

Evaluation of the Demographical and Clinical Characteristics of the Children with Foreign Body Aspiration: A Single Center Experience

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Abstract

Objective: To evaluate the determination of demographic and clinical characteristics and the roles of parental education and income levels in foreign body aspirations in childhood.

Methods: Seventeen patients who admitted to the Necmettin Erbakan University Meram Faculty of Medicine, Department of Pediatric Pulmonology for foreign body aspirations and from whom the body is taken out were evaluated retrospectively, and compared with the demographic features of 60 matched healthy children with the same age and gender.

Results: The mean age of the patients was 14.9±4.8 months, and of the patients 9 (53%) were males. The most common symptoms at admission were sudden onset of cough (76.5%) and wheezing (64.7%), while sunflower peel (47%) was the most commonly detected foreign body. Difference in lung aeration was the most common finding (76.5%) in radiological imagings, and foreign bodies were mostly removed from right bronchus (47%). While 76.5% of the patients had 5 or more households, this ratio was 46.6% in control group (p=0.008). Income level of patient group was significantly lower compared to control group (p=0.02). The rate of mothers who did not have high school and/or university education was higher (94.1%) than the control group (63.3%) (p=0.02).

Conclusion: Foreign body aspiration should be the first reason to be thought when there is a sudden onset of cough and wheezing in a child. Low socioeconomic level, to be in a crowded family and low education level of the mother should be evaluated among risk factors for foreign body aspirations.

Keywords: Bronchoscopy, child, family characteristics, foreign body aspiration

INTRODUCTION

Foreign body aspiration (FBA) is an important case with high morbidity and mortality rates, which is frequently observed in childhood, particularly before the age of 3 years. The possibility of foreign body aspiration should be kept in mind in the presence of prolonged or recurrent respiratory findings and it should be investigated particularly. If the diagnosis of the foreign body aspiration is established and removed in early period, the risk for development of complications will be reduced (1-5). The mortality rate associated with FBA has recently decreased because of the improvements in endoscopic technology, protection, and first aid (1). It is thought that the education of parents is important for the prevention of FBA and the establishment of early diagnosis. A crowded family environment and low socio-economic status can cause the findings to be overlooked because of the lack of care given to a child (4).

In this study, demographic features of children with FBA, including age and gender, their clinical findings, results of their physical and radiological examinations, and educational background and income levels of their parents, were evaluated, and the relationship between FBA and education and income levels of parents was investigated.

METHODS

This study included patients who were referred to the Department of Pediatric Pulmonology in the Meram Medical Faculty of Necmettin Erbakan University with the suspect of FBA because of the findings such as the difference in lung aeration or persistent pneumonia, the complaint of sudden onset of cough, or a history of FBA and who underwent bronchoscopy for the removal of foreign body (FB)

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between January 2009 and March 2010. The characteristics of patients and their parents were evaluated retrospectively. The patients' ages and genders, the time between the onset of their complaints and their admission to the hospital, respiratory complaints and findings (cough, shortness of breath, wheezing, unilaterally decreased respiratory sound, auscultation findings continuing in a certain region of the lung), radiological findings (difference in lung aeration, atelectasis, tracheal deviation, cardiac deviation, consolidation), the time of the application of bronchoscopy, the type of the FB that was removed (organic, inorganic), the location of the removed FB, the duration of hospitalization after the bronchoscopy procedure, and the complications that were developed were assessed. The foreign bodies of patients were removed through rigid bronchoscopy under general anesthesia. The data obtained were compared with the data of 6–30 month-old healthy children (n=60) who applied to the pediatric outpatient clinic and had a protocol number ending with an odd number. In the control and patient groups, the ages, educational levels and occupations of the parents, number of siblings, number of household members, and total monthly income of the family were questioned and recorded. Because the study was a retrospective study, the consent was not obtained from the patients. The ethics committee approval was received from the Ethics Committee for Non-Interventional Clinical Research in the Meram Medical Faculty of Necmettin Erbakan University.

