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Mobile Learning Package for Mothers about Bronchial Asthma of their Children

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Abstract: Bronchial asthma is a major cause of child disability. Asthma is constituting a serious public health problem all over the world. Mothers play pivotal role in the children's adjustment to the illness. **Aim:** The aim of the study was to determine the effect of mobile learning package for mothers about bronchial asthma of their children. **Design:** A quasi- experimental design was used. **Setting:** The study was conducted at the Pediatric Outpatient Clinic in Helwan General Hospital, Helwan District, Cairo, Egypt. **Sampling:** A purposive sample was used. **Sample size:** 150 mothers with their children diagnosed with bronchial asthma. **Tool of data collection:** One tool was used, a structured designed interviewing questionnaire covering three parts: **Part 1:** (A) Demographic characteristics of mothers, (B) Demographic characteristics of children and past history (C) Child health status. **Part 2:** Mothers' knowledge of about bronchial asthma. **Part 3:** Mothers' reported practices about bronchial asthma. **Results:** The current study showed that the study sample had poor knowledge (68.7%) and inadequate reported practices (85.3%) about bronchial asthma for their child before conducting the mobile learning package. Highly statistically significant improvements were detected after the implementation of the mobile learning package in good knowledge (82.0%) and adequate reported practices (90.7%). There was a statistically significant association between mothers' total knowledge scores and total reported practice scores at $p < 0.001$. **Conclusion:** Mobile learning package improved mothers' knowledge and practices at the posttest than pretest, with highly statistically significant differences. **Recommendation:** Simple educational pamphlets and posters about asthma should be provided for all mothers in outpatient clinics.

Key words: Mobile Learning Package, Bronchial Asthma.

INTRODUCTION

Asthma is a heterogeneous or a chronic inflammatory disease of airways characterized by recurrent attacks of shortness of breath associated with wheezing and may get worse during physical activity or at night time ^[1].

Bronchial asthma is a chronic disease of respiratory tract; it is an important cause of morbidity and mortality among children all over the world. However, it is considered a common cause of emergency room visits and hospital admissions ^[2]. Although the onset of asthma may occur at any age, 80% to 90% of children have their first symptoms before 4 or 5 years of age, and boys are affected more frequently than girls until adolescence. Bronchial asthma is affecting 10% to 15% of children worldwide, and affects an estimated 300 million individuals worldwide with an expected increase to 400 million worldwide by 2030. In addition, 250,000 asthma deaths are reported worldwide and approximately 500,000 annual hospitalizations are due to asthma ^[3].

Bronchial asthma in children usually has many causes, or triggers. These triggers may not be the same for each child and children often have more than one trigger. Asthma triggers may change as a child ages and child's reaction to a trigger may also change with treatment. Asthma trigger factors are classified as follows; genetic factors, environmental factors which may be indoor or outdoor allergens, respiratory infection, diet allergy, drugs allergy, psychological factors, gastro esophageal reflux disease, weather factors and endocrine factors ^[4].

The symptoms of asthma can range from mild to severe. Symptoms vary between children who may have one or more asthma symptoms. The most common symptoms are coughing, particularly at night and early morning and with exercise, breathlessness that includes shortness of breathing or difficult of breathing, a tight chest like a band tightening around it, and chest wheezing. When asthma symptoms get significantly worse it is known as an asthma attack. Such attacks are usually accompanied by diffuse, variable limitation of airflow in the lungs, which usually subsides spontaneously or with treatment ^[5,6].

Classification of bronchial asthma attack is divided according to severity into intermittent, mild, and severe depending on the grade of symptoms, airflow limitation and lung function variability. However, it is important to recognize that asthma severity involves both the severity of the underlying disease and its responsiveness to treatment ^[7].

The most common reasons for uncontrolled asthma are non-adherence to treatment, poor knowledge and skills in disease management. Inadequate education about the prevention of exposure to asthma triggers, the inability to prevent acute attacks and ineffective use of inhalers are the common reasons for uncontrolled asthma. Mothers' education about asthma is a vital component in disease control and management ^[8].

The goal of bronchial asthma care is to achieve and maintain control of the clinical manifestations of the disease for prolonged periods. When asthma is controlled, patients can

prevent most attacks, avoid troublesome symptoms day and night also keep physically active. To reach this goal, the asthmatic patient and caregiver can learn how to avoid risk factors, take medications correctly, and recognize dangerous signs indicating that their asthma is worsening and take action or seek medical help as appropriate^[9]. To improve the control of bronchial asthma and reduce the needs for medication, children should follow certain instructions as avoiding allergens and pollutants include staying away from tobacco smoke, foods and additives if they are known to cause symptoms^[10].

Mothers are typically the primary agents in promoting their children's health, giving direct care, providing access to health services, improving practices and behaviors that influence their children's well-being. Education of mother is the main role because she is the most contact person with her child, so health education is an important aspect of asthma management^[11].

A learning package should contain basic explanation about asthma and the factors that influence asthma (asthma triggers), the importance of adherence to prescribed medication and description of how to recognize asthma deterioration when this occurs. Therefore, raising the level of knowledge and practices of mothers is very important to enhance and maintain competency of their children's care^[12].

Recently, technology has developed to be one of the primarily considerable means by which to acquire health and medical information^[13]. Mobile in health means the use of a portable electronic device with software applications to provide health services and provide information. With approximately 5 billion mobile phone users worldwide, opportunities for mobile technologies to play a formal role in health services, particularly in low- and middle-income countries, are increasingly being documented^[14].

