



Ethnic differences of children with foreign body aspiration: a need for preventive education

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Abstract

Introduction Only in 2005 was a product labeling law passed in Israel that requires food companies to mark a choking hazard. We wished to investigate the influence of the hazard warning on the number of foreign body aspirations (FBA) in Israel, as well as the racial differences in the prevalence of and death rates from FBA.

Materials and Methods All the medical records of patients under the age of 14 who arrived at our center's emergency department between the years 2007 and 2015 with suspected FBA were retrospectively reviewed. Population data was extracted from the Central Bureau of Statistics.

Results Overall, 90 children arrived at the hospital with suspected FBA during 2007–2015. Forty-six (51%) of the patients were males, the mean age was 3.5 years. Seventy-one bronchoscopies were performed due to high suspicious presence of a foreign body. The most common objects aspirated were different types of nuts and seeds. In all cases, the patient's parents witnessed the aspiration of the foreign body. Most children (77, 86%) were of Arab ethnicity. The yearly prevalence of FBA in children 0–4 years of Arab ethnicity was 16.6:100,000 compared to 6.0:100,000 in the non-Arab population ($p < 0.001$).

Conclusion FBA is still a common injury in our region. Since most cases are preventable, efforts should be targeted among the population at higher risk, which are parents of children under the age of 4 and parents of Arab ethnicity. We believe that national effort and support for preventive education are needed.

Keywords Foreign body aspiration · Ethnic group · Children

Abbreviation

FBA Foreign body aspirations

Introduction

Foreign body aspiration (FBA) is a common cause of mortality and morbidity in children. During 2000, FBA was responsible for 17,537 emergency department visits in this age group, most are in children younger than 2 years of age [1]. There are ethnic differences in the death rates in the USA where African-Americans have the highest death rates per 100,000 children, followed by Whites and Hispanics, that might be explained by higher rates of FBA [2–4].

In previous articles from Israel between 1994 and 2004 the rate of FBA was found to be 14.5 in 100,000 children per year [5, 6]. In this study Arabs had a threefold higher rate of FBA than non-Arabs, and the authors believed it was because of lack of education as well as differences in diet between the two populations. The same difference was found in other studies in Israel [7–9].

Only in 2005 was a product labeling law passed in Israel that requires food companies to mark a choking hazard warning on bags of seeds and nuts.

Our medical center is situated in a region populated with diverse ethnic groups. We wished to investigate the influence of the hazard warning on the number of FBAs in Israel. We hypothesize that after 2005 the FBA rates will decrease and that the differences between the races will decrease as well.

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Methods

Ethical considerations

The study was approved by the institutional research board (NHR010115). No informed consent was needed since it is a retrospective study.

Patients

All the medical records of patients under the age of 14 who arrived at our center's emergency department between 2007 and 2015 with suspected FBA were retrospectively reviewed. Variables examined included age, gender, ethnicity, types of FBA, history, the treatment given, and results of bronchoscopy. Population data were extracted from the Central Bureau of Statistics [10].

Data analysis

We described data using frequency and percentage. Quantitative data were analyzed using averages and standard deviations, median and range. The data were described for the entire sample and separately for different types of populations. Comparison of qualitative data between groups was performed by Pearson Chi-Square test. The results were based on SPSS version 19 at a significance level of 5%. Two-tailed tests were used unless otherwise mentioned.

Results

Overall, 90 children arrived at the hospital with suspected FBA between 2007 and 2015. Forty-six (51%) of the patients arriving to the hospital were males, the majority of the cases presented were children aged 1–2 years (70%), the mean age was 3.5 years, and the median age was 2 years.

Of the 90 children, 71 bronchoscopies were performed due to high suspicious presence of a foreign body. High suspicion was defined as either having a witnessed event, or at least two positive parameters out of history, physical examination, and chest X-ray, when performed [8]. FBA was confirmed in 66 (71%) of children in the operating room. Positive bronchoscopies were significantly more frequent in children who were younger than 2 years. No deaths were reported.

About two-thirds (68%) of the foreign bodies removed by bronchoscopy were identifiable. The most common objects aspirated were different types of nuts and seeds (pistachio, watermelon seeds, peanuts, and other types of nuts), both according to caregiver history and the findings on bronchoscopy (48% and 38%, respectively).