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) 15.0 software for Windows (Chicago, IL, USA). The values of data displaying abnormal distribution were presented as median (25%–75%). For comparing the difference between the frequency rates of categorical data, Chi-square or Fisher's exact tests were employed. Student's t-test was used for comparing the difference between the means of data displaying normal distribution, and Mann–Whitney U test was used for comparing the difference between the means of data displaying abnormal distribution. Moreover, Spearman's correlation test was applied to identify the relationship between nominal values. The level of statistical significance was accepted to be $p < 0.05$.

RESULTS

The male/female ratio was found to be 1:1 for a total of 17 cases, including nine male (53%) and eight female (47%) patients. The mean age was 14.9 ± 4.8 (5–24) months. The time between the onset of complaints and the admission to the hospital was 13 days (1–120) on average. The applications of patients after aspiration were conducted on the first day in two cases (11.7%), on the first seven days in six cases (35.2%), in the first month in 13 cases (76.4%), and in the range of 1–4 months in four cases (23.5%).

The most common complaints at admission included a sudden onset of cough [13 (76.5%)] and wheezing [11 (64.7%)]. The finding that was most frequently identified in the radiological evaluation was the difference in the lung aeration [13 (76.5%)]. The complaints at admission and radiological findings are summarized in Table 1.

Rigid bronchoscopy revealed the shell of a sunflower seed in eight patients (47%); hazelnut in two patients (11.8%); peanut in two patients (11.8%); and white cheese, corn, apple pieces, or egg shell in one patient each (5.9%). An inorganic object (pin) was detected only in one patient (5.9%). Half of the FBs were removed from the

Table 1. Demographic features, complaints, and radiological findings of patients and the characteristics of foreign bodies

Number of patients		17
Gender (M/F)*		9/8
The mean age (months)**		14.94 ± 4.84
Time of the onset of complaints (days)†		13 (1–120)
Duration of hospitalization (days)**		6.47 ± 4.74
Complaint	Cough	13 (76.5%)
	Wheezing	11 (64.7%)
	Shortness of breath	3 (17.6%)
	Fever	3 (17.6%)
Radiological findings	Difference in aeration	13 (76.5%)
	Infiltration	4 (23.5%)
	Atelectasia	4 (23.5%)
	Tracheal deviation	1 (5.9%)
	Cardiac deviation	1 (5.9%)
	Normal	1 (5.9%)
The type of the removed foreign body	Organic	16 (94.1%)
	Inorganic	1 (5.9%)
The location of the removed foreign body	Right main bronchus	8 (47%)
	Left main bronchus	5 (29.4%)
	Under vocal cord	2 (11.8%)
	Trachea	1 (5.9%)
	Both bronchi	1 (5.9%)

*Male/female; **: mean $\pm$ standard deviation; †: median (25%–75%)

right main bronchus (Table 1). In a patient, the pieces of cheese were found in both bronchi.

The duration of hospitalization after bronchoscopy was 5 (1–17) days on an average. A strong negative relationship was detected between the duration of hospitalization and the age of the patient. It was observed that the hospitalization time was prolonged because the age group got younger ($r = -0.82$, $p < 0.001$). Five patients (29.4%) were hospitalized for ≤ 3 days, 13 patients (76.4%) were hospitalized for ≤ 9 days, and four patients (23.5%) were hospitalized for ≥ 10 days (Table 1). The mean follow-up time of patients was 33 (18–49) months.

The median of sibling number was found to be 2 (1–3) in the patient group. While six children (35.3%) had three siblings and six children (35.3%) had two siblings, five children (29.4%) had no siblings. Compared to the control group, no statistically significant difference was found with respect to the number of siblings (Table 2).

The median of the number of household members was 5 (3–10) in the patient group and 4 (3–8) in the control group ($p = 0.008$). While the number of household members was ≥ 5 in 76.4% of the families in the patient group, this rate was 46.6% in the control group (Odds ratio 3.7; 95% confidence interval 1.08–12.7) (Table 2).

