 two month post test = 120.00, p = <0.001*
***** significant at 0.05% level**

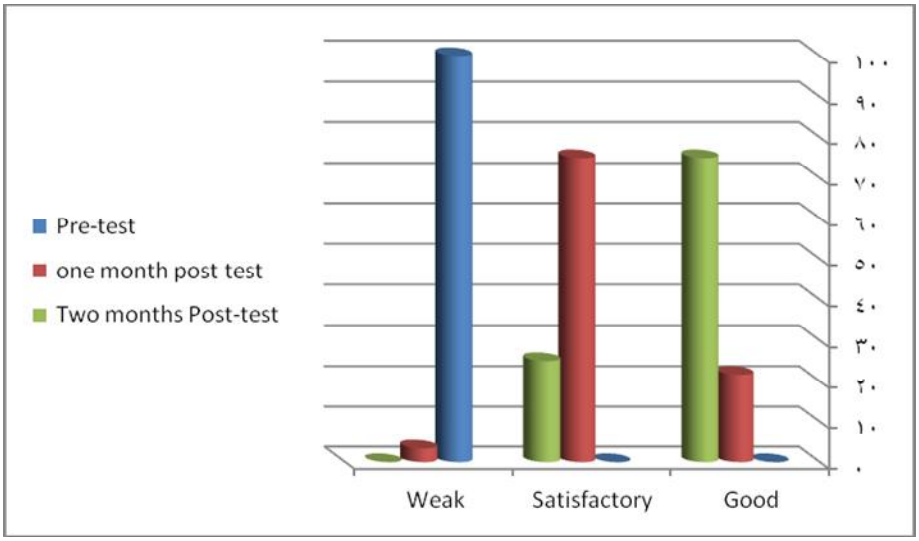

Fig. (2) : children's practice regarding peak flow meter, pre-test, one and two months post test.

Table (VII) Distribution of children's self efficacy responses pre test " n=60"

Items	Not at all true No.	Percent	Hardly true No.	Percent	Moderate true No.	Percent	Exactly true No.	Percent
1- I Can always manage asthma exacerbation if I try hard enough	56	93.33	4	6.67	-	-	-	-
2- If asthma exacerbation oppose me, I can find the means and ways to get what I want.	45	75.00	12	20.00	3	5.00	-	-
3- It is easy for me to stick to peak flow meter technique	58	96.67	2	3.33	-	-	-	-
4- I am confident that I could deal efficiently with peak flow meter	34	56.67	24	40.00	2	3.33	-	-
5- Thanks to my resourcefulness, I know how to handle peak flow meter.	25	41.67	30	50.00	5	8.33	-	-
6- I can solve most problems if I invest the necessary effort.	39	65.00	15	25.00	6	10.00	-	-
7- I can remain calm when facing difficulties because I can rely on my coping abilities.	46	76.67	14	23.33	-	-	-	-
8- When I am confronted with health problem, I can usually find several solutions.	57	95.00	3	5.00	-	-	-	-
9- If I am in asthma exacerbation, I can usually think of a solution.	55	91.67	5	8.33	-	-	-	-
10- I can usually handle whatever comes my way.	56	93.33	2	3.33	2	3.33	-	-

Table (VIII) Distribution of children's self efficacy responses One month post test " n=60"

Items	Not at all true No.	Percent	Hardly true No.	Percent	Moderate true No.	Percent	Exactly true No.	Percent	χ^2	P
1- I Can always manage asthma exacerbation if I try hard enough	35	58.33	12	20.00	8	13.33	5	8.33	21.85	<0.001*
2- If asthma exacerbation oppose me, I can find the means and ways to get what I want.	23	38.33	17	28.33	14	23.33	6	10.00	20.54	<0.001*
3- It is easy for me to stick to peak flow meter technique	44	73.33	9	15.00	5	8.33	2	3.33	13.38	0.001*
4- I am confident that I could deal efficiently with peak flow meter	32	53.33	18	30.00	6	10.00	4	6.67	6.25	0.044*
5- Thanks to my resourcefulness, I know how to handle peak flow meter.	25	41.67	21	35.00	6	10.00	8	13.33	5.85	0.054
6- I can solve most problems if I invest the necessary effort.	19	31.67	24	40.00	15	25.00	2	3.33	14.23	<0.001*
7- I can remain calm when facing difficulties because I can rely on my coping abilities.	33	55.00	12	20.00	8	13.33	7	11.67	17.29	<0.001*
8- When I am confronted with health problem, I can usually find several solutions.	44	73.33	7	11.67	6	10.00	3	5.00	12.27	0.002*
9- If I am in asthma exacerbation, I can usually think of a solution.	37	61.67	22	36.67	1	1.66	-	-	4.72	0.030*
10- I can usually handle whatever comes my way.	43	71.67	6	10.00	5	8.33	6	10.00	9.75	0.002*

