Effect of Education on Asthma Control in Children: A Quasi-Experimental Study

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Abstract

Background
The prevalence of asthma has increased significantly in recent decades, especially in lower socioeconomic groups and in minority populations. Because of the increasing prevalence of asthma among children in worldwide and Iran, the importance of timely control of the disease after its diagnosis and few studies on the effect of education on asthma control in Iran, the aim of this study was to investigate the effect of education on asthma control in children.

Materials and Methods
In this quasi-experimental study, 104 Iranian children (6-14 years old) with asthma referred to asthma and allergy clinic of Children's Medical Center in Tehran, Iran, were studied via convenience sampling method. Recruitment was occurred between 2011 and 2015. Subjects randomly were divided into two equal groups of intervention and control. For intervention group, common education as well as special education in format of booklet, pamphlets, CD and group training sessions were applied every two weeks within the first two months of follow up and every two months then after; while the control group received usual care.

Results
The means of FEV1/ FVC change, frequency of admission to the ED, hospitalization and absence from school and use of steroids were significantly different before and after education in the intervention group; while changes among measured parameters in the control group were not significantly different ($p > 0.05$).

Conclusion
The results of this study showed that specific education has significant helpful effect on asthma attack control in children.

Key Words: Asthma, Asthma Control Test, Children, Education, Iran.

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1- INTRODUCTION

Asthma is the most common chronic disorders in the world (1) that affect children (2-4). It is more common in the 6–7 year age-group in comparison to 13–14 year age-group (5). The prevalence of asthma has increased significantly in recent decades, especially in lower socioeconomic groups and in minority populations (6). According to a systematic review study, the prevalence of Asthma in Iran between 1992 and 2012 was 2.7 % and 3.5% in children aged 6-7 and 13-14 years, respectively (7). Despite the evidence-based guidelines, morbidity and mortality related to asthma remain high (8). Children with asthma suffer from a high number of school absences (9), the high and increasing rate of disability (10, 11), and high health care costs (12). The aim of asthma control is restoring the lung function and daily activities to normal levels, prevention of acute and chronic inflammation and asthma attacks (13, 14).

Thus, patient education is highly effective in motivating the patients and families to achieve these goals and their better compliance with prescribed medications (15). Results of a systematic review of 32 trials on pediatric patients showed that asthma education programs compared to usual care improved physiological function and self-efficacy, reduced days of school absence and days of restricted activity, decreased emergency department utilization, and reduced sleep disturbances at night (4). In patient education, highlights of the content of asthma education includes: a) Understanding basis of asthma, b) The role of medications and the importance of proper use of them, c) Skills (use of equipment, breathing containers, how to assess asthma control, symptom control and monitoring, Peak Expiratory Flow (PEF) monitoring, accurate recognition of symptoms and appropriate responses to them, d) The importance of reducing environmental triggers, and e) When and how to adjust treatment based on the action plan and how to answer to the changes that occur over time in the management of asthma (15). Based on the programs designed for asthma, such as the Expert Panel Report 3 (EPR—3), it is recommended that training of patients with asthma as a routine and daily care to be included in the programs of patients' visits in any place where the patient is visited (such as Emergency Department (ED), hospital ward, pharmacy, clinic, etc.); also an interaction should be made between patient and health care providers for effective management of asthma (13). Because of the increasing prevalence of asthma among children in worldwide and Iran, the importance of timely control of the disease after its diagnosis and few studies on the effect of education on asthma control in Iran, the aim of this study was to investigate the effect of education on asthma control in children.

2- MATERIALS AND METHODS

In this quasi-experimental study, 104 Iranian children (6-14 years old) with asthma, who referred to asthma and allergy clinic of Children's Medical Center in Tehran, Iran, were studied via convenience sampling method. Recruitment was occurred between 2011 and 2015. Subjects randomly were divided into two equal groups of intervention and control based on the hospital reception list. This study was conducted in accordance with ethical issues in human subjects mentioned in declaration of Helsinki. Written informed consent was obtained from families and children before any research activities were initiated. In this study, we treated both intervention and control groups by common and standard therapies of asthma based on Global Initiative for Asthma (GINA) guidelines in 2007 (9). For intervention group, common education as well as special education in format of booklet, pamphlets, CD and group training

sessions were applied every two weeks within the first two months of follow up and every two months then after; while, the control group received usual care. Demographic (gender, type of nutrition and mother`s route of delivery), and clinical (symptoms, triggers of disease, admission to emergency department [ED], hospitalization, family history and drugs used before admission) were collected by a checklist. Moreover, the valid and reliable Persian version of Asthma Control Test (ACT) questionnaire (Cronbach's alpha coefficient= 0.89) (16) were used for data collection which were completed within the first visit and one-year follow-up, respectively. ACT has been designed based on the age of children. For children 4 to 11 years old, ACT with seven questions is used and the total score ranges from 0 – 27. For teens 12 years old and older, ACT with 5 questions was used and total score ranges from 5-25. In both age groups, score equal to or less than 19 was considered as uncontrolled asthma and well controlled asthma was attributed to score greater than 19 (17).