The development of web-based programs and the use of mobile telephone technology will be considered as a means of delivering asthma education training programs. Mobile learning can be allowing easier access to convenience amount of knowledge and help to recognize adequate practices during and after asthma attacks in order to encourage mother to perform emergency action and decrease complication^[15].

Community health nurse can identify strategies to detect asthma triggers, provide skills, practices, promote education and enhance the quality of child care with bronchial asthma^[16]. Nurse can manage children with bronchial asthma through assessment of respiratory condition, giving adequate hydration, promoting airway clearance, improving of breathing and finally providing support to child and family. Also, the nurse should observe child's condition after providing care in order to evaluate improvement. Therefore assessing level of knowledge and practices for mother is very important to enhance and maintain competency of care for child with bronchial asthma^[17].

Significance of the study:

Bronchial asthma is the most prevalent chronic disease of childhood. Asthma constitutes serious public health problem, the incidence and severity of asthma are increasing

all over the world^[18]. The prevalence of bronchial asthma among Egyptian children aged 3-10 years was estimated between 7.7% in Nile Delta to 9.4% in Cairo. Current asthma prevalence is higher for children than for adults. The burden of the uncontrolled asthma is high, which needs frequent emergency room visits and hospital admissions^[19].

Mobile phone interventions have improved preventive behaviors. The advantages of mobile technologies may be a powerful media for providing persons with adequate knowledge and practices, which means interventions can be delivered to large numbers of mothers for help to raise care for their children^[20].

Aim of the study:

The study aimed to determine the effect of mobile learning package for mothers about bronchial asthma of their children.

Research Hypotheses:

H₁: Mobile learning package will improve mothers' knowledge about bronchial asthma.

H₂: Mobile learning package will improve mothers' practices about bronchial asthma for their children.

H₃: There will be a significant relation between knowledge and practices of mothers and their demographic characteristics.

SUBJECTS AND METHODS

Design:

A quasi-experimental study design was used in this study

Setting:

This study was conducted at the Pediatric Outpatient Clinic in Helwan General Hospital, Helwan District, Cairo, Egypt.

Subjects:

A purposive sample composed of 150 of available mothers with their children diagnosed with bronchial asthma representing 10% of the attendants to the Outpatient Clinic in the previous year 2018-2019.

They were recruited according to the following inclusion criteria:

1. Age of child from 1 year to 10 years previously diagnosed with bronchial asthma, from both sexes.
2. Mother should have smart phone, basic familiarity with the usage of mobile phone, sending and receiving a short message.
3. Availability of mobile phone network in mothers' area.
4. Mothers should be able to read, write and communicate with the researchers.

Tools of data collection:

A Structured Interviewing Questionnaire: Designed by the researchers after reviewing previous and recent available related literatures, it was written in simple Arabic language and it includes the following three parts:

Part I: includes the following:

- A) Demographic characteristics of mothers: include age, marital status, level of education, residence and occupation.

- B) Demographic characteristics of children: include age, sex, child's rank and past history of bronchial asthma.
- C) Child health status: which include frequency of asthmatic attack, fever, upper respiratory tract infections, moist caught, difficult breathing, fatigue during any activity and current medications used. At pre and post mobile learning package

Part II: Mothers' knowledge about bronchial asthma of their children. It includes 10 questions in Arabic language related to meaning, causes, symptoms and signs, predisposing factors, most foods that trigger an asthma, high risk group, alarming factors for asthma attack, conditions that require immediate emergency, complications and management of bronchial asthma. The answers were scored based on the level of knowledge of the studied subjects. Each question had 3 responses: complete correct answers (2 scores), incomplete answers (1 score), and incorrect answer or don't know (0). The higher score indicates a greater level of knowledge. Mother's answers were compared with a model key answer.

Scoring system:

Knowledge answers were classified into three categories:

- Poor knowledge that represents < 50% scored from (0- <10)
- Fair knowledge from 50-<75% scored (10<15).
- Good knowledge 75% or more scored from (15 - 20).

Part III: Mothers' reported practices about dealing with children who are suffering from bronchial asthma that were adopted from ^[21,22], used to assess practices of mothers related to bronchial asthma divided to three sub items as pre asthma attack (preparation of medication, administration of right medication, avoid predisposing factors, change the wet clothes and isolation), During asthma attacks (Administration of medication, ventilation, give warm fluids, massage child chest or back, let child cough to clear lung from mucus, breathing and coughing exercise, nebulizer and referral to emergency), and prevention of asthma attacks (regular intake of medications, remove aggravating factors from house, treat common cold attacks, prevent severe exercises and regular practice of breathing exercises).

Scoring system:

- Reported practices were calculated as two scores for always practiced, while one score for sometimes practiced and zero for rarely practiced. The total practice scores were categorized as adequate practice $\geq 60\%$ scored from 24-40, while inadequate practice <60% scored 0-< 24.

Data collection procedures:

- **Study Period:** The actual fieldwork was carried out from beginning of October 2017 to beginning of March 2018 over a period of six months in the previously mentioned setting. The time spent to fill in the questionnaire was 20-30minutes. The researchers visited the study setting two days/week (Wednesdays & Thursdays) from 10.00 a.m. to 2.00 p.m. The researchers implemented the program by using mobile and making group on Whats App included studied mothers

- **Approval:** An official letter was addressed to the Director of mentioned hospital. The researchers explained the purpose and benefits of this study. The director was informed about the study title, aim, time and date of data collection.
- **Ethical considerations:** Official approval was obtained from the Faculty of Nursing. Then send to the director of mentioned hospital. The researchers explained the purpose and benefits of this study to the studied sample who agreed to participate in the study. Oral consent was obtained before data collection. They were assured that all the collected data will be used for research purpose only. Participants' anonymity, confidentiality, privacy, safety and protection were secured.

