



Original Research Article

Foreign Body in the Airway: Types and Sites of Impaction-A Clinical Analysis

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Abstract: Background: Foreign body aspiration is a frequent and potentially life-threatening emergency in children, particularly in developing countries where dietary habits and environmental exposure contribute to a higher risk. **Objective:** To determine the types of airway foreign bodies and their common sites of impaction among pediatric patients presenting with suspected foreign body inhalation. **Methods:** This cross-sectional study was conducted at the ENT Department of Ayub Teaching Hospital, Abbottabad, from 4th July 2025 to 4th November 2025, and included 188 children aged 1–15 years. Non-probability consecutive sampling was used. Demographic details, type of foreign body, and impaction site were recorded using a structured proforma. **Results:** The mean age of patients was 4.8 ± 2.6 years, with the highest frequency in the 1–5-year group (64.4%). Males predominated (62.2%). Organic foreign bodies were most common (72.3%), especially seeds (38.8%) and nuts (19.7%). The right main bronchus was the leading site of impaction (56.3%), followed by the left bronchus (31.9%). Significant associations were observed between age and type of foreign body ($p < 0.05$), and whistles showed a strong association with tracheal and laryngeal impaction ($p = 0.009$). Complications occurred in 12.2% of patients, mainly atelectasis and pneumonia. Rigid bronchoscopy successfully removed the foreign body in 97.3% of cases, with no mortality. **Conclusion:** Organic foreign bodies, particularly seeds and nuts, remain the predominant cause of aspiration in young children, with the right main bronchus being the most common site of lodgment. Early diagnosis and prompt bronchoscopy ensure excellent outcomes.

Keywords: Foreign body aspiration, pediatric airway, bronchoscopy, bronchial impaction, seeds, nuts.

INTRODUCTION

Foreign body airway obstruction represents a significant and urgent issue linked to high rates of mortality and morbidity. Airway obstruction can result from food as well as non-food items, leading to varying degrees of oxygen deprivation. It frequently occurs in both young children as well as the elderly population. A considerable proportion of obstructions occurrences do not result in hospital admissions or fatalities, leading to their frequent underreporting. Incidents of choking on nonfood items are less common, but they predominantly influence young children [1,2]. Challenges arise from children who are either unwilling or unable to give a history of the inhaled object or the timing of the incident. This includes specific populations such as infants, children, individuals with mental disorders, those with psychiatric conditions, as well as prisoners. The wide

variety of potential symptoms, clinical manifestations, and related complications can render this condition challenging to assess and manage effectively [3,4]. The majority of inhaled foreign bodies typically navigate the gastrointestinal tract without incident. However, certain cases can end up in complications if the object becomes lodged either due to its size or if smaller items, such as pills, adhere to moist surfaces. Furthermore, objects with sharp or pointed edges, such as razor blades or pins, can cause mucosal trauma, which in some cases may lead to caustic burn injuries [5-7].

Accidental inhalation often involves small objects, including pins, peanuts, needles, toy components, marbles, and meat bones, and marbles [8]. The measurement of airway obstruction occurrences

presents challenges, as many of these instances do not lead to hospital admissions. In children going through treatment for airway obstruction incidents, food emerges as the predominant factor, causing 59.5% of cases. Non-food items, including marbles, balloons, as well as paper pins, constitute 31.4% of the incidents. Airway obstruction incidents predominantly affect infants under the age of 1, with more than 75% of such occurrences involving children under 3 years old [9]. A study found the impaction site (right main bronchus 5.5%, left bronchus 38.9%, and trachea 5.6%), and type of foreign body airway (pin 8%, peanut 5.5%, seeds 4.4%, whistle 2.2%) in cases with foreign body inhalation [10]. Foreign bodies in airway can cause momentous morbidity, and their location plays a significant role in determining the risk of complications. Due to the scarcity of literature on this subject locally, the goal of this study is to determine the impaction site and the type of foreign body airway in children presenting with foreign body inhalation at our health setup.

Objective

To determine the impaction site and the type of foreign body airway in children presenting with foreign body inhalation.

METHODOLOGY

This cross-sectional study was conducted at the ENT Department of Ayub Teaching Hospital, Abbottabad, from 4th July 2025 to 4th November 2025. Sample size was determined by using the WHO sample size calculator (188), keeping the following mentioned assumptions. Taking the frequency of foreign body type airway (whistle 2.2%) [10] in cases with foreign body inhalation. Margin of error 2.1%, and confidence level 95%.

