Knowledge and Self-Care Management Practice Among Asthmatic Children (6-12 Years): An Educational Intervention Study

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ABSTRACT

Background: Asthma is a highly prevalent chronic respiratory disease which has been increasing worldwide. Education to support self-management is an integral part of asthma care that improves disease control, reduces exacerbations and admissions, and improves quality of life of asthmatic children and their caregivers.

Objective: The aim of the current work was to assess factors affecting knowledge and self-care management practice of asthmatics and their care givers and to evaluate the effect of implementing an asthma educational intervention.

Patients and Method: An interventional study (pre and post comparison study design) was conducted that compared the change in knowledge and self-care practices among participants before and after implementing a health educational program. **Results**: Asthma educational intervention significantly increased asthma symptoms control and pediatric asthma quality of life among studied asthmatic children, asthma knowledge and pediatric asthma caregivers quality of life among caregivers of the studied asthmatic children after the application of the educational program (P<0.001).

Conclusions: It is postulated that children with asthma who receive an interactive, comprehensive educational program would improve their quality of life, asthma management and asthma control compared with children receiving usual care.

Keywords: Knowledge, asthmatic children, educational intervention

INTRODUCTION

Asthma is a highly prevalent chronic respiratory disease affecting 300 million people world-wide [1]. In recent decades, both asthma prevalence and incidence have been increasing worldwide, not only due to the genetic background, but mainly to the effect of a wide number of environmental risk factors, many of which included under the umbrella of "modern lifestyle [2].

In 2019, it was estimated that 262 million people all over the world were affected with asthma that caused 461000 deaths [3] and was responsible for 21.6 million DALYs which was 20·8% of total DALYs from chronic respiratory disease [4]. Asthma affects people from different age range, recent data from the general population showed that in children up to 5 years old, the overall asthma incidence rate was 23/1,000 children per year; this incidence rate decreased among youth aged 12–17 years old to 4,4/1,000/year[2]. The observed prevalence of asthma in the Middle East ranges from 4.4% to 7.6% while in Egypt is 6.7% [5].

Poorly controlled asthma in the growing child may impact emotional, intellectual and physical development [6] and it accounts for a large proportion of childhood hospitalizations, healthcare visits, absenteeism from day care/school and missed work days by parents[7], People with asthma and their families need education to understand more about their disease, their treatment, triggers to avoid, and how to manage their symptoms at home. It is also important to raise community awareness, to reduce the myths and stigma associated with asthma in some settings [2]. Education to support self-management is an integral part of asthma care not an optional extra, overviews of the extensive evidence-base concluded that asthma self-management

supported by regular professional review improves asthma control, reduces exacerbations and admissions, and improves quality of life [8].

The aim of the present study was to assess factors affecting knowledge and self-care management practice of asthmatic school aged children and their care givers and to evaluate the effect of implementing an asthma educational intervention program on knowledge and self-care management practice of asthmatic school aged children and care givers.

SUBJECTS AND METHODS

Study design: An interventional study (pre and post comparison study design) was conducted. It compared the change in knowledge and self-care practices among participants before and after implementing a health educational program.

Study setting: This study was carried out in pediatric outpatient clinic at Benha University Hospitals, due to high attendance rate of asthmatic children and better quality of care on hands of professional physicians with availability of getting repeated follow-up visits.

Study period: This study was carried out in two years; from the first of December 2019 to the end of November 2021.

Study subjects: It included well-diagnosed asthmatic children attending pediatric outpatient clinic at Benha University Hospitals and fulfilling the inclusion criteria of this study.

Inclusion criteria: Asthmatic children attending pediatric outpatient chest clinic at Benha University

Hospitals regardless of their asthma condition, and school aged children between 6 and 12years.

Exclusion criteria: Patients having other lung co-morbidities, including congenital (e.g., cystic fibrosis) and airway infections. Asthmatic children complicated with heart failure (cor pulmonale) or associated with congenital heart disease, and non-responders and drop-out.