Tool development:

- **Validity:** Tools were tested for content validity by a jury of 5experts in the Community Health Nursing field and Pediatric Health Nursing to confirm the consequence and comprehensiveness of the tools.
- **Reliability:** Reliability coefficients were calculated for the questionnaires of mothers' knowledge about bronchial asthma, Cronbach's Alpha was 0.87. While reported practices of mothers toward bronchial asthma, Cronbach's Alpha was 0.92.
- **Pilot study:** A pilot study was carried out on 10% of the study sample to evaluate tools for clarity, applicability and to estimate the time required for filling in the tools before starting the actual data collection. Data obtained from the pilot study were analyzed and the necessary modifications and rearrangements on the study tools were done. Participants in the pilot study were excluded from the main study sample.

Construction of mobile learning package for mothers about bronchial asthma for their children include the following:

- At the beginning of the interview, the researchers greeted the mothers of child with bronchial asthma, introduced themselves to each one included in the study. This phase covered interviewing the studied sample to collect baseline data. The pretest questionnaire was implemented to identify the mother's knowledge and reported practices about bronchial asthma.
- A mobile learning package for mothers of children with bronchial asthma was developed based on the findings of the assessment and in the light of related literatures. The knowledge regarding bronchial asthma included meaning, causes, common symptoms, signs, predisposing factors, most foods that trigger an asthma, high risk group, alarming factors for asthma attack, conditions that require immediate emergency, complications and management for bronchial asthma were prepared. Practices about bronchial asthma before, during and measures of prevention were designed to improve mothers' practices regarding bronchial asthma.
- The researchers implemented the mobile learning package followed by the immediate post-test, which lasted over a period of 6 months; by sending 40 messages for theoretical knowledge and 5 videos about practices of bronchial asthma to each mother via mobile, using simple and clear language to be appropriate with all studied mothers' levels of education.

Different teaching methods were used including videos, pictures through mobile by making a group on Whats App to provide all studied sample by messages and making soft designed booklet. In addition, more contact between researchers and all studied mothers to exchange questions, experiences between group and to determine the effect of the messages and videos on mothers' knowledge and practices.

The booklet included: Meaning of asthma, causes, environmental factors that could trigger or exacerbate an attack, warning signs and symptoms, preventive strategies and home management (using inhaler, breathing and coughing exercise, massage child chest, prevent severe exercise, exhaustion, regular practice of breathing exercises, clean house to remove dust and aggravating factors).

- Evaluating of mobile learning package was done immediately after its implementation by using the same preprogramming tools.

Statistical Analysis:

Data entry and analysis were done using the Statistical Package for the Social Sciences(SPSS),version 23 and state graphics statistical software packages. Data were presented using descriptive statistics in the form of frequencies and percentages. Quantitative data were presented in the form of mean ± SD. Qualitative variables were compared using Chi-square test (X^2) to compare between 2 qualitative variables. Statistical significance was considered at P-value < 0.05.

RESULTS

Table 1a: Shows the distribution of mothers' demographic data. As for age, 64% of them aged 30-<40 years with a Mean ± SD= 35.06 ± 5.66, 72% of them were married, 51.3% of them had university education, 57.3 % of the sample were housewives, and 68% reside in urban area.

Table 1b: Presents that children's age, 54.7% of them were in between 3-<6 years with Mean ± SD= 6.69 ± 1.57, 60.7% of them were boys, 35.3% of them ranked first child for their parents and 42.0% of children had family history of bronchial asthma. 68.7% of children were suffering from

bronchial asthma since ≤ 3 years, and 80% of them peak of seasonal attack was in winter.

Table 2: Clears that statistically significant improvement were detected in health status of children with bronchial asthma at post than pre mobile learning package as decrease in frequency of asthmatic attack, moist cough, upper respiratory tract infection, difficult breathing, fatigue during any activity and fever.

Table 3: Demonstrates that highly statistically significant differences were detected between the studied mothers pre and post mobile learning package about bronchial asthma in all mothers' knowledge item sat (P ≤ 0.001).

Figure 1: Illustrates that 68.7% of studied mothers had poor total knowledge scores about bronchial asthma at pre mobile learning package, which improved to 82.0% of studied mothers had good total knowledge scores at post mobile learning package ($\chi^2=184.860$ at P < 0.001).

Table 4: Displays mothers' reported practices at pre and post mobile learning package about bronchial asthma. Statistically significant improvements were found in the mothers' practices regarding bronchial asthma in the post-mobile learning package than pre at (P < 0.001).

Figure 2: Explores that only 9.3% of studied mothers had adequate practices at pre mobile learning package, which improved to 90.7% had adequate practice at post with highly statistically significant improvement in the mothers' total practice scores regarding bronchial asthma in the post-mobile learning package than pre ($\chi^2=59.867$ at P < 0.001).

Table 5: Shows that, there was a highly statistically significant association between total knowledge scores and total reported practice scores at post mobile learning package (P < 0.001).

