BRIEF COMMUNICATION
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How Hospitalizations Can Be Effective in Subsequent Care of Children with Asthma?

Samin Sharafian[1], Ghasem Barjouei Fard[2], Maryam Atabakzadeh[3], Masoud Movahedi[4], Nima Parvaneh[4], Mansoureh Shariat[4], and Mohammad Gharagozlou[4]

[1] Department of Allergy and Clinical Immunology, Mofid Children's Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2] Department of Pediatrics, Children's Medical Center Hospital, Tehran University of Medical Sciences, Tehran, Iran
[3] Vice-Chancellery Research and Technology Affairs, Bushehr University of Medical Sciences, Bushehr, Iran
[4] Division of Allergy and Clinical Immunology, Department of Pediatrics, Children's Medical Center Hospital, Tehran University of Medical Sciences, Tehran, Iran

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ABSTRACT

Asthma is a prevalent chronic inflammatory disorder in children, and poor therapeutic response in asthmatic children could result from various factors related to the physician, patient, disease, and treatment. This study aimed to evaluate the most important causes of failure in asthma control.

One hundred three children referred to the Children's Medical Center in Tehran, Iran, participated in this study in 2017. A specific questionnaire was organized and completed by telephone interviews with parents.

The mean age of participants was 10.30 years, and 68.9% were male. More action plans (45/53) were received from hospitalized patients in the asthma and allergy ward than from hospitalized patients in the emergency department (13/46). Moreover, 85% of admitted patients in the asthma and allergy ward were visited by a specialist compared with 50% in the emergency department (23/46).

Hospitalization in the asthma and allergy ward resulted in receiving more action plans, spirometry tests, and visits by an allergist after discharge compared with admission to the emergency department.

Keywords: Action plan; Asthma; Children; Education; Hospitalization; Spirometry

INTRODUCTION

Asthma is the most prevalent chronic inflammatory disorder, with more than 300 million individuals suffering from it worldwide.[1-3] According to a national study of 33,260 Iranian children aged 6 to 14 years, 10.9% were found to have asthma.[4] Asthma management aims to improve airway inflammation by reducing pre-inflammatory environmental exposures, using daily anti-inflammatory medications, and controlling comorbidities.[5] Poor cooperation of children in asthma treatment is an important factor in poor therapeutic response.[6] The reasons for poor therapeutic

Corresponding Author: Mohammad Gharagozlou, MD; Division of Allergy and Clinical Immunology, Department of Pediatrics, Children's Medical Center Hospital, Tehran University of Medical Sciences, Tehran, Iran. Tel: (+98 912) 4338 381, Fax: (+98 21) 6642 8996, Email: gharagoz@tums.ac.ir

response or nonadherence in asthma patients can be divided into variables related to the physician (such as unfamiliarity with standard guidelines and misdiagnosis), the patient (lack of regular visits, low level of education, and insufficient understanding of the need for treatment), the disease (such as comorbidities, asthma triggers, and type of asthma), and treatment (long-term treatments, multiple treatment regimens, and side effects of medications).[6] This study aimed to clarify the most important causes of failure in asthma control, including evaluating the status of patients 6 months before and 6 months after hospitalization in this center; the role of education by the medical team; regular and targeted visits by physicians in the asthma and allergy department; and evaluating the patients with spirometry.

MATERIALS AND METHODS

This cross-sectional study was conducted on 103 patients referred to the emergency, asthma and allergy, and intensive care unit (ICU) departments of Children's Medical Center in Tehran, Iran, in 2017. The Ethics Committee of Tehran University of Medical Sciences approved this study (No. 13964105). A questionnaire was organized in accordance with socioeconomic and cultural conditions and answered via telephone interviews with parents. The questionnaire included 11 questions related to age, sex, insurance status, parental education, multiple treatments, side effects, multiple doctor visits, adverse drug reactions, long course of treatment, receiving effective medication before diagnosis, severity of asthma, visit to an asthma or lung specialist, and spirometry. In addition, Tables 1 and 2 present a list of variables.

Statistical Analysis

Data analysis was performed using SPSS software, version 18 (IBM, Chicago, IL, USA). To describe the categorical variables, frequency and percentage were used. Mean and standard deviation were determined for quantitative variables. Chi-square analysis and Fisher's exact test investigated the association between the interventions and the qualitative outcomes. To compare quantitative variables before and after hospitalization, the paired *t* test was used. A significance level of 0.05 was considered.

RESULTS

This study examined the demographic data of 103 children with asthma, 71 (68.9%) of whom were boys. The mean age of the participants was 10.30 years (SD, 2.10), and 98% had insurance. In our research, most parents had a diploma or less. A family history of allergic diseases was reported in 84 of 103 patients. Among hospitalized patients, 80% had received medical training, mainly during and after hospitalization. Table 1 provides the number and percentage of some studied variables. The mean ages of onset and start of treatment were 4.66 and 5.48 years, respectively. Furthermore, 45 of the 53 asthmatic children hospitalized in the asthma and allergy ward had received an action plan.