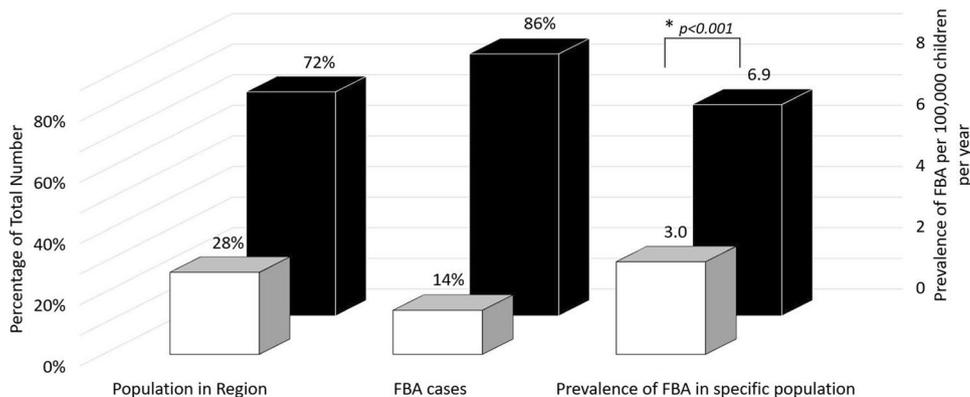
In all cases, the patient's parents witnessed the aspiration of the foreign body. In the majority ($n = 54$), parents recognized the object that the child inhaled. In only five cases, the parents did not recognize the object. In 31 cases, we were not able to determine the object type (because the object could not be identified after bronchoscopy, or there was no information in the files).

There were no statistically significant differences in the yearly and monthly distribution of children with suspected FBA. The average yearly cases were 10.

Patients with FBA suspicion arrived at the hospital in different hours. When the admission hours were analyzed, it became apparent that most children (52%) arrived between 4 and 9 pm with a median arrival time of 5:38 pm.

According to the Central Bureau of Statistics [10] there is an average of 70.5% Arabs among the population between the ages of 0 and 4 in the area our Medical Center serves in the period the study was conducted compared with 75.3% in the period of 1998–2000 when the previous study was conducted in this area before the labeling law was passed [8]. Most children in our cohort were of Arab ethnicity (86%), as can be seen in Fig. 1. The yearly prevalence of FBA in children of Arab ethnicity between the ages of 0–4 was 16.6:100,000 compared to 6.0:100,000 of the non-Arab

Fig. 1 Ethnic differences of FBA cases and prevalence. Black columns—Arab children, white columns—non-Arab children. FBA foreign body aspiration. The FBA cases distribution between the ethnic groups is statistically different ($p < 0.001$) on 2-tailed Pearson Chi-Square test than expected from their percentage in the region. The number of cases per year per 100,000 children belonging to the Arab ethnic group is more than twice



population (two-sided Pearson Chi Square, $p < 0.001$) [10]. This difference remained but to a lower extent in the older age group of 5–14, where the yearly prevalence of children of Arab ethnicity was 2.4:100,000 compared with 1.4:100,000 in the non-Arab population (2-sided Pearson Chi Square, $p < 0.001$). In children under the age of 15, the yearly prevalence of FBA cases of Arab ethnicity was 6.9:100,000 compared with 3.0:100,000 in the non-Arab population (2-sided Pearson Chi-Square, $p < 0.001$).

We compared our results to pre-labeling law data published in previous studies in the area [6, 8]. Detailed data for comparison was available only for the 0–14 age group. We noticed a reduction in FBA prevalence for both Arab and non-Arab population under the age of 14 (2-sided Pearson Chi Square, $p < 0.001$) as can be seen in Fig. 2.

Discussion

In our study, 70% of FBAs occurred in children younger than 2 years, and the frequency of FBA was almost similar in boys as in girls. Distribution of the FBA age in this study was correlated with other studies [6, 8, 11]. FBA was found to be higher in males than in females in those studies, contrary to our findings. The rate of positive bronchoscopies (71%) was similar to other studies [6, 8]. A lower rate of false-negative bronchoscopies might yield a higher rate of missed FBA and delayed diagnosis [6].

Positive bronchoscopies were significantly more frequent in children who were younger than 2 years [6]. The authors of this study assumed that the reason might be due to mucous plugs in the narrower airways of infants that imitate the physical findings of a foreign body.

Most of the FBAs were of food origin, which is consistent with other studies from our region [6–8, 11, 12]. This factor might play a role in the ethnic differences we found in our study.

In all cases, the patient's parents witnessed the aspiration of the foreign body. Similar findings were found in other

studies [4, 8, 13]. This fact might mean that the children were not left unattended. A national education program might be beneficial in these circumstances, since some of these cases might be preventable by the parent who is supervising the child.

There were no deaths or other major complications following FBA. This can be explained by the retrospective nature of the study. Mortality from FBA may have been coded differently.