Table (6): Reveals that, there were statistically significant relationships between mothers' demographic characteristics and their total knowledge and total reported practice scores post applying mobile learning package regarding age, level of education and occupation.

Table 1a: Distribution of Demographic Characteristics for Studied Mothers (N=150).

Items	No.	%
Age (years)		
• <30	15	10.0
• 30 ≤ 40	96	64.0
• 40+	39	26.0
Mean ± SD	35.06 ± 5.66	
Marital status		
• Married	108	72.0
• Divorced	22	14.7
• Widow	20	13.3
Level of education		
• Basic education	26	17.4
• Secondary education	42	28.0
• University education	77	51.3
• Above university education	5	3.3
Residence		
• Rural	48	32.0
• Urban	102	68.0

Occupation		
• Employed	64	42.7
• Housewives	86	57.3

Table (1b): Distribution of Demographic Characteristics for Studied Children with Bronchial Asthma and their Past History (N=150).

Items	No.	%
Age (years)		
• 1-< 3	23	15.3
• 3- < 6	82	54.7
• 6 -10	45	30.0
Mean± SD	6.69 ±1.57	
Sex:		
• Boys	91	60.7
• Girls	59	39.3
Child's rank		
• First	53	35.3
• Second	49	32.7
• Last	48	32.0
Family history:		
• Yes	63	42.0
• No	87	58.0
Period of disease		
• ≤3 years	103	68.7
• >3 years	47	31.3
Peak of seasonal attacks		
• Winter	120	80.0
• Summer	30	20.0

Table (2): Health Status of Children with Bronchial Asthma at Pre and Post Mobile Learning Package (N = 150).

Items	Pre		Post		χ ²	P
	No.	%	No.	%		
Frequency of asthmatic attack						
• Once per week	77	51.3	3	2.0	119.400	0.004
• Once per month	45	30.0	20	13.3		
• Once per three months	28	18.7	50	33.4		
• Once per six months	0	0.0	77	51.3		
Moist cough increase at night						
• Yes	77	51.3	21	14.0	129.345	0.003
• Sometimes	55	36.7	42	28.0		
• No	18	12	87	58.0		
Upper respiratory tract infection						
• Yes	80	53.3	7	4.7	137.623	0.002
• Sometimes	68	45.4	27	18.0		
• No	2	1.3	116	77.3		
Difficult breathing						
• Yes	114	76	8	5.4	122.987	0.004
• Sometimes	24	16	37	24.6		
• No	12	8	105	70		
Fatigue during any activity						
• Yes	90	60	14	9.3	124.159	0.004
• Sometimes	50	33.3	23	15.3		
• No	10	6.7	113	75.4		
Fever						
• Yes	84	56	19	12.7	146.15	0.002
• Sometimes	57	38	30	20		
• No	9	6	101	67.3		
Current medications used*						
• Anti-histaminic	132	88	50	33.3	121.058	0.004
• Anti-biotic	115	67.7				
• Bronchodilator	146	97.3				
		46	30.6			
		58	38.6			

*Mutual exclusion

Table (3): Knowledge of Studied Sample about Bronchial Asthma at Pre and Post Mobile Learning Package (N =150).

Items	Pre		Post		χ^2	P
	No.	%	No.	%		
Meaning of bronchial asthma						
• Complete correct answers	0	0	112	74.7	182.400	<0.001
• Incomplete answers	96	64	32	21.3		
• Incorrect or don't know	54	36	6	4.0		
Causes of bronchial asthma						
• Complete correct answers	3	2.0	121	80.7	195.345	<0.001
• Incomplete answers	77	51.3	23	15.3		
• Incorrect or don't know	70	46.7	6	4.0		
Symptoms & signs of bronchial asthma						
• Complete correct answers	18	12	126	84	156.623	<0.001
• Incomplete answers	87	58	19	12.7		
• Incorrect or don't know	45	30	5	3.3		
Predisposing factors of bronchial asthma						
• Complete correct answers	6	4	120	80	182.987	<0.001
• Incomplete answers	67	44.7	23	15.3		
• Incorrect or don't know	77	51.3	7	4.7		
Foods that trigger an asthma attack						
• Complete correct answers	19	12.7	123	82	148.059	<0.001
• Incomplete answers	63	42	20	13.3		
• Incorrect or don't know	68	45.3	7	4.7		
High risk group of bronchial asthma						
• Complete correct answers	7	4.7	118	78.7	176.976	<0.001
• Incomplete answers	80	53.3	29	19.3		
• Incorrect or don't know	63	42	3	2		
Alarming factors for asthma attack						
• Complete correct answers	6	4	110	73.3	164.844	<0.001
• Incomplete answers	63	42	33	22		
• Incorrect or don't know	81	54	7	4.7		
Conditions that require immediate emergency						
• Complete correct answers	9	6	118	78.7	169.177	<0.001
• Incomplete answers	83	55.3	29	19.3		
• Incorrect or don't know	58	38.7	3	2		
Complications of bronchial asthma						
• Complete correct answers	10	6.7	112	74.7	154.101	<0.001
• Incomplete answers	81	54	35	23.3		
• Incorrect or don't know	59	39.3	3	2		
Management of bronchial asthma						
• Complete correct answers	7	4.7	123	82	183.173	<0.001
• Incomplete answers	92	61.3	20	13.3		
• Incorrect or don't know	51	34	7	4.7		