Inclusion Criteria:

- Male and female patients
- Age between 1 and 15 years
- Identified cases of airway foreign body inhalation

RESULTS

Data were collected from 188 patients, most children were between 1 and 5 years of age (121 children, 64.4%), followed by those aged 6 to 10 years (47 children, 25%) and 11 to 15 years (20 children, 10.6%), with a mean age of 4.8 ± 2.6 years. There was a male predominance, with 117 males (62.2%) and 71 females (37.8%). A majority of the patients belonged to rural areas (129 children, 68.6%) and came from lower socioeconomic backgrounds (137 children, 72.8%). Organic foreign bodies were more frequent, accounting for 136 cases (72.3%), with seeds being the most common (73 cases, 38.8%), followed by nuts (37 cases, 19.7%), food or chalk particles (26 cases, 13.8%), and plastic toy parts (25 cases, 13.3%). Inorganic objects totaled 52 cases (27.7%) and included whistles (13 cases, 6.9%) and metallic items (14 cases, 7.4%). The right main bronchus was the most frequent site of impaction (106 cases, 56.3%), followed by the left bronchus (60 cases, 31.9%), trachea (16 cases, 8.5%), and larynx (6 cases, 3.2%).

Table 1: Demographic Characteristics of Patients (N = 188)

Variable	Frequency (n)	Percentage (%)
Age Groups		
1–5 years	121	64.4
6–10 years	47	25.0
11–15 years	20	10.6

as per operational definitions

Exclusion Criteria:

- Known airway pathology
- Tracheal or bronchial tumors
- Patients in respiratory failure requiring mechanical ventilation

Data Collection Procedure

A total of 188 patients who met the inclusion criteria were enrolled after obtaining approval from the hospital's ethical review committee and the CPSP research unit. Written informed consent was obtained from parents or guardians after explaining the study objectives, benefits, and assurance of no risk. Baseline demographic information, including age, gender, weight, residential area, and socioeconomic status, was recorded. All patients identified with airway foreign body inhalation were evaluated for the type of foreign body and site of impaction according to operational definitions. Each case was assessed by a consultant ENT specialist with at least five years of post-fellowship experience. A pre-designed, structured proforma was used for standardized documentation.

Data Analysis

Data were entered and analyzed using IBM SPSS version 27. Numerical variables such as age and weight were assessed for normality using the Shapiro–Wilk test and presented as mean $\pm$ standard deviation or median (IQR), depending on distribution. Categorical variables including gender, type of airway foreign body, site of impaction, residence, and socioeconomic status were expressed as frequencies and percentages. The type of foreign body and impaction site were stratified by age, gender, weight, residence, and socioeconomic class to identify potential effect modifiers. Post-stratification, the Chi-square test or Fisher's exact test was applied, with a p-value ≤ 0.05 considered statistically significant.

Mean age (years)	4.8 ± 2.6	—
Gender		
Male	117	62.2
Female	71	37.8
Residence		
Rural	129	68.6
Urban	59	31.4
Socioeconomic Status		
Lower	137	72.8
Middle	43	22.9
Upper	8	4.3
Type of Foreign Body		
Seeds (melon, pumpkin, sunflower)	73	38.8
Nuts (peanut, walnut fragments)	37	19.7
Plastic toy parts	25	13.3
Food particles / chalk pieces	26	13.8
Whistles	13	6.9
Metallic objects (pins, beads, screws)	14	7.4
Total Organic FBs	136	72.3
Total Inorganic FBs	52	27.7
Site of Impaction		
Right main bronchus	106	56.3
Left main bronchus	60	31.9
Trachea	16	8.5
Larynx	6	3.2

Complications were observed in 23 out of 188 patients (12.2%). Atelectasis occurred in 10 children (5.3%), localized pneumonia in 7 children (3.7%), post-removal wheeze or stridor in 4 children (2.1%), and granulation tissue formation in 2 children (1.1%). Despite these complications, outcomes were highly favorable, with rigid bronchoscopy successfully removing the foreign body in 183 patients (97.3%). Only 5 patients (2.7%) required additional airway support, and no mortality was recorded.

Table 2: Complications Observed (N = 188)

Complication Type	Frequency (n)	Percentage (%)
Atelectasis	10	5.3
Localized pneumonia	7	3.7
Post-removal wheeze/stridor	4	2.1
Granulation tissue formation	2	1.1
Total Complications	23	12.2
Outcomes		
Successful removal via rigid bronchoscopy	183	97.3
Required additional airway support	5	2.7
Mortality	0	0.0
Presenting Symptoms		
Sudden onset cough	157	83.5
Choking episode	131	69.7
Wheeze / noisy breathing	88	46.8
Dyspnea / respiratory distress	41	21.8
Stridor	22	11.7
Cyanotic spells	9	4.8
Recurrent chest infections	18	9.6
Decreased air entry on auscultation	62	33.0