Table 2. Parental educational level, number of household members, and income level

		Patient (n=17)	Control (n=60)	p
Gender (F/M)		9/8	31/29	>0.05
The mean age (months)		14.94±4.84	17.07±5.93	>0.05
The mean age of mother (years)		29.7±5.6	28.2±5.5	>0.05
The mean age of father (years)		33.1±6.1	32.75±8.9	>0.05
Education of mother, n (%)	Illiterate	1 (5.9)	0	0.03
	Elementary school graduate	15 (88.2)	38 (63.3)	
	High school graduate	0	13 (21.7)	
	University graduate	1 (5.9)	9 (15.0)	
Education of father, n (%)	Elementary school graduate	11 (70.4)	21 (35.0)	>0.05
	High school graduate	5 (23.5)	26 (43.3)	
	University graduate	1 (5.9)	13 (21.7)	
The number of household members, n (%)	3-4 people	4 (23.5)	32 (53.4)	0.008
	5-6 people	9 (53.0)	26 (43.3)	
	≥7 people	4 (23.5)	2 (3.3)	
The number of siblings, n (%)	1-2 siblings	6 (35.3)	37 (61.7)	>0.05
	≥3 siblings	11 (64.7)	23 (38.3)	
Income level, n (%)	≤600 TL	8 (47.0)	9 (15.0)	0.02
	601-1200 TL	5 (29.4)	26 (43.3)	
	>1200 TL	4 (23.5)	25 (41.7)	

M: male; F: female

Demographic features of the study groups are presented in Table 2. No statistically significant difference was found between the patient and control groups with respect to the ratios of gender, mean age, and mean parental age.

Of the mothers in the patient group, only one (5.9%) was a government official and the others (94.1%) were housewives. On the other hand, of the mothers in the control group, 11 (18.3%) were government officials, 44 (73.3%) were housewives, and five (8.4%) were self-employed ($p<0.001$). When considering the occupations of the fathers, it was observed that 16 fathers were workers, self-employed, or unemployed and only one was a government official in the patient group. In the control group, nine (15%) of the fathers were government officials, 21 (35%) were workers, 24 (40%) were self-employed, and six (10%) were unemployed.

When the educational levels of the parents in the patient and control groups were compared, it was found that the educational level of the mothers was significantly lower in the patient group, while there was no statistically significant difference among the fathers ($p=0.03$). In the patient group, only one mother was illiterate. However, in the control group, the rate of literacy was 100%.

The income level of the patient group was apparently lower than that of the control group. The number of families with the income level below minimum wage was eight (47%) in the patient group and nine (15%) in the control group ($p=0.02$) (Table 2).

DISCUSSION

The most important cause of deaths due to accidents is FBA in childhood, and it is the fifth most common cause of death in children younger than a year (1, 2). Considering the frequency of FBA in our country, Türkmen et al. (6), from the Uludağ University found the rate of FBA as 2.2% in the age group of 0–94 year-old forensic cases who applied to the emergency department. None of the FBs, particularly in the age group of 0–9 years, was stamped as a forensic case (6). Özdemir et al. (7) and Çetin et al. (8) found the rate of death induced by a FB as 0.26% and 0.28 %, respectively.

The severity of symptoms associated with FBA depends on the location of obstruction and its degree. Complete obstructions at the level of the main bronchus can lead to severe respiratory distress that will not allow the child to cough or breathe (9, 19). Gürses et al. (11) revealed that fever and dyspnea were encountered more frequently in the group who applied late. In obstructions that are not associated with FBA in the respiratory tract, the symptoms can be mild or they can be asymptomatic in 10%–20% of patients. Physical examination may not reveal any abnormal finding in 20%–40% of children (12). In most of our patients, the complaints of cough with sudden onset or prolonged cough and wheezing remained in the forefront.