** Highly significant at P ≤ 0.001.

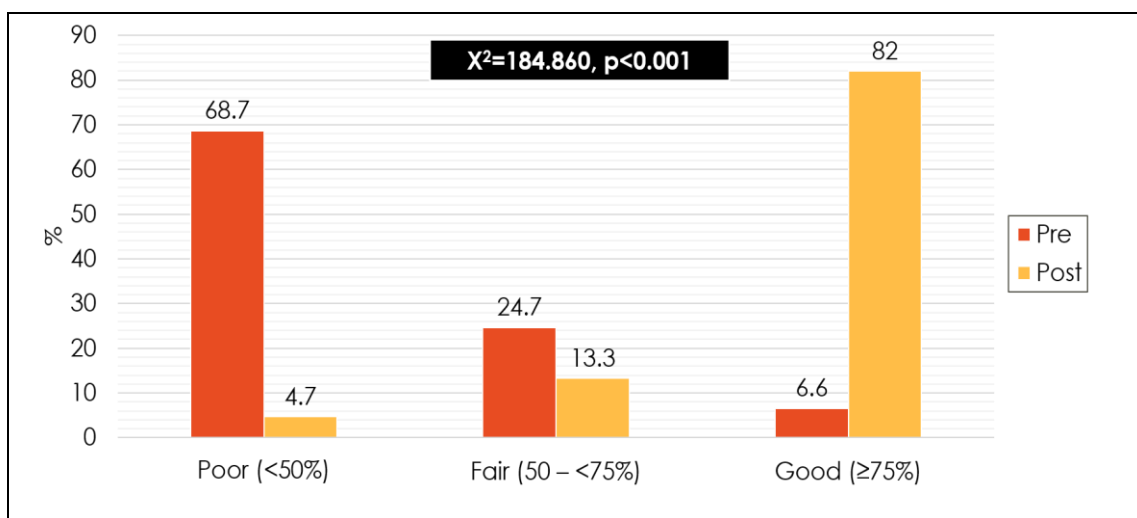


Figure (1): Total Knowledge Scores of Studied Sample about Bronchial Asthma at Pre and Post Mobile Learning Package (n=150).

Table (4). Reported Practices of Studied Sample about Bronchial Asthma at Pre and Post Mobile Learning Package (n=150).

Items	Pre						Post						χ ²	P
	Always		Sometimes		Rarely		Always		Sometimes		rarely			
	No	%	No	%	No	%	No	%	No	%	No	%		
Pre asthma attack														
Preparation of medication	62	41.3	69	46	19	12.7	121	80.6	15	10	14	9.3	54.49	<0.001
Administration of right medication	61	40.6	69	46	20	13.3	118	78.6	17	11.3	15	10	50.30	<0.001
Avoid predisposing factors	62	41.3	71	47.3	17	11.3	116	77.3	19	12.7	15	10	46.55	<0.001
Change the wet clothes	43	28.7	99	66	8	5.3	117	78	23	15.3	10	6.7	81.79	<0.001
During asthma attacks														
Administration of medication	48	32	85	56.7	17	11.3	133	88.7	10	6.7	7	4.7	103.29	<0.001
Ventilation	54	36	71	47.3	25	16.7	118	78.7	17	11.3	15	10	59.45	<0.001
Give worm fluids	58	38.7	69	46	23	15.3	116	77.3	19	12.7	15	10	49.42	<0.001
Massage child chest or back	93	62	32	21.3	25	16.6	126	84	17	11.3	7	4.6	19.68	<0.001
Let child cough to clear lung from mucus	41	27.3	99	66	10	6.6	116	77.3	24	16	10	6.7	81.56	<0.001
Breathing and coughing exercise	62	41.3	66	44	22	14.6	118	78.7	18	12	14	9.3	46.62	<0.001
Nebulizer	62	41.3	69	46	19	12.7	121	80.7	15	10	14	9.3	54.49	<0.001
Let child rest and minimize movements	61	40.6	69	46	20	13.3	118	78.6	17	11.3	15	10	50.30	<0.001
Referral to emergency	62	41.3	71	47.3	17	11.3	116	77.3	19	12.7	15	10	46.55	<0.001
Preventive measures of asthma attacks														
Regular intake of medication	104	69.3	25	16.7	21	14	127	84.7	16	10.7	7	4.7	11.26	0.004
Clean house to remove dust and aggravating factors	43	28.7	99	66	8	5.3	117	78	23	15.3	10	6.7	81.79	<0.001
Treat common cold attacks	55	36.6	69	46	26	17.3	120	80	16	10.7	14	9.3	60.79	<0.001
Let child cough to get rid of mucus	48	32	85	56.7	17	11.3	133	88.7	10	6.7	7	4.7	103.29	<0.001
Let child relax	61	40.6	71	47.3	18	12.3	121	80.7	15	10	14	9.3	56.74	<0.001
Prevent severe exercise and exhaustion	62	41.3	71	47.3	17	11.3	120	80	16	10.7	14	9.3	53.54	<0.001
Regular practice of breathing exercises	60	40	50	33.3	40	26.7	105	70	31	20.7	14	9.3	29.24	<0.001