Sampling Design:
- **Sample size:** The sample size was calculated using G power software version 3.1.9.4 at effect size .3, power 95% and α error .05. This yielded a sample size of 111 asthmatic children. Allowing for non-responders and drop out or missed data of about 5%, the sample size was adjusted and increased to 116 asthmatic children.
- **Sampling type and technique**: The required sample size (116) was selected randomly from the study population (target population) by using systematic random sampling technique as follow: the first patient was chosen randomly then patients were included every specific number according to their flow until the required sample size was achieved. Because asthmatic children might attend for follow up visits, if the child was repeated, the next child was chosen instead of him or her.

Study tools:
A) Interviewing questionnaires: The following interviewing questionnaires were obtained:-

First questionnaire: Socioeconomic status scale [9].

Second questionnaire: Asthma knowledge questionnaire (AKQ) used to assess the level of asthma knowledge of caregivers of asthmatic children and to assess the efficacy of an educational intervention [10]. Arabic translation of **Alanazi et al. [11]** of AKQ was used.

Third questionnaire: Eight items Morisky medication adherence scale (MMAS-8), each item is measuring a specific medication taking behavior, so barriers to adherence can be identified more clearly[12].

Fourth questionnaire: Pediatric asthma quality of life questionnaire (PAQLQ) was validated for use among children between the ages of 6 and 17 years, it included 23 items in three domains (5 questions of activity limitation domain, 10 questions of symptoms domain and 8 questions emotional function domain) or **pediatric asthma care giver quality of life questionnaire (PACQLQ)** which had 13 items in 2 domains (4 questions for activity limitation and 9 questions for emotional function) [13]. Arabic versions provided by the author were used.

B) Checklist for inhaler technique: The asthmatic children were asked to show how they use their inhaler and check their technique against the checklist for that type most commonly used inhalers are pressurized metered dose inhalers with spacer and dry powder inhalers. Optimal technique was defined as successful execution of each step on the checklist without errors [14].

C) GINA guidelines for determining the level of asthma symptoms control: GINA[15]

Administrative and Ethical design: The necessary official permissions to carry out the study were obtained from the Dean of Benha Faculty of Medicine, the administrators of Benha University Hospitals and Public Health and Community Medicine Department at Faculty of Medicine Benha University.

Ethical consideration:
The study protocol was approved by the Ethical Committee, Faculty of Medicine, Benha University and IRB "institutional review board. An informed consent was obtained from all participants and the relatives of children in this study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis
The collected data were statistically presented and analyzed using the Statistical Package for Social Science (SPSS) SPSS software, version 22.0 (IBM, Armonk, NY, USA) for Windows, The normality of distribution for the analyzed variables was tested using Kolmogorov-Smirnov tests. The collected data were summarized in terms of median and IQR quantitative data while categorical data were presented as number and percentages. Chi square (χ2) and McNemar's test were used to analyze categorical data. Non parametric quantitative variables were analyzed by Wilcoxon Signed Ranks Test, Z Mann Whitney Test, and Kruskal-Wallis test. Testing the association between 2 variables was done by using Spearman's correlation test for ordinal and skewed variables. The accepted level of significance in this work was ($p \leq 0.05$) and ($p > 0.05$) was considered non-statistically significant.

RESULTS
Regarding socio demographic characteristics the mean age of the studied asthmatic children was 8.38 ±2.03 years, 51.7% of them were males, 57.8% were from rural areas and most of their mothers and fathers (92.2% and 95.7% respectively) were Literate, 63.8% of the studied families had a moderate socio-economic level. Regarding asthma related factors nearly half of the studied asthmatic children (50.9%) had average BMI, 46.6% of them had positive family history of asthma, 65.5% had asthma since less than 3 years,

52.5% had exposed to passive smoking, and 63.8% had no other allergies while 81% had previous history of asthma education (table 1).