The most commonly faced FBs traveling down the respiratory tract are dried nuts such as sunflower seed, hazelnut, peanut, and raisin, unchewed portions of food, and the pieces of toys. However, the nature of aspirated FBs differs among the countries and even among the regions in the same country (2, 9, 10, 13). These are watermelon

seeds in Lebanon (14); peanuts in the United States of America (15) and Egypt (16); and peanuts, peas, and corn in Brazil (17). It has been revealed that the most frequent cause of FBA is sunflower and bean in the region of Ankara, hazelnut in Samsun, and watermelon seed in Diyarbakır (5, 18, 19). Yüksek et al. (20) evaluated the results of 190 children with FBA in the region of Konya and found that 72.1% of FBs were organic substances. In 94.1% of our series, the FBs were organic. These foreign bodies in our cases were the shell of a sunflower seed, hazelnut or peanut, white cheese / corn / apple pieces, or egg shell considering their frequencies.

Radiological findings that are mostly observed in cases of FBA include the difference in aeration between the two lungs and atelectasis (39). It has been reported that radiological sensitivity is 70.3% and specificity is 62.5% in the diagnosis of FBA (3). While radiological findings are normal within the first 24 h after aspiration in approximately half of the cases, the possibility of the identification of a positive finding in the radiography increases after 24 h (119). In 76.5% of the direct chest images of our patients, the presence of a difference in aeration was observed. No pathological finding was found in the radiological image only in one patient.

The application time to the hospital after FBA varies among patients. In our study, the median for the duration between the onset of complaints and admission to the hospital was 13 (1–120) days. Of our patients, only 11.8% were diagnosed within the first 2 days and 35.3% were diagnosed within a week. In the study of Karakoç et al. (21), 60% of patients underwent bronchoscopy approximately after 30 days from the onset of complaints and bronchiectasis developed in 25% of them. Of our patients, only two of them were diagnosed after ≥ 30 days. It was observed that a significant pulmonary complication did not develop in the patient diagnosed approximately 120 days later. One of the features that is emphasized in our study is the presence of a negative correlation between the duration of hospitalization and age. This may result from the fact that the risk for the development of complications increases as the age of the patient decreases.

There is an inverse relationship between the educational level and FBA. In a study conducted in Kocaeli, it was reported that 74% of children diagnosed with FBA were primary school graduates. This rate increased up to 83%, particularly in patients diagnosed late (4). In our study, the rate of mothers who were illiterate or primary school graduates (5-year education) was 82.3%. While only one mother (5.9%) was a university graduate, others (94.1%) did not receive any education or complete 8 years of education, which is compulsory education. The rate of working mothers in our study was apparently lower than the control group (22). According to the 2013 data taken from the address-based population system of the Turkish Statistical Institute (TUIK), of men living in the region of Konya, 50.1% were elementary school graduates, 17.6% were high school graduates and 11.3% were university graduates. Of women, 53.5% were elementary school graduates, 11.5% were high school graduates, and 7.0% were university graduates (23).

We found that the rate of FBA was parallel with the increase in the number of household members. In our study, the number of household members per house was significantly higher than that in the control group. Particularly, when the number of household members

was ≥ 5 , the risk was 3.7 times higher than that in the control group. According to the TUIK 2013 data, the number of people per house is 3.6 in Konya (23). Considering these results, it can be suggested that living in a crowded house is a factor that increases the risk for FBA.

In the evaluation of the economic status of the families, it was observed that only one father was a government official and the others were workers. We think that although the number of people who will take the responsibility for the child care increases in crowded environments, the attention given to children can be reduced and findings associated with FBA can easily be overlooked. Because of the circumstances in our country, the educational programs should be organized in visual and printed media, and the midwives working in health institutions should raise the awareness of pregnant women on this issue and educate them.

CONCLUSION

The low level of mothers' education and family income and high number of household members increase the risk of FBA in children. The organization of consciousness-raising educational programs about FBA can be helpful.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Non-Interventional Clinical Research Necmettin Erbakan University (2012/83).

Informed Consent: Due to the retrospective design of the study, informed consent was not taken.

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