*Significant at P< .05,** Highly significant at P ≤ 0.001

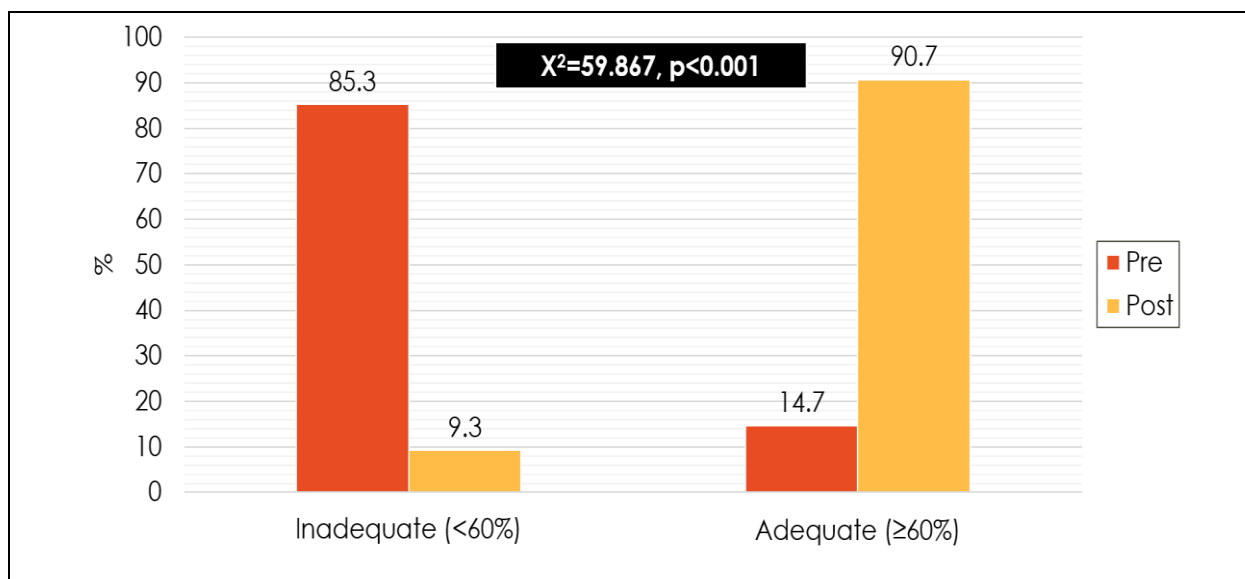


Figure (2): Total Reported Practice Scores about Bronchial Asthma at Pre and Post Mobile Learning Package (n=150).

Table (5): Associations between Total Knowledge Scores and Total Practice Scores about Bronchial Asthma at Post Mobile Learning Package (N=150)

Total knowledge scores	Total practices scores				χ^2	P
	Inadequate practice (< 60%)		Adequate practice (\geq 60%)			
	N=14	%	N=136	%		
• Poor	5	3.3	2	1.3	64.674	<0.001
• Fair	8	5.4	12	8		
• Good	1	0.7	122	81.3		

** Highly significant at $P \leq 0.001$

Table (6): Relationships between Mothers' Demographic Characteristics and their Total Scores of Knowledge and Reported Practices about Bronchial Asthma at Post Mobile Learning Package (n=150).

Mothers' demographic characteristics	Total practices at post					Total knowledge scores									
	Inadequate practice (n=14)		Adequate practice (n=136)		χ^2	P	Poor (n=7)		Faire (n=20)		Good (n=123)		χ^2	P	
	No	%	No	%			No	%	No	%	No	%			
Age (years)															
• <30	1	7.1	14	10.3	22.503	0.001**	0	0.0	1	5.0	14	11.4	12.39	0.015*	
• 30-40	2	14.3	94	69.1			4	57.1	8	40.0	84	68.3			8
• 40+	11	78.6	28	20.6			3	42.9	11	55.0	25	20.3			
Marital status															
• Married	7	50.0	101	74.3	4.208	0.122	3	42.9	14	70.0	91	74.0	5.790	0.215	
• Divorced	3	21.4	19	13.9			3	42.9	4	20.0	15	12.2			
• Widow	4	28.6	16	11.8			1	14.2	2	10.0	17	13.8			
Residence															
• Rural	7	50.0	41	30.15	2.299	0.129	3	42.9	4	20.0	41	33.3	1.803	0.406	
• Urban	7	50.0	95	69.85			4	57.1	16	80.0	82	66.7			
Level of education															
• Basic education	9	64.3	17	12.5	23.873	0.001**	3	42.9	12	60.0	11	8.9	37,68	0.001**	
• Secondary education	2	14.3	41	30.1			3	42.9	4	20.0	35	28.5			
• University education	3	21.4	73	53.7			1	14.2	4	20.0	72	58.5			
• Postgraduate education	0	0.0	5	3.7			0	0.0	0	0.0	5	4.1			
Occupation															
• Employed	5	35.7	57	41.9	8.452	0.031*	5	71.4	6	30	47	38.2	18.29	0.017*	
• House wife	9	64.3	79	58.1			2	28.6	14	70	76	61.8			6

** : Highly significant at $P \leq 0.001$ and * : significant $P < .05$

DISCUSSION

Worldwide, the prevalence of asthma among children has increased steadily during the last 2 decades. Therefore, a vast majority of their parents all over the world are in great need for asthma education [23]. Care giving in childhood asthma is generally the responsibility of the children's mothers, as the children spend most of their time with their mothers rather than any other families' members. So that, the current study was conducted to determine the effect of mobile learning package for mothers about bronchial asthma of their children.