This table reveals that there was a statistically significant relationship between total asthma control score among the studied asthmatic children and their residence where the median (IQR) total score of urban asthmatic children was 0(0.0-1) and of rural asthmatic children was 3 (2-4) , For mother's education the median (IQR) of total score of illiterate mothers was 4 (2.5-4) compared to that of the literate ones 1 (0.0-3) (P<0.001),while for socio economic level, the median (IQR)of total score among low, middle and high social class asthmatic children were 4 (3-4), 1 (0.0-1) and0 (0-0) respectively(P<0.001) , however there were insignificant statistical relationships between total asthma control score among the studied asthmatic children and their age and their sex in the pre-intervention stage(P>0.05).

Table (1): Total asthma control score (Median, IQR) among the studied asthmatic children regarding some socio –demographic characteristics in the pre-intervention stage (No.=116):

Score / Socio demographic characteristic	Total asthma control score		Test of significance	P value
	Median	IQR		
Age in years ▪ **(6-9)Year** ▪ **(9-12)Year**	1 1	(.5-3) (0.0-4)	Z Mann Whitney =.214	.831
Sex ▪ **Male** ▪ **Female**	1 1	(0-3) (1-4)	Z Mann Whitney = .717	0.47
Residence ▪ **Urban** ▪ **Rural**	0 3	(0.0-1) (2-4)	**Z Mann Whitney =8.54**	**0.001***
Mother's education ▪ **Illiterate **** ▪ **Educated**	4 1	(2.5-4) (0.0-3)	**Z Mann Whitney =190.5**	**0.002***
Socio economic level* ▪ **Low** ▪ **Middle** ▪ **High**	4 1 0	(3-4) (0.0-1) (0-0)	**Kruskal-Wallis test = 80.6**	**0.001***

IQR=Inter quartile range;
* Significant (P<0.01),
**according to a modified score from El- Gilany social score (El- Gilany *et al.*, 2012)

Table 2 shows that there was a statistically significant relationship between asthma knowledge level of caregivers of the studied asthmatic children and family history of asthma where 78.9% of caregivers with good asthma knowledge level had asthmatic children with positive family history of asthma compared to 44%, 43.4% of those with poor and moderate asthma knowledge level respectively(P<0.001). Regarding to duration of asthma disease, 60.5% of caregivers with good knowledge level had children with asthma since 3 years or more compared to 16%, 37.7% of caregivers with poor and moderate asthma knowledge level respectively (P<0.05), while for the presence of other allergies 60.5% of caregivers with good knowledge level had children with other allergies compared to 20% and 26.4% of those with poor and moderate knowledge level respectively (P<0.05). Also for history of previous asthma education 92% of caregivers with poor asthma knowledge level, their children had no history of previous asthma education compared to 90.6% and 47.4% of caregivers with moderate and good asthma knowledge level respectively (P<0.001), however, there was insignificant statistical difference between asthma knowledge level of caregivers and history of exposure to passive smoking among studied asthmatic children in the pre-intervention stage (P>0.05).

Table (2): Asthma knowledge level of caregivers of the studied group regarding some asthma related factors in the pre-intervention stage (No.=116):

Knowledge Level* / Asthma related factors		Poor (No= 25)		Moderate (No= 53)		Good (No= 38)		Total (No=116)		Chi-square test (X²)	P value
		No	%	No	%	No	%	No	%		
Family history of asthma	+ve	11	**44**	23	**43.4**	30	**78.9**	64	55.2	**27.29**	**0.001**
	-ve	14	56	30	56.6	8	21.1	52	44.8		
Duration of asthma (years)	<3 years	21	84	33	62.3	15	39.5	69	59.5	**6.07**	**0.03**
	≥3years	4	**16**	20	**37.7**	23	**60.5**	47	40.5		
Passive smoking	Exposed	15	60	26	49.1	20	52.6	61	52.6	.816	0.656
	Not exposed	10	40	27	50.9	18	47.4	55	47.4		
Other allergies	Present	5	**20**	14	**26.4**	23	**60.5**	42	36.2	**14.77**	**0.001**
	Absent	20	80	39	73.6	15	39.5	74	63.8		
History of previous asthma education	Yes	2	8	5	9.4	20	52.6	27	23.3	**27.29**	**0.001**
	No	23	**92**	48	**90.6**	18	**47.4**	89	76.7		