For statistical analysis moderately true and exactly true were grouped together
* significant at 0.05% level

Table (IX) Distribution of children's self efficacy responses Two months post-test " n=60"

Items	Not at all true No.	Percent	Hardly true No.	Percent	Moderate true No.	Percent	Exactly true No.	Percent	χ^2	P
1- I Can always manage asthma exacerbation if I try hard enough	17	28.33	22	36.67	11	18.33	10	16.67	54.30	<0.001*
2- If asthma exacerbation oppose me, I can find the means and ways to get what I want.	7	11.67	29	48.33	15	25.00	9	15.00	51.15	<0.001*
3- It is easy for me to stick to peak flow meter technique	7	11.67	12	20.00	18	30.00	23	38.33	88.16	<0.001*
4- I am confident that I could deal efficiently with peak flow meter	4	6.67	18	30.00	22	36.67	16	26.66	57.21	<0.001*
5- Thanks to my resourcefulness, I know how to handle peak flow meter.	6	10.00	11	18.33	33	55.00	10	16.67	51.08	<0.001*
6- I can solve most problems if I invest the necessary effort.	1	1.67	4	6.67	28	46.66	27	45.00	83.70	<0.001*
7- I can remain calm when facing difficulties because I can rely on my coping abilities.	3	5.00	12	20.00	23	38.33	22	36.67	82.89	<0.001*
8- When I am confronted with health problem, I can usually find several solutions.	5	8.33	14	23.33	13	21.67	28	46.67	91.73	<0.001*
9- If I am in asthma exacerbation, I can usually think of a solution.	2	3.33	6	10.00	15	25.00	37	61.67	101.37	<0.001*
10- I can usually handle whatever comes my way.	7	11.67	4	6.67	23	38.33	26	43.33	82.42	<0.001*

* significant at 0.05% level

Table (X) Comparison between self efficacy responses pre test, one and two months post-test

Self- Efficacy responses	Pre-test		One month Post-test		Two months Post-test	
	n=60	100%	n=60	100%	n=60	100%
1- Not at all true	47	78.33	34	56.66	6	10.00
2- Hardly true	11	18.33	15	25.00	13	21.67
3- Moderately true	2	3.33	7	11.67	20	33.33
4- Exactly true	-	-	4	6.67	21	35.00

χ^2 one month post test = 8.93, p = <0.011* χ^2 two month post test = 45.43, p = <0.001*
(NB: moderately and exactly were grouped together) * significant at 0.05% level

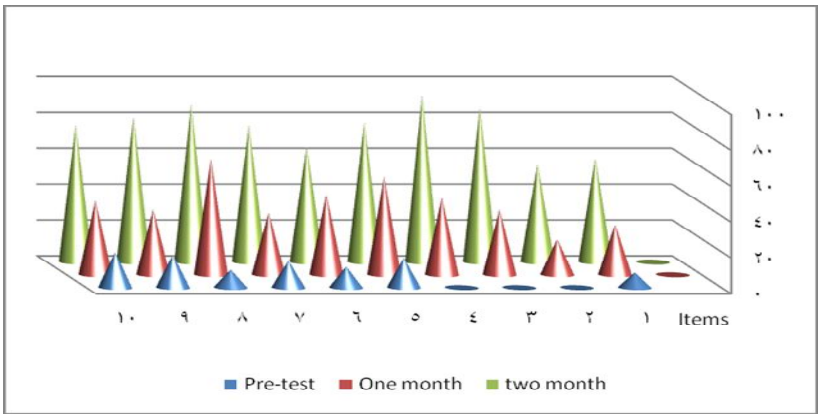

Fig. (3):*Comparison* between children's self efficacy pre test, one month and two month post test

4. Discussion

Asthma is a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyper responsiveness, and an underlying inflammation [25]. For some patients, the development of chronic inflammation may be associated with permanent alterations in the airway structure—referred to as airway remodeling—that are not prevented by or fully responsive to currently available treatments [26] .