Concerning demographic characteristics of studied mothers, the present study results revealed that slightly less than two thirds of the studied mothers were in the age group from 30 to <40 years with a mean \pm SD was 35.06 \pm 5.66, less than three quarters of the sample were married, slightly more than half of them had university education, about two thirds of sample reside urban areas, and less than three fifths were housewives. These results are congruent with those of Al Binali et al., [24] in Saudi Arabia, who studied "Asthma knowledge and behaviors among mothers of asthmatic

children in Aseer, south-west Saudi", and found that 66.7% of mothers were in age 30-<40, 49.8% of mothers had secondary education, more than two thirds were housewives and majority of mothers reside urban areas. Also, these results were supported by Abd AL-Razaq et al., [25] in Iraq, who studied "Knowledge of mothers concerning child with bronchial asthma" and found in their study that the vast majority of mothers' age ranged between 29 and 38 years, more than one third of mothers had secondary education and more than half were housewives.

The current study findings revealed that, more than two thirds of mothers reside in urban. This finding is corresponding with that of Ahmed [26], in Egypt who studied "Stressors and coping patterns of mothers having children with bronchial asthma" and reported that more than half of asthmatic children were living in urban areas. Also, these results were in agreement with those of Hossny et al., [27], who carried out a study entitled "Analysis of the filed data of a sample of Egyptian children with bronchial asthma" observed that allergic diseases were more prevalent in urban residents, followed by suburban residents, with few cases coming from rural areas. From the researchers'

opinion, these differences can be partially explained by differences in environment exposures to air pollution, and exposure to allergens, such as pollens and house dust.

Regarding to demographic data of children, past history and health status, the current study revealed that more than half of the studied children were in age group 3-<6 years with a mean age of 6.69 ± 1.57 years, slightly more than three fifths of them were boys, more than one third of them ranked first child for their parent. These results were supported by **Zhang et al.**,^[28] in USA, who studied "Asthma related knowledge among parents of asthmatic children at the moment of admission to a specialized service" they mentioned that 52% of child were in age 4-6 years, 61% were boys and reported also that boys have more asthma attacks than girls and prevalence of bronchial asthma is more common in boys than girls. From the researcher's opinion of view, the prevalence of asthma in children may be related to that the immune system of children is not well developed, which may lead to increase risk of developing respiratory tract infections thus leads to triggering of asthma and the nature of male in Egyptian society differs from females in which they like to play outdoor than females, which exposes them to outdoor triggers of asthma and also male children are very active and prefer to play stressful games than females which predisposes them to asthma attacks.

The present study showed that more than one third of child had family history of bronchial asthma and more than two thirds had duration of disease ≤ 3 years, this result is similar to **Zedan et al.**,^[29] who studied "The prevalence of bronchial asthma among Egyptian school children", they found that 32% had positive family history of bronchial asthma. Also, these findings are contrasting with those of **Mansour et al.**,^[30] who study titled in "Prevalence of bronchial asthma and its impact on the cognitive functions and academic achievement among preparatory school children in Damietta Governorate, **Egypt**", they found that 68.3% had duration of asthma more or equal 10 years. From the researchers' point of view, genetic factors play important role in incidence of bronchial asthma. This discrepancy may be attributed to different age group and health condition of each child.

The current study result revealed that more than three quarters of children had peak seasonal attacks during winter and statistically significant improvement were detected in health status of children with bronchial asthma at post than pre mobile learning package as decrease in frequency of asthmatic attack, moist cough, upper respiratory tract infection, difficult breathing, fatigue during any activity and fever. These results were agreement with those of **Abdallah et al.**,^[31] in **Egypt**, who mentioned that the attacks were commonly reported in winter and clarified that cold air, overcrowding, inadequate ventilation and increased frequency of upper respiratory tract infection, fever, increase the chance of occurrence of difficult breathing during the cool season also reported that 63% of children had asthma attack once per month. In addition, these result agreement with that **Manchana and Mahal**^[17] in the Netherlands, who study titled in "Effectiveness of parent education on quality of asthma management among childhood asthmatics", they

found that improvement in child health status after implementation of parent education. From researchers' point of view, the empowering mothers' knowledge and practices about bronchial asthma management helps them in providing their children by appropriate preventive measures and reduces asthma attack, which reflected on their children health status.

As regards mothers' knowledge about bronchial asthma, the present study results showed that highly statistically significant improvements were detected in all items of knowledge at post mobile learning package than pre. As well, this study findings showed statistically significant improvement in mothers' total knowledge scores, also the results revealed that more than two thirds had poor knowledge scores at pre, while at post mobile learning package, more than four fifths of them had good knowledge scores. These results were congruent with those of **Rekha and Padmaja**^[32] in **India**, whose study entitled "A Study to assess the effectiveness of structured teaching program on knowledge regarding bronchial asthma among mothers of under five children in selected hospitals", showed improvement in knowledge after implementation of the structured teaching program in posttest than pretest. Furthermore, this result was in agreement with that of **Allison**^[33] in **America**, who conducted a study entitled "Improving pediatric asthma outcomes using self-management skills" and found that educating mothers about asthma triggers, proper medication administration, and identification of early warning signs and symptoms are essential to asthma control and observed improvement in total knowledge after self-management.

Moreover, these results were supported by **Chiang et al.**,^[34] in **Taiwan**, who studied "Effects of a self-management asthma educational program based on PRECEDE-PROCEED model for parents with asthmatic children", which stated that educational program had impact on improving the level of knowledge about bronchial asthma among the experimental group than control group. From the researchers' view point, this improvement in knowledge may be related to that the implementation of mobile learning package was an effective method for studied mothers to be acquired with knowledge about bronchial asthma.