Table 3 shows that there were significant positive correlations between accuracy of inhalers technique and age, residence, fathers' education, education of mother, history of previous asthma education and level of adherence to treatment among the studied asthmatic children in the pre-intervention stage (P<0.001).

Table (3): Variables significantly correlated to accuracy of inhalers among the studied asthmatic children in the pre-intervention stage (No= 116):

Variables	Accuracy of metered dose inhaler with spacer		Accuracy of dry powder inhaler	
	(r_s)	P-value	(r_s)	P-value
Age of asthmatic children	.766	.000	.825	0.001
Residence	.845	.000	.842	0.001
Fathers' education	.243	.000	.265	0.001
Education of mother	.925	.000	.894	0.001
History of previous asthma education	.766	.000	.664	0.001
Level of adherence to treatment	.980	.000	.933	0.001

Table 4 displays that there were statistically significant increases in (median, IQR) of the total asthma symptoms control score among studied asthmatic children, myths and beliefs domain score , general knowledge domain score, associated aspects domain score and total knowledge score among caregivers of studied asthmatic children, activity limitation domain score, symptoms domain score, emotions domain score and total PAQLQ score among studied asthmatic children and activity limitation domain score, emotions domain score and total PACQLQ score among caregiver of the studied asthmatic children after the application of the educational program compared with the pre-intervention stage (P<0.001).

Table (4): Comparison between asthma control, asthma knowledge of caregivers, pediatric and caregiver's quality of life (Pre-intervention versus post-intervention) (No.=116):

Interventional stage		Pre Intervention		Post intervention		Wilcoxon Signed Ranks test	P Value
		Median	IQR	Median	IQR		
Total asthma control score		1.0	0.25-3.0	1.0	0.0-1	**6.200**	**0.001**
Asthma knowledge questionnaire domain's scores	Myths and beliefs domain	19.5	9-25	24	16-26	**3.42**	**0.001**
	General knowledge domain	16	12-19.75	22	19.25-24	**8.65**	**00.001**
	Associated aspects domain	11	9-13	14	13-16	**8.49**	**0.001**
	Total knowledge level scores	45	36-53	60.5	50-65	**7.52**	**0.001**
Pediatric asthma quality of life questionnaire domains' scores	Activity limitation domain	4.5	4.2-4.8	5	4.8-5.4	**6.82**	**0.001**
	Symptoms domain	4.1	3.8-4.3	4.15	4.1-4.4	**3.907**	**0.001**
	Emotions domain	3.5	3.25-3.75	3.75	3.5-4.25	**5.45**	**0.001**
	Total PAQLQ	4	3.82-4.13	4.37	4.22-4.5	**9.0**	**0.001**
Pediatric asthma caregiver's quality of life questionnaire domains' score	Activity limitation domain	3.75	3.5-4.25	4.75	4.31-5.75	**8.65**	**0.001**
	Emotions domain	3.88	3.77-4.11	4.77	4.44-5.11	**9.27**	**0.001**
	Total PACQLQ	3.84	3.76-4.07	4.86	4.56-5.2	**9.32**	**0.001**

DISCUSSION

The current study found that there was a statistically significant relationship between total asthma control score among the studied asthmatic children and their residence which was consistent with **Mpairwe et al.** [16] who found that poor asthma control was associated with city residence in early life.

Our findings supported a study conducted in Lebanon at which the high mothers' level of education was significantly associated with more asthma control [17], but it was inconsistent with **Kuti et al.** [18] findings where there was no significant association between the caregiver's level of education and the level of asthma control in their children. This could be explained by different level of culture that could affect level of knowledge disrespect of level of education.