Additionally, spirometry was performed for 30 of 46 (65%) patients admitted to the emergency department, while 46 of 53 (87%) asthma patients underwent spirometry in the asthma and allergy ward. A significant association was found between spirometry, a visit from a pediatrician and allergist, and receiving an action plan during and after admission with the type of hospitalization ward (emergency, ward, and ICU) ($p<0.01$).

Furthermore, the frequency of spirometry, visits by a pediatrician and allergist, and receiving an action plan before, during and after admission are presented in Table 2. The frequency of medications used before and after admission is also listed in Table 2.

Table 1. The frequency of asthma-related variables and patient information

Variable	n (%)	Variable	n (%)
History of hospitalization due to Asthma		**The frequency of asthma Attacks in past 6 months**	
Yes	84 (82.4)	**No Attack**	15 (14.9)
No	18 (17.6)	**1**	57 (56.4)
No response	1	**2**	16 (15.8)
		3	10 (9.9)
		4	3 (3)
		No response	2
Asthma Diagnosis before hospitalization		**Emergency visits in last year**	
Yes	47 (45.6)	**No visit**	23 (23)
No	56 (54.4)	**Once**	69 (69)
		Twice	8 (8)
		No response	3
Oral education		**Patient difficulties during exercise and playing**	
Yes	83 (81.4)		
No	19 (18.6)	**Mild**	62 (60.2)
		Moderate	27 (26.2)
		No Problem	14 (13.6)
Patient status from parents' perspectives		**Waking up due to asthma**	
		Often	6 (6)
Bad	19 (18.4)	**Sometimes**	75 (75)
Good	78 (75.7)	**Never**	19 (19)
Very good	6 (5.8)	**No response**	3 (3)
Cough status		**Cough and wheezing in last 4 weeks**	
Often	12 (11.7)		
Sometimes	85 (82.5)	**Without symptoms**	23 (22.5)
No	6 (5.8)	**1–3**	61 (59.8)
		4–10	16 (15.7)
		>10	2 (2)
School absences due to asthma in last year		**Hospitalization status**	
		Emergency	46 (45.5)
Never	11 (14.5)	**Ward**	53 (52.5)
1	26 (34.2)	**Intensive care unit**	2 (2)
2	26 (34.2)	**No response**	2
3	11 (14.5)		
6	2 (2.6)		
No response	27		
Influenza vaccine	24 (24.2)	**Go to clinic**	78 (88.6)
No response	4	**No response**	15

Table 2. Comparison of asthma management practices before, during, and after intervention

		Before n (%)	During n (%)	After n (%)
Action plan		1 (2)	61 (59.2)	49 (98)
Drug therapy	Yes	65 (69.10)	–	94 (100)
	SABA	70 (68.00)		102 (99.00)
	ICS	45 (43.70)		96 (93.20)
	LABA	2 (1.90)		12 (11.70)
	LTRA	0 (0.00)		44 (43.60)
	Oral corticosteroids	0 (0.00)		67 (65.00)
	Injection Corticosteroids	0 (0.00)		32 (31.10)
	SABA only	79 (76.70)		98 (95.00)
	SABA + ICS	35 (34.00)		87 (84.50)
	ICS only	103 (100.00)		103 (100.00)
Spirometry	Yes	3 (3.00)	27 (26.20)	69 (67.00)
Pediatrician visit	Yes	14 (13.60)	–	83 (82.20)
Regular pediatrician visit	Yes	10 (10.30)	–	33 (35.90)
Allergy specialist visit	Yes	7 (7.00)	–	69 (67.00)
Pediatrician visit and spirometry	Both	2 (2.00)	–	63 (62.40)
Pediatrician visit or spirometry	Both	15 (15.20)	–	87 (86.10)
Pediatrician visit, spirometry and drug therapy	None	29 (100.00)	–	13 (18.57)
	All three	0 (0.00)	–	57 (81.43)

ICS: inhaled corticosteroids; LABA: long-acting beta-agonists; LTRA: leukotriene receptor antagonists; SABA: short-acting beta-agonists.

DISCUSSION

In the current study, most of the children with asthma were boys (68.9%). In a study conducted in Italy, of the 183 patients with asthma, 110 were male.[7] This gender predominance in developing asthma in children has been reported in other studies.[8,9] This predominance could be attributed to factors such as the presence of narrower airways; higher production of interferon-gamma in boys' peripheral blood mononuclear cells as the result of stimulation by phytohemagglutinin; and genetic predisposition to induce allergic reaction.[9]

The minimum and maximum ages of the patients were 7 and 17 years, respectively. Additionally, symptoms began as early as before 1 year up to 13 years old.