This results justified the research hypothesis **H1**, which stated that "Mobile learning package will improve mothers' knowledge about bronchial asthma".

Regarding to the self-reported practices of studied mothers, this study result revealed highly statistically significant differences in all items of mothers' reported practices regarding bronchial asthma of their children at pre/post mobile learning package. As well, this study showed statistically significant improvement among mothers regarding total reported practice scores at post. This result was congruent with that of **Koshapor et al.**,^[35] in **Iran**, who studied "Knowledge, attitude, and practices of parents towards children with asthma referring to Ahvaz teaching hospitals", they found statistically significant improvement in practices about bronchial asthma after the intervention for the study group than the control group.

In addition, this finding was in agreement with that of **RoachandBhaskaran**^[36] in India, whose study entitled "A study on the effectiveness of an educational package on the knowledge and practices of mothers of asthmatic children on bronchial asthma", they observed that the difference between the experimental and control groups knowledge was statistically significant ($F=223.663, p < 0.01$) and practices of mothers were improved after implementation of educational package in experimental group than control group. As well, they added that empowering mothers about asthma will help in adopting appropriate preventive measures and reduce asthma exacerbations in children. This result matched with that of **Ahmed, et al.**^[37] in Egypt who performed a study entitled "The use of self-management skills in improving pediatric asthma outcomes", and they reported that there was highly statistically significant improvements in mothers' practices related to their children with asthma after application of self-management program. This may be due to that change in mothers' knowledge which reflected on their practices toward bronchial asthma measures and the effectiveness of the mobile learning package led to improve mothers' knowledge and practices. This results verified the research hypothesis **H2**, which stated that "Mobile learning package will improve mothers' practices about management for their children with bronchial asthma".

The results of the current study indicated that there were statistically significant association between total knowledge scores and total practice scores of studied mothers regarding bronchial asthma of their children at post mobile learning package. This result was in the same line with that of the study done by **Clark et al.**,^[38] in London, who studied "Educational interventions to improve asthma outcomes in children", they reported that the improvement in knowledge leads to increase adequate practices regarding asthma control and found positive correlation between knowledge and total practices. This finding was also agreement with **Gallefossand Bakke**^[39], in India, who studied "Effectiveness of self-management in asthmatics: Follow-up randomized, controlled trial", and found improvement in knowledge and practices in intervention group than control group.

Moreover, **Everhart and Koinis-Mitchell**^[40] in USA who studied "supporting caregivers in the management of childhood asthma", they found that, there was highly statistically significant positive correlation between mothers' knowledge and reported health care related practice. In the same context, **Dawood et al.**,^[41] in Malaysia, who studied "Parents' knowledge and management of their children's ailments", they clarified that, parents with better and higher medical knowledge had better means of managing their children's ailments. This result indicated that the improvement in mothers' knowledge about asthma led to improve mothers' practices. As well, this observed improvement in knowledge and practices regarding asthma clarifies that knowledge plays an important role to promote practices.

The findings of the present study demonstrated that significant relations were found between demographic characteristics of studied mothers as regards age, level of

education and occupation and their total knowledge at post mobile learning package. These findings can be due to the fact that, the young age and educated mothers are more powerful and more oriented to take the right decision related to their children's health. As well as, the housewives' mothers have a good chance and plenty of time to care for their children's health by themselves and also, they are usually in need for any valuable instructions related to their children's health. These results are corresponding with those of **El Sayed**^[42] in Egypt, who carried out a doctorate thesis entitle "Impact of supportive care for mothers of children with brain tumor on their coping in Pediatric Surgical Unit at Cairo University Specialized Pediatric Hospital", who found that, there were statistically significant differences between the mothers' knowledge and their level of education and their age post supportive care. Additionally, **Golfenshtein et al.**,^[43] in USA, who studied "Interventions for reducing parenting stress in families with pediatric conditions", they mentioned that higher level of education is usually associated with good behavior towards child's health.

The current study findings revealed that significant relations were found between demographic characteristics of studied mothers regarding age, level of education and occupation and their total practices at post mobile learning package. These findings were in agreement with those of **Bell and Wright**^[44] in New York, who mentioned in a study entitled "The illness beliefs model: Advancing practice and knowledge about bronchial asthma and family interventions", that more misconceptions in asthma practices between studied caregivers was much stronger in less educated and employed mothers. From researchers' view point, the empowering mothers' knowledge about asthma helps them in providing their children by appropriate preventive measures and reduces asthma attack.

This results agreed with the research hypothesis **H3**, which stated that "There will be a significant relation between knowledge and practices of mothers and their demographic characteristics".

CONCLUSION

Mothers' knowledge and practices improved at post Mobile learning package than pre, with highly statistically significant differences. In addition, there was significant improvement in children's health status after improvement of mothers' knowledge and practices. Also, there was significant relation between knowledge and practices of mothers and their demographic characteristics post applying Mobile learning package.

RECOMMENDATIONS

- Illustrated booklet should be available at all emergency departments, inpatient departments, outpatient hospital clinics and health centers for all mothers of children with bronchial asthma.
- Periodical follow-ups should be carried out to assess health status of children with bronchial asthma and their mothers' level of knowledge and practices.
- Simple educational pamphlets and posters about asthma should be provided for all mothers in outpatient clinics.

- Similar studies should be conducted on a larger sample of children with different age and regions for generalization of the results.

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