Regarding socio economic level, there was statistically significant relationship between total asthma control score among the studied asthmatic children and socio-economic level which agreed with **Kuti et al.** [18], however **Eze Joy** [17] findings showed that socio-demographic characteristics of the children were not statistically significant with asthma control. Such a difference could be attributed to narrow range of socio economic level in the former studies that couldn't

affect level of asthma control among the studied asthmatic children.

The age and sex of asthmatic children had insignificant statistical relationship with asthma control in our results which was consistent with **Kuti et al.** [18] who found that there was no significant association between the gender, age, and the level of asthma control in the children but it was inconsistent with **Temprano & Mannino** [19] who found that women were more likely to have poor short and long-term asthma control compared with men. Such difference may be explained by different age range between our study and this study which included adult people among whom sex hormones may play a role in asthma control and exacerbation.

There was a statistically significant relationship between asthma knowledge level of caregivers of the studied asthmatic children and family history of asthma, duration of having asthma and presence of other allergies in asthmatic children during pre interventional stage. Meanwhile a Nigerian study found a statistically significant relationship between asthma knowledge level of caregivers of the studied asthmatic children and family history of asthma but failed to find a significant relationship between asthma knowledge level of

caregivers and time since asthma diagnosis among the studied children and presence of other allergic diseases [20]. This could reflect their limited curiosity to know about the medical status of their children.

In this study, Asthma knowledge level of caregivers had a significant relationship with history of previous asthma education which was consistent with **Ali et al.** [21], while accuracy of inhalers technique had a significant positive correlations with age, residence, fathers' and mothers' education, history of previous asthma education and level of adherence to treatment among the studied asthmatic children in the pre-intervention stage which supported the findings of **Barbara et al.** [22] who found a negative correlation between advancing age and correct technique across MDI and varying DPI devices, but it didn't support the results of **Cinar et al.** [23] who found insignificant relation between parents' educational level and accuracy of inhaler technique. This disparity could reflect high level of caregivers' awareness disrespect of their educational level.

The results of this study was consistent with **Azzi et al.** [24] who found that adherent behavior was independently associated with inhaler technique maintenance using logistic regression which was the first research to unequivocally establish a predictive relationship between inhaler technique maintenance and actual patient adherence.

After the application of the educational program and compared with the pre-intervention stage, there were statistically significant increases in (median, IQR) of the total asthma symptoms control score among studied asthmatic children, myths and beliefs domain score , general knowledge domain score, associated aspects domain score and total knowledge score among caregivers of studied asthmatic children, activity limitation domain score, symptoms domain score, emotions domain score and total PAQLQ score among studied asthmatic children and activity limitation domain score, emotions domain score and total PACQLQ score among caregiver of the studied asthmatic children($P<0.001$) .This agreed with **Ali et al.** [21] who found a statistically highly significant difference among pre and post asthma education according to the childhood asthma control test, where, the mean score was significantly higher post asthma education (22.27 ± 1.84) than pre asthma education (19.03 ± 1.79), with **Kotwani & Chhabra**[25] interventional trial which found that educational intervention led to improvements in knowledge in several domains of asthma knowledge questionnaire (AKQ), with a study conducted in Saudi Arabia by **Alreshidi** [26] which concluded that the asthma education program impacted positively on students' knowledge , with a study conducted in Mansoura by **Elbanna et al.** [27], which found that the educational intervention significantly improved the level of asthma knowledge ($p < 0.001$) , with a study conducted by **Kocaaslan & Akgün Kostak** [28] at which the

children's quality of life (activity limitation domain score, symptoms domain score, emotions domain score and Total PAQLQ score) and self-efficacy scale increased significantly after education and with **Munzenberger & Vinuya** [29], study at which significant improvements were seen in overall QOL scores after asthma education, but it was not consistent with a study of **Cano-Garcinuño et al.** [30], where no differences were observed in terms of quality of life between controls and any of the intervention asthmatic children groups after conducting health education sessions and **Butz et al.** [31], where there was no significant difference in parent and child quality of life at follow-up after conducting health education. We can explain this by the fact that QOL has many factors that affect it rather than health knowledge only.