The ethnic differences in FBA was found to be statistically significant in our study as well as in other studies coming from the region [6–8] (see Table 1) and from other countries [4, 14]. The ethnic difference to the detriment of Israeli-Arabs was seen throughout the country. In those studies, the most frequent FBA was food. In a national child safety report [9], Arab children had threefold higher rates of home accidents as well road accidents compared to other ethnic groups. In 2005, a product labeling law was passed in Israel that requires food companies to mark a choking hazard warning on bags of seeds and nuts. Other studies from our region, that were conducted before the 2005 product labeling law, found similar higher rates of FBA in children of Arab ethnicity [6, 8] with reported rates of 14.5 and 5.6 cases per 100,000 in Arabs and non-Arabs, respectively. Our study, that encompassed the time period after the issuing of the labeling law, showed lower rates of FBA in the population between the ages of 0 and 14 years; however, we did not have data to compare the changes in the different age groups. We believe that the product labeling must be accompanied by an effective national education effort throughout the population at risk, which are parents of children under the age of 4 and parents of Arab ethnicity. In a previous prospective study conducted in our hospital, it was found that there was no association between FBA and level of education or age of parents, the number of children in the family, or location of the child within the family. We therefore believe that the high rate of FBA within the Arab population is due to lack of knowledge on FBA prevention, and diet habits. In a prospective study published in 1995, Sadan et al. [15] investigated

Fig. 2 Ethnic differences of FBA in different time periods. Black columns—Arab children, white columns—non-Arab children. FBA foreign body aspiration. The number of FBA cases per year per 100,000 children between the age 0–14 in the current study is statistically different compared to studies conducted before 2005 in the region (2-tailed Pearson Chi-Square test, $p < 0.001$)

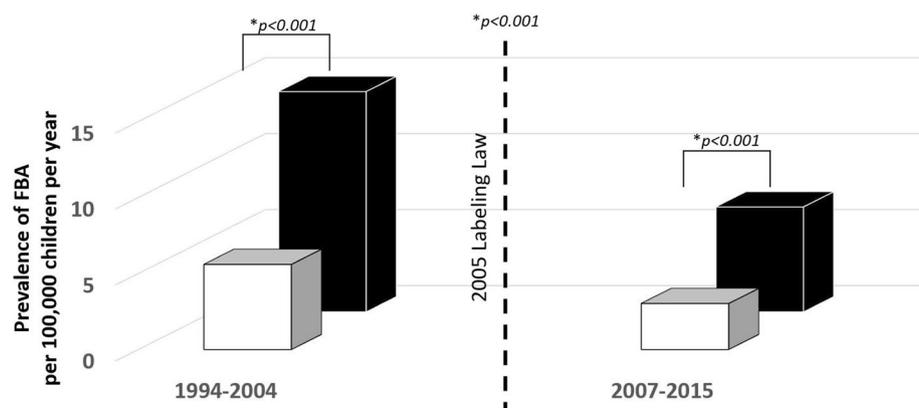


Table 1 Case series studies on FBA conducted in Israel between the years 1983 and 2015

Author	Years	Ages	Mean age	%M	No.	Substance	Prevalence in 100,000/year	Prevalent Ethnicity	Region
Laks [12]	N/A	7m-13y	2.9y	63	149	Food	N/A	N/A	Coast
Wolach [16]	1983–1994	81% under 3y	N/A	N/A	127	N/A	N/A	N/A	Coast
Even [8]	1998–2000	8m-7y	2.0y	54	98	Food	N/A	Arabs	North
Shlizerman [5, 6]	1994–2004	5m-15y	2.75	63	136	Food	14.5 Arabs/5.6 non-Arabs	Arabs	North
Mansour [11]	2006–2010	2.4m-15y	2.8y	58	115	Food	N/A	N/A	North
Cohen [7, 17]	2003–2005	3y-14y	Median 20m	N/A	142	Food	N/A	Arabs	Jerusalem
Current study	2007–2015	0-14y	5.3y	51	90	Food	6.9 Arabs *3.0 non-Arabs	Arabs	North

In all studies investigating ethnic differences throughout the country there is a predominance of Israeli-Arabs

M males, N/A not available, m months, y years

* Pearson chi square 2 tailed, $p < 0.001$

the impact of a nationwide educational campaign on the incidence of FBA in children. The campaign included television and radio broadcasts, newspaper articles and interviews, and medical educational programs in community pediatric care centers, and resulted in a reduction in the incidence of FBA by 35%. A public awareness campaign is warranted in populations at risk, such as those highlighted in the current study.

Strength and limitations

The main limitation to our study is its retrospective design. The ethnic composition of the population the hospital is serving is drawn from the central bureau for statistics. Patients can refer to other hospitals, not in the region, although this is less likely in an emergency such as an airway foreign body. The study's strength is the analysis done to compare FBA in different ethnic groups relative to their prevalence in the general population. Doing so we were able to draw conclusions on ethnic FBA differences. Another strength is that the study was conducted after the 2005 product labeling law that requires food companies to mark a choking hazard warning, thus we could compare our results to previous studies conducted on the same population.

Conclusions

FBA is still a common injury in our region. Since most cases are preventable, efforts should be targeted among the population at higher risk, which are parents to children under the age of 4 and parents of Arab ethnicity. We believe that national effort in support of preventive education is needed.

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Compliance with ethical standards

Conflict of interest Florencia Kanelo, Deborah Shor, Maureen Ashkar, Ilana Kepten and Ohad Ronen declare that they have no conflict of interest.

Ethical approval The study was approved by the institutional review board prior to its commencement (Registration number: NHR010115).

Informed consent Written consent was waived by the institutional review board.

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