After completion of ACT, the patients underwent spirometry to measure two parameters such as Forced Expiratory Volume in 1 sec (FEV1), and Forced Vital Capacity (FVC). Variables such as FVC, FEV1, FEV1/FVC, frequency of hospitalization, admission to the ED, and absence from school, use of systematic steroids, and antibiotics were measured and compared before and after intervention in both groups. Data were analyzed by SPSS version 18.0. Descriptive statistics and statistical tests such as paired t- test and independent sample t -test were used for data analysis. P-value less than 0.05 were considered as significant.

3- RESULTS

A total of 104 patients participated in this study. The mean age of children was 8.01 (1.62) and 8.42 (2.08) years in the intervention and control group, respectively. Demographic and clinical characteristics of children are shown in **Table.1**.

Table-1: Frequency distribution of demographic and clinical characteristics of children with asthma

Variables	Number (%)
Gender	
Boy	79 (76)
Girl	25(24)
Type of Nutrition	
Breast milk	91(87.5)
Breast milk and formula	13(12.5)
Route of delivery	
Cesarean section	61(58.7)
Vaginal delivery	43(41.3)
Symptoms	
Cough	86(82.7)
Wheezing	49(47.1)
Dyspnea	26(25)
Feeling of pressure in the chest	7(6.7)
Aggravated at night	56(53.8)
Daily aggravation	5(4.8)
Continuous secretion of sputum	20(19.2)
Persistent secretion of sputum	59(56.7)

Seasonally secretion of sputum	45(43.3)
Triggers of disease	
Respiratory tract infections	87(83.7)
Exercise	68(65.4)
Perfumes	66(63.5)
Detergents	53(51)
Smoke	51(49)
Emotional states	66(63.5)
Domestic animals	13(12.5)
Pollen	31(29.8)
Admission to ED	80(76.92)
Hospitalization	35(33.65)
Family history	
Asthma	73(70.2)
Urticaria	23(22)
Allergic rhinitis	37(35.6)
Eczema	11(10.6)
Used drug	
Oral salbutamol	61(58.7)
Inhaled salbutamol	75(72.1)
Cromolyn sodium	13(12.5)
Inhaled beclomethasone	35(33.7)
Inhaled fluticasone	62(59.6)
Oral theophylline	45(43.3)
Systemic steroids	57(54.8)

In the intervention group, the mean ACT score was 18.76 (3.26) and 19.61 (2.35) before and after education, respectively (p=0.005). Before any intervention, asthma has been controlled in 25 patients (48.08%), and has not been controlled in 27 patients (51.92%); while, after intervention, asthma was controlled in 32 patients (61.53%) and remained uncontrolled in 20 patients (38.46%) (p<0.05).

On the other hand, in the control group, the mean ACT score before and after education was 18.80 (2.77) and 19.03 (2.35) with no significant difference (p=0.147). Moreover, asthma, in the control group, had been controlled in 24 patients (46.15%), and not controlled in 28 patients (53.85%), whereas at the end of the study, the disease was controlled in 28 patients (53.85%) and 24 patients (46.15%) remained uncontrolled (p=0.244). The results of the analysis of measured parameters before and after education in both intervention and control groups are shown in the **Table 2 and 3**.

According to **Table.2**, the means of FEV1/FVC change, frequency of admission to the ED, hospitalization and absence from school and use of steroids were significantly different before and after education in the intervention group (p<0.05); while changes among measured parameters in the control group were not significantly different (p>0.05) (**Table.3**).

Table-2: Mean and standard deviation of measured parameters before and after education in intervention group

Parameters	Before Mean (SD)	After Mean (SD)	P-value
FVC (L)	90.93(14.36)	89.84(14.05)	0.428
FVC change (L)	-1.10 (11.25)	0.84(10.65)	0.383
FEV1 (L)	93.58(20.38)	95.01(17.10)	0.541
FEV1 change (L)	-2.72(12.99)	0.81(10.36)	0.176
FEV1/FVC (%)	102.97(9.45)	104.07(9.76)	0.499
FEV1/FVC change (%)	-3.11(10.55)	1.15(7.28)	0.018
Frequency of admission to ED	1.62(1.41)	1.15(1.22)	0.005
Frequency of hospitalization	0.46(0.75)	0.25(0.48)	0.001
Use of systemic steroids	0.25(1.66)	1.83(1.75)	0.005
Frequency of absence from school	6.19(6.19)	4.69(5.38)	0.005
Use antibiotic	2.58(1.69)	2.46(1.85)	0.224

SD: standard deviation, FVC = forced vital capacity, FEV1= forced Expiratory volume in 1 second, ED= emergency department.