Concerning to children's age and sex, the present study revealed that, nearly half of the sample aged between 12 ≥14 years, while, slightly more than one quarter of the children (26.67%) aged between 10>12 years. As regard to gender, More than half of the children were female (53.33%) and the rest were male. These results in agreement with **Eder *et al.* 2006)** who found that early life, the prevalence of asthma is higher in boys. At puberty, however, the sex ratio shifts, and asthma appears predominantly in women.[27] This may be due to the influence of sex hormones, or related hormone generation, that linked to asthma and contribute to the onset and persistence of the more than half of the children (55%) had asthma onset from 6 to 8 years and 30% had onset of asthma from 4-6 years. Nearly half of the children admitted to hospital from 4 to 6 times / year and, (60%) admitted to intensive care unit. This is in consistent with Burkhart**, (2007)** who found that children younger than 18 years of age account 47.8% of the emergency department visits and 34.6% of the hospitalization due to asthma exacerbation [28]. This may reflect that the individual's age at the time of asthma onset influences declines in lung function growth. An inverse association between lung function and duration of asthma was noted when, the children had longer duration of asthma.

Successful management of asthma requires that the patient or patient's caregiver "mothers" have a fundamental understanding of and skills for following the therapeutic recommendations, including manifestations, predisposing factors and measures to control asthma exacerbations. The present study shows , statistical significant differences in mothers' knowledge about asthma definition, predisposing factors and complications. Also, the majority of the mothers who had lack of knowledge about peak flow meter importance and technique, were experience great enhancement after two months of education. These results is in agreement with the study of **Perneger *et al.* (2002)** who reported that, providing self-management education including an asthma action plan for exacerbations resulted in reduced symptoms, fewer days of restricted activity, and improvement in quality of life [29] . Self-management education also resulted in improved self-confidence to manage asthma, and improved adherence to therapy **Janson *et al.* (2003)** and **Magar *et al.* (2005).** [30,31]. This may explain that, specific training in self-management skills is necessary to produce behavior that modifies the outcomes of chronic illnesses such as asthma. Expert care, with regular review by health professionals, is necessary but not sufficient to improve outcomes. Patients and care givers must actively participate in their care, which means consciously using strategies and taking actions to minimize exposure to factors that make asthma harder to control.

Patient education is the mechanism through which patients learn to accomplish those tasks successfully. It is also a powerful tool for helping patients gain the motivation, skill, and confidence to control their asthma Butz *et al.* (2005) [32]. A trial of training to improve children's technique in using a breath-activated inhalation device showed that individual training provided by nurses in a single visit improved inhalation technique and that instructions to practice at home for 2 weeks resulted in further improvements. These results are in congruent with

the present study who shows that, Equal percent of three quarters from the children were satisfactory and good in one month and two post test respectively while, one quarter of children were satisfactory two months after training. Compared to all of the children who were weak in peak flow practice pre-test. Statistical significant difference were evident at this study pre-test, one and, two month post test.

Concerning self efficacy, the present study revealed statistical significant difference pre-test, one month and two months post test. Most of the children (33.33% and 35%) respectively were moderately true or exactly true in their responses to self efficacy two months post test. compared to slightly more than half of the sample and one quarter who were not at all true and hardly true respectively one month post test and more than three quarters who were not at all true pre-test. These results are in agreement with, a meta-analysis of 32 controlled trials of educational interventions for self-management in children and adolescents, involving 3,706 patients, showed significant effects of education in improving the child's self-efficacy and lung function as well as in reducing days with restricted activity, school absences, and ED visits.(34) Another study reported the effectiveness of an asthma educational intervention in improving asthma knowledge, self-efficacy, and quality of life in rural families.(36) Improvement in self efficacy after education or training may be result from children's judgment of their own capabilities based on mastery criteria. It's a sense of their competence within a specific task. Self efficacy focuses on assessment of children own abilities in relation to goals and standards rather than in comparison with others' capabilities.

5. Conclusion and Recommendations

Mothers' knowledge regarding asthma definition, predisposing factors and complications were improved two months post test and, there were statistical significant differences. Children's practice in using peak flow meter show, high statistical significance pre-test, one and two months post test. Regarding to self-efficacy, improvement in children's personal abilities to deal with a variety of experiences, tasks and situations. However, the growth of self-efficacy is enhanced through acquiring new skills, experiences and understanding.

From the ongoing conclusion, the following recommendations are suggested:

- Developing a training program for pediatric nurses about asthma management skills.
- Fostering a training program for teachers to enforce self-efficacy of asthmatic children.
- Developing asthma exacerbation home treatment program for children and their caregivers.
- Design a tracking program for peak flow monitoring.
- Structured patient education is needed to improve self-efficacy by acquiring both knowledge and skills about asthma self management.

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