Regarding caregivers' QOL, our results supported **Julian et al.** [32], finding where there was a significant statistical improvement in PACQLQ after therapeutic education ($P < 0.001$), but it was inconsistent with a study conducted by **Dolinar et al.** [33], where quality of life as measured by the PACQLQ remained unchanged over the interventional period of health education ($p>0.05$) and this also could be explained by the fact that QOL has many factors that affect it rather than health knowledge only.

CONCLUSION
Patient education has been an important intervention in all fields of nursing for decades, with benefits for both patients and their caregivers. Education aims to provide suitable information that not only increases patients' knowledge related to their health, but also helps them to take a more active role in the care management of their own situation. It is postulated that children with asthma who receive an interactive, comprehensive education program would improve their quality of life, asthma management and asthma control compared with children receiving usual care.

REFERENCES
1. **Mims J (2015):** Asthma: definitions and pathophysiology. International Forum of Allergy & Rhinology, 5(1): 2-6.
2. **Nunes C, Pereira A, Morais-Almeida M (2017):** Asthma costs and social impact. Asthma Res Pract., 3: 1-3.
3. **World Health Organization (2021):** Asthma fact sheet. http://www.who.org.
4. **Vos T, Lim S, Abbafati C et al. (2020):** Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the

Global Burden of Disease Study 2019. The Lancet, 396(10258): 1204-1222.

5. **Tarraf H, Aydin O, Mungan D** *et al.* **(2018):** Prevalence of asthma among the adult general population of five Middle Eastern countries: results of the SNAPSHOT program. BMC Pulm Med., 18: 68-72.

6. **Al-Gewely M, El-Hosseiny M, Abou Elezz N** *et al.* **(2013):** Health-related quality of life in childhood bronchial asthma, Egypt J Pediatr Allergy Immunol., 11(2):83-93.

7. **Ibrahim N, Alhainiah M, Khayat M** *et al.* **(2019):** Quality of Life of asthmatic children and their caregivers. Pak J Med Sci., 35(2):521-526.

8. **Pinnock H (2015):** Supported self-management for asthma. Breathe, 11(2): 98-109.

9. **El-Gilany A, El-Wehady A, El-Wasify M (2012):** Updating and validation of the socioeconomic status scale for health research in Egypt. East Mediterr Health J., 18(9):962-8.

10. **Rodríguez Martínez C, Sossa M (2005):** Validation of an asthma knowledge questionnaire for use in parents or guardians of children with asthma: Arch Bronconeumol., 41(8):419-24.

11. **Alanazi A, Al-Moamary M, Ismaeil T** *et al.* **(2014):** The Reliability of the Arabic Version of the Asthma Knowledge Questionnaire and Assessment of the Level of Asthma Awareness among Parents of Children with Asthma in Saudi Arabia. Middle East Journal of Scientific Research, 20(4): 41-46.

12. **Morisky D, Ang A, Krousel-Wood M** *et al.* **(2008):** Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich), 10(5):348-54.

13. **Juniper E, Guyatt G, Feeny D** *et al.* **(1996):** Measuring quality of life in children with asthma. Qual Life Res., 5(1):35-46.

14. **National Asthma Council Australia (2019):** Australian Asthma Handbook, Version 2.0. National Asthma Council Australia, Melbourne. http://www.asthmahandbook.org.au

15. **Global Initiative for Asthma (2016):** Global Strategy for Asthma Management and Prevention. http://www.ginasthma.com

16. **Mpairwe H, Tumwesige P, Namutebi M** *et al.* **(2019):** Asthma control and management among schoolchildren in urban Uganda: results from a cross-sectional study. Wellcome Open Research, 4: 168-163.