Seeds most commonly lodged in the right bronchus (49 cases, 67.1%), followed by the left bronchus (22 cases, 30.1%) and trachea (2 cases, 2.7%). Nuts showed a similar pattern, with 21 cases (56.8%) in the right bronchus, 13 cases (35.1%) in the left bronchus, and 3 cases (8.1%) in the trachea. Plastic toy parts were found mostly in the right bronchus (14 cases, 56%), with others in the left bronchus (7 cases, 28%), trachea (3 cases, 12%), and larynx (1 case, 4%). Food or chalk pieces were distributed across the right bronchus (11 cases, 42.3%), left bronchus (12 cases, 46.2%), and trachea (3 cases, 11.5%). Metallic objects were found in the right bronchus (6 cases, 42.9%), left bronchus

(5 cases, 35.7%), trachea (2 cases, 14.3%), and larynx (1 case, 7.1%). Whistles showed a distinct pattern, occurring in the right bronchus (5 cases, 38.5%), trachea (5 cases, 38.5%), left bronchus (1 case, 7.7%), and larynx (2 cases, 15.4%), highlighting their tendency for upper airway lodgment.

Table 3: Relationship between Type of Foreign Body and Site of Impaction (N = 188)

Type of Foreign Body	Right Bronchus n (%)	Left Bronchus n (%)	Trachea n (%)	Larynx n (%)	Total n
Seeds	49 (67.1%)	22 (30.1%)	2 (2.7%)	0 (0%)	73
Nuts	21 (56.8%)	13 (35.1%)	3 (8.1%)	0 (0%)	37
Plastic toy parts	14 (56.0%)	7 (28.0%)	3 (12.0%)	1 (4.0%)	25
Food / chalk pieces	11 (42.3%)	12 (46.2%)	3 (11.5%)	0 (0%)	26
Metallic objects	6 (42.9%)	5 (35.7%)	2 (14.3%)	1 (7.1%)	14
Whistles	5 (38.5%)	1 (7.7%)	5 (38.5%)	2 (15.4%)	13
Total	106	60	16	6	188

Sudden onset cough was the most common symptom and occurred in 157 children (83.5%), with the highest frequency in the 1–5 years group (106 cases, 90%), showing a significant association with age ($p = 0.004$). Choking episodes were reported in 131 patients (69.7%), predominantly in the 1–5 years group (92 cases, 76%), with a significant p -value of 0.012. Wheeze or noisy breathing occurred in 88 children (46.8%), and dyspnea or respiratory distress in 41 children (21.8%), both without significant age association ($p = 0.091$ and $p = 0.971$, respectively). Stridor was present in 22 cases (11.7%), cyanotic spells in 9 cases (4.8%), and recurrent chest infections in 18 cases (9.6%), with no significant differences across age groups. Decreased air entry was noted in 62 children (33%), also without significant association ($p = 0.561$).

Table 4: Presenting Symptoms and Their Association with Age Groups (N = 188)

Presenting Symptom	1–5 yrs n (%)	6–10 yrs n (%)	11–15 yrs n (%)	Total n (%)	p-value
Sudden onset cough	106 (90.0%)	38 (80.9%)	13 (65.0%)	157 (83.5%)	0.004
Choking episode	92 (76.0%)	30 (63.8%)	9 (45.0%)	131 (69.7%)	0.012
Wheeze / noisy breathing	63 (52.1%)	19 (40.4%)	6 (30.0%)	88 (46.8%)	0.091
Dyspnea/respiratory distress	27 (22.3%)	10 (21.3%)	4 (20.0%)	41 (21.8%)	0.971
Stridor	17 (14.0%)	4 (8.5%)	1 (5.0%)	22 (11.7%)	0.329
Cyanosis	6 (5.0%)	2 (4.3%)	1 (5.0%)	9 (4.8%)	0.974
Recurrent chest infections	12 (9.9%)	4 (8.5%)	2 (10.0%)	18 (9.6%)	0.953
Decreased air entry	43 (35.5%)	14 (29.8%)	5 (25.0%)	62 (33.0%)	0.561

Seeds demonstrated a significant association with right bronchial impaction, with 49 out of 73 cases (67.1%) located in the right bronchus, reflected by a p -value of 0.021. Nuts, plastic toy parts, food or chalk fragments, and metallic objects did not show significant distribution patterns, with p -values of 0.188, 0.376, 0.412, and 0.611 respectively. Whistles displayed a distinct pattern, with 5 cases (38.5%) in the right bronchus, 5 cases (38.5%) in the trachea, and 2 cases (15.4%) in the larynx, resulting in a statistically significant association with upper airway impaction ($p = 0.009$).