Table-3: Mean and standard deviation of measured parameters before and after education in control group

Parameters	Before Mean (SD)	After Mean (SD)	P-value
FVC (L)	93.04 (12.05)	92.76 (12.51)	0.829
FVC change (L)	3.36 (12.49)	0.78(10.81)	0.193
FEV1 (L)	97.55(13.96)	96.98(16.97)	0.797
FEV1 change (L)	3.24 (12.62)	3.27 (24.75)	0.993
FEV1/FVC (%)	102.85(8.97)	102.76 (11.35)	0.969
FEV1/FVC change (%)	0.59 (9.37)	2.26 (13.35)	0.468
Frequency of admission to ED	1.96 (1.37)	1.83(1.21)	0.180
Frequency of hospitalization	0.54 (0.85)	0.46 (0.69)	0.209
Use of systemic steroids	2.44 (1.91)	2.40 (1.92)	0.485
Absence from school	5.87 (5.69)	5.81 (5.76)	0.518
Use antibiotic	2.85(2.23)	3.85(2.32)	1

SD: standard deviation, FVC = forced vital capacity, FEV1= forced Expiratory volume in 1 second, ED= emergency department.

4- DISCUSSION

In the present study, the prevalence of asthma was higher in boys than girls, which was similar to the results of other studies (18, 19). It may be due to the gender preferences for boys in the study region. The most patients in this study were born by cesarean section that was predictable due to high rate of cesarean section in our society. In terms of nutrition, the high percentage of patients fed with breast milk, which was predictable. Moreover, the most common symptoms were cough, wheezing and dyspnea, which was in accordance with the textbooks and other studies (20). Respiratory infections, exercise and perfumes were the most common triggers of asthma attacks in the present study that was consistent with other studies (21-24). The number of patients with controlled asthma in the intervention group was significantly higher than before education. This reflects the positive effect of special education on asthma control in children. In addition, the mean number of admissions to ED in the intervention group within one- year follow- up was significantly less

than before training; while in the control group, there was not any difference in the number of admissions to ED at the beginning and the end of the study that indicate the effectiveness of the training on of asthma attack control. These results were consistent with other studies (25-27). Mean number of hospitalizations in the intervention group within one- year follow- up after education was significantly lower than before education; while in the control group, there was no difference in the mean number of hospitalizations at the beginning and the end of the study, which was consistent with the results of other studies and confirms the positive effect of education on control of asthma attacks (28, 29).

The mean number of taking systemic steroids in the intervention group within one- year follow- up after education was significantly lower than before education; while in the control group no significant difference was found in the mean number of taking steroids at the beginning and the end of the study that was consistent with the findings of other studies (18, 30-34). In the present study, the mean number of taking antibiotics was not significantly different before and after education in the intervention group and at the beginning and the end of the study in the control group. It can be because of the viral origin of infections triggering attacks and antibiotics were not indicated and prescribed in viral infections.

On the other hand, the number of days children was absent from school or kindergarten in the intervention group within one- year follow- up after education was significantly less than before education; while in the control group no significant difference was found at the beginning and the end of the study. These results were in line with other studies (25, 27, 32). Spirometry parameters except mean FEV1/FVC did not change before and after education in the intervention

group. In the control group, no significant difference was found in spirometry parameters at the beginning and the end of the study. In Pbert et al., study, there was no significant effect on pulmonary function indices such as PEF and FEV1 following education (35). It can be concluded that pulmonary status did not change much during the study period and the effect of education on patient behavior and lifestyle modification resulted in the prevention of severe attacks, sudden and short-term risky exacerbation episodes. Therefore, a significant reduction in FEV1/FVC after training is also indicating the effect of training on this index. Recent studies on the effect of education on asthma control also showed different outcomes such as increasing the children's awareness and improvement in quality of life and asthma control within 1.5 years from onset of disease (36), increasing the adoption time and treatment compliance (37), reducing admission to the ED (38, 39), decreasing the mean duration of hospitalization (40), and reducing stress (35). Conducting of this project in the referral Children's Medical Center in Iran is one of the most important strengths of our study. On the other hand, difficulty in following-up patients from far distance to the study center for regular follow-up was our study limitations. So, it is suggested that it should be considered in future studies.

5- CONCLUSION

The results of this study showed that specific education has significant effect on asthma attack control in children. Therefore, physicians and other health care providers should always pay attention to special education and a standard training program for patients with asthma and their families is recommended

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENTS

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