In our study, the highest frequency of parents' education level was a diploma. Similar results were obtained in a survey by Mirsadraee et al in 2012.[10] In a study by Weinstein et al of 223 children with uncontrolled asthma, 66.4% of parents had an education level of a diploma or less.[11] This could lead to less knowledge regarding the pathogenesis of the disease and consequently less awareness of the importance of regular use of drugs, leading to poor adherence to asthma control.[12] Thakur et al demonstrated a relationship between the low educational level of mothers and poorly controlled asthma.[13]

As indicated by the results, 81.6% of family members reported a medical history of at least 1 allergic disease. A positive family history of asthma, especially

in mothers, is considered a significant risk factor for developing asthma in children.[1]

Of the study population, 98% had insurance, indicating a proper understanding of the role of insurance in the community inasmuch as lack of insurance coverage could cause problems in drug preparation, regular medical visits, and other aspects of healthcare.[14,15] In a study by Thakur et al lack of health insurance was associated with higher nocturnal symptoms and fewer activities.[13]

Of the hospitalized patients, 80% had received medical training, most of whom had been trained during and after admission. This written training was provided to less than half of the admitted patients, and most of the patients did not receive written training preadmission. As the findings of the Grover et al study showed, considerable improvement was obtained in terms of quality of life for asthma patients, knowledge about asthma and asthma control in a group with education for asthmatic children and their parents.[16]

In our study, only 13 of 46 hospitalized patients in the emergency department received an action plan, while 46 of 53 patients admitted to the asthma and allergy department received an action plan. The findings demonstrated a significant relationship between the hospitalization department and receiving an action plan. According to the literature review, a written action plan could help reduce acute asthma attacks and reduce the number of visits.[17,18,19]

Furthermore, a higher percentage of patients admitted to the asthma and allergy department (45/53) were visited by an allergist and clinical immunologist than patients admitted to the emergency department (23/46) after discharge. As Jafarnejad et al suggested, special education is necessary for asthmatic inpatients in the emergency department after discharge, as well-controlled asthma requires sufficient patient education. There is not enough time for this education by emergency specialists.[20] Sing Chung et al considered a history of hospitalization in the emergency department and ICU as a risk factor for readmission in children with asthma.[21]

Spirometry was performed for 30 of the 46 inpatients in the emergency department, while 46 of the 53 patients admitted to the asthma and allergy ward underwent spirometry. Furthermore, a significant relationship was observed between hospitalization in the asthma and allergy ward and spirometry. In a study by Gharagozlou et al in 2008, pediatricians were less aware of the standard guidelines. Unfamiliarity with standard guidelines for asthma management could predict poor control of asthma.[22] In another study by Herrera et al, the unwillingness or unfamiliarity of primary care physicians, emergency department physicians, or pediatricians to diagnose asthma could delay diagnosis.[17]

As the findings showed, 47% had a positive response about smoking; most users were the patients' fathers. Interestingly, 35% of these fathers smoked at home before their child's asthma diagnosis. In comparison, only 14% smoked after their child's asthma diagnosis, likely due to family awareness of the side effects of smoking.

As demonstrated in the evaluations of the medicinal process before and after admission, 29 (30%) and 8 (76.7%) did not receive any asthma medication before and after hospitalization, respectively. In an Italian study, of the 183 patients, 18 (10%) did not take any treatment after admission.[7]

The analysis of prescribed medications shows that 68% of the subjects used short-acting beta-agonists (SABA) before hospitalization, while SABA was administered to most patients after admission. On the other hand, 79 individuals used SABA alone preadmission, while only 5% of patients used SABA alone after admission. In the Bianchi et al study, 9% of patients used SABA alone preadmission, but its use alone reached zero after hospitalization. Overall, SABA administration was 83% and 84% pre- and post-admission, respectively.[7]

Simultaneous use of SABA and inhaled corticosteroids was reported in 34% of subjects before hospitalization, while this percentage reached 84% after hospitalization. It showed a significant increase and can result from the correct diagnosis and management of the disease after admission according to standard guidelines. No individuals received oral corticosteroids before hospitalization, while after hospitalizing and receiving an action plan, corticosteroids were given to 65% of patients following severe symptoms and uncontrolled asthma.

Of the admitted patients, 70 were trained by the medical team, while 30 subjects had not received any medical training, most of whom were admitted to the emergency department. Furthermore, 33% of the subjects stated that nurses provided a series of training sessions related to the disease and the use of drugs, most of which were in cases admitted to the asthma and allergy ward.

As the results indicated, only 2% of patients were visited by a specialist and underwent spirometry before hospitalization. However, approximately 63% of the patients were seen by a specialist and underwent spirometry after hospitalization. In a study by Herrera et al, the number of medical monitoring visits was significantly correlated with the severity of asthma.[17]

In addition, considering the simultaneous use of 3 variables—specialist visits, spirometry, and therapeutic process—29 patients had not undergone any of the above-mentioned medical procedures preadmission, reducing to 13 after hospitalization. Furthermore, after the hospitalization of 57 patients, all the above treatment measures were performed simultaneously. As mentioned in the review of the literature; to increase adherence to medications and asthma control, appropriate communication is suggested between the patient, physician, and medical team.[23]

This study demonstrated that admitted patients in the asthma and allergy ward received more action plans, more spirometry, and more visits by an allergist and clinical immunologist after discharge compared with inpatients in the emergency department.

STATEMENT OF ETHICS

The Ethics Committee of Tehran University of Medical Sciences approved this study (No. 13964105).

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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