Table 5: Relationship between Type of Foreign Body and Site of Impaction (N = 188)

Type of Foreign Body	Right Bronchus n (%)	Left Bronchus n (%)	Trachea n (%)	Larynx n (%)	Total (n)	p-value
Seeds	49 (67.1%)	22 (30.1%)	2 (2.7%)	0 (0%)	73	0.021
Nuts	21 (56.8%)	13 (35.1%)	3 (8.1%)	0 (0%)	37	0.188
Plastic toy parts	14 (56.0%)	7 (28.0%)	3 (12.0%)	1 (4.0%)	25	0.376
Food / chalk	11 (42.3%)	12 (46.2%)	3 (11.5%)	0 (0%)	26	0.412
Metallic objects	6 (42.9%)	5 (35.7%)	2 (14.3%)	1 (7.1%)	14	0.611
Whistles	5 (38.5%)	1 (7.7%)	5 (38.5%)	2 (15.4%)	13	0.009

DISCUSSION

This study evaluated the types of airway foreign bodies and the common sites of impaction among children presenting to the ENT Department of Ayub Teaching Hospital, Abbottabad. The findings aligned closely with the epidemiological patterns documented in multiple local and regional studies, reaffirming that foreign body aspiration remains a significant pediatric

emergency in Pakistan, predominantly affecting young children due to behavioral tendencies, immature swallowing coordination, and underdeveloped airway protective reflexes. In the present study, the majority of patients were between 1–5 years of age (64.4%), which is consistent with studies from Karachi, Lahore, Peshawar, and India, all reporting the highest vulnerability in preschool-age

children. This age group's exploratory behaviour, tendency to place objects in the mouth, and lack of molar teeth contribute to a higher risk [11]. A clear male predominance (62.2%) was also observed, which has been consistently reported in local studies from Jinnah Hospital, Mayo Hospital, and Khyber Teaching Hospital, suggesting that behavioural and environmental factors may predispose boys more frequently to aspiration incidents. Organic foreign bodies were significantly more common (72.3%), with seeds and nuts forming the largest category. This pattern mirrors trends seen across Pakistan, India, Turkey, and Middle Eastern countries, where dietary practices often include dry fruits, roasted seeds, and small snack items accessible to children. These items are small, slippery, and spherical, making them more prone to aspiration [12-14]. In contrast, inorganic foreign bodies such as whistles, toy parts, and metallic items, though less frequent, were found predominantly in older children, reflecting age-related exposure differences. The right main bronchus was the most common site of impaction (56.3%), which is anatomically expected due to its wider lumen, vertical orientation, and direct continuation from the trachea. This finding is supported by previous Pakistani studies as well as international literature from China, Saudi Arabia, and the United States. The left bronchus accounted for 31.9% of cases, while tracheal and laryngeal impaction were less common but associated with more severe acute symptoms such as stridor and respiratory distress [15,16].

Statistically significant associations were found between age and type of foreign body, with younger children showing a greater tendency toward organic FBs ($p < 0.05$). Additionally, seed-type FBs showed a significant association with right bronchial impaction, while whistle-type FBs were more frequently lodged in the trachea and larynx ($p < 0.05$). These associations have also been reported in other South Asian studies, likely reflecting object size, shape, and airflow dynamics [17]. Complications were noted in 12.2% of cases, including atelectasis, pneumonia, and wheezing. These findings are consistent with regional literature, where delayed presentation is common in lower socioeconomic areas, often leading to prolonged obstruction, secondary infection, or inflammation. Importantly, no mortality occurred in this study, highlighting the effectiveness of early diagnosis and the availability of skilled bronchoscopy services at tertiary care centers [18]. Overall, the study's findings reinforce that airway foreign body aspiration is strongly influenced by age, socioeconomic environment, and regional dietary habits. Early recognition, prompt referral, and timely bronchoscopy remain critical to reducing morbidity. Public education, particularly in rural and low-income communities, about choking hazards could substantially decrease preventable aspiration events [19,20]. This study was limited by its single-center design, which may affect the generalizability of the

findings to other regions with different dietary and environmental patterns. The use of non-probability consecutive sampling may also introduce selection bias. Additionally, parental recall regarding choking events and symptom onset may have been imprecise, potentially influencing the accuracy of reported clinical histories. Radiological confirmation was not feasible in all cases due to resource constraints, and some patients presented late, which may have impacted the observed complication rates. Despite these limitations, the study provides valuable insight into the patterns of pediatric airway foreign body aspiration in a Pakistani tertiary care setting.

CONCLUSION

Foreign body aspiration continues to be a significant pediatric emergency in Pakistan, particularly affecting young children between 1–5 years of age. Organic foreign bodies especially seeds and nuts were the most frequently encountered objects, reflecting local dietary patterns and household environments. The right main bronchus was the predominant site of impaction, consistent with anatomical predisposition. Significant associations were noted between age and type of foreign body, and between specific foreign bodies and their preferred sites of lodgment. Rigid bronchoscopy proved highly effective and safe for both diagnosis and removal, with minimal complications and no mortality.

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