17. **Eze Joy N, Ayuk Adaeze C, Ughasoro Maduka D (2021):** Spatial difference in the Socio-demographic char-acteristics of children with varied asthma control does it make a difference?. African Journal of Respiratory Medicine, 16(2): 31-36

18. **Kuti B, Omole K, Kuti D (2017):** Factors associated with childhood asthma control in a resource-poor center. Journal of Family Medicine and Primary Care, 6(2): 222–230.

19. **Temprano J, Mannino D (2009):** The effect of sex on asthma control from the National Asthma Survey. Journal of Allergy and Clinical Immunology, 123(4): 854-860.

20. **Kuti B, Omole K (2016):** Factors associated with caregivers' knowledge about childhood asthma in Ilesa, Nigeria. Ann Nigerian Med., 10(1): 30-33.

21. **Ali H, Mervat G, Refaey M** *et al.* **(2021):** Asthma education and its impact on emergency department visits by asthmatic children. The Medical Journal of Cairo University, 89: 2809-2819.

22. **Barbara S, Kritikos V, Bosnic-Anticevich S (2017):** Inhaler technique: does age matter? A systematic review. European Respiratory Review, 26(146): 126-130.

23. **Cinar A, Altinkaynak P, Besli E** *et al.* **(2021):** Evaluation of Proper Inhaler Use in Children with Acute Asthma Admitted to the Emergency Department: A Single-Center Cross-Sectional Study. Erciyes Medical Journal, 43(1): 67-75.

24. **Azzi E, Srour P, Armour C** *et al.* **(2017):** Practice makes perfect: self-reported adherence a positive marker of inhaler technique maintenance. NPJ Primary Care Respiratory Medicine, 27(1): 29-33.

25. **Kotwani A, Chhabra S, Tayal V** *et al.* **(2012):** Quality of asthma management in an urban community in Delhi, India. The Indian Journal of Medical Research, 135(2): 184-188.

26. **Alreshidi N, Livesley J, Al-Kalaldeh M** *et al.* **(2020):** The Impact of a School-based, Nurse-delivered Asthma Health Education Program on Quality of Life, Knowledge, and Attitudes of Saudi Children with Asthma. Comprehensive Child and Adolescent Nursing, 20: 1–15.

27. **Elbanna R, Sileem A, Bahgat S** *et al.* **(2017):** Effect of bronchial asthma education program on asthma control among adults at Mansoura district. Egyptian Journal of Chest Diseases and Tuberculosis, 66(4): 561-569.

28. **Kocaaslan E, Akgün Kostak M (2019):** Effect of disease management education on the quality of life and self-efficacy levels of children with asthma. Journal for Specialists in Pediatric Nursing, 24(2): 12241.

29. **Munzenberger P, Vinuya R (2002):** Impact of an asthma program on the quality of life of children in an urban setting. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 22(8): 1055-1062

30. **Cano-Garcinuño A, Díaz-Vázquez C, Carvajal-Urueña I** *et al.* **(2007):** Group education on asthma for children and caregivers: a randomized, controlled trial addressing effects on morbidity and quality of life. Journal of Investigational Allergology and Clinical Immunology, 17(4): 216-20.

31. **Butz A, Pham L, Lewis L** *et al.* **(2005):** Rural children with asthma: impact of a parent and child asthma education program. Journal of Asthma, 42(10): 813-821.

32. **Julian V, Amat F, Petit I** *et al.* **(2015):** Impact of a short early therapeutic education program on the quality of life of asthmatic children and their families. Pediatric Pulmonology, 50(3): 213-221.

33. **Dolinar R, Kumar V, Coutu-Wakulczyk G** *et al.* **(2000):** Pilot study of a home-based asthma health education program. Patient Education and Counseling, 40(1): 93-102.