Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i6.1928
*Biol. Clin. Sci. Res. J., Volume 6(6), **2025**: 1928*
Original Research Article

Outcomes of Foreign Body Inhalation in A Tertiary Care Hospital

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(Received, 14th May 2025, Accepted 22nd June 2025, Published 30th June 2025)

Abstract: *Foreign body inhalation (FBI) is a potentially life-threatening emergency, particularly in children, and is associated with significant morbidity if diagnosis and management are delayed.* ***Objective:*** *To evaluate the clinical presentation, diagnostic findings, management, and outcomes of foreign body inhalation among children presenting to a tertiary care hospital.* ***Methods:*** *This descriptive cross-sectional study was conducted in the Department of Paediatric Medicine, Benazir Bhutto Hospital, Rawalpindi, from January 2025 to April 2025. A total of 103 children aged 3–12 years with suspected foreign body inhalation were enrolled using non-probability consecutive sampling. Clinical features, radiological findings, bronchoscopic outcomes, and follow-up results were recorded on a standardized pro forma.* ***Results:*** *The mean age of patients was 6.1 ± 2.3 years, with the majority aged 3–6 years (56.3%). Male predominance was noted (59.2%). The most common presenting symptoms were coughing (79.6%), wheezing (65.0%), and choking (53.4%). Chest X-ray abnormalities were detected in 69.9% of cases, and rigid bronchoscopy confirmed foreign bodies in 93.2% of these cases. The right main bronchus was the most frequent site of impaction (45.6%). Organic foreign bodies, predominantly peanuts and seeds, accounted for 68.9% of cases. Bronchoscopic removal was successful in 91.3% of cases on the first attempt, while repeat procedures were required in 8.7% of cases. Complications included post-bronchoscopy pneumonia (11.7%) and atelectasis (7.8%).* ***Conclusion:*** *Foreign body inhalation is most common among younger children, with organic materials being the predominant cause. Timely diagnosis and prompt bronchoscopy result in excellent outcomes with minimal complications.*

Keywords: Foreign body inhalation, bronchoscopy, airway obstruction, outcomes

[***How to Cite:*** Hussain MS, Hussain MB, Zaib K, Baig MA, Habib F. Outcomes of foreign body inhalation in a tertiary care hospital. *Biol. Clin. Sci. Res. J.*, **2025;** 6(6): 306-310. doi: https://doi.org/10.54112/bcsrj.v6i6.1928

Introduction

Foreign bodies in children are one of the major pediatric surgical emergencies. Foreign body inhalation is a medical emergency that primarily affects the pediatric population but can also occur in adults (1). Foreign objects, when inhaled, can become a cause of severe morbidity and even mortality. As a result of their inquisitive nature, children are often susceptible to foreign bodies and, in some cases, they tend to be stuck in the esophagus and airway, leading to death. The other reason for a foreign body in the aero digestive tract is due to childish curiosity, where children explore objects with their mouths and are unable to distinguish whether an object is edible or not. In addition, young children lack coordination when swallowing, cannot chew, do not have teeth, and breathe too fast, all of which translate into increased risks of aspiration (2). The effects of swallowed or inhaled foreign objects depend on the size, shape, and location of their passage through the aero-digestive tract, among other factors such as the age and gender of the victim (3, 4).

Depending on various factors (type, size, and location of the inhaled object, as well as the type and promptness of medical care), there are several possible outcomes of foreign body inhalation (FBI). The prevalence of outcomes related to the FBI, acute obstruction, chronic respiratory issues, the respiratory system, and infection was higher among children (43%) and adults (20%), respectively (5, 6). One hundred and forty-two children, aged between 3 months and 14 years and having histories of suspected foreign body inhalation, were referred. Unusual physical and radiologic findings were observed in 42 children, in which a foreign body was identified. Specifically, 17 children had abnormal physical or radiologic findings, while two children had normal physical and radiologic findings but a persistent cough. Successful ejection or extraction of a foreign body by various means, such as bronchoscopy or surgery, is also possible. The most characteristic one in children is foreign body inhalation. A complete history, followed by an in-depth clinical examination and suitable radiological investigations, is paramount to an accurate diagnosis. If there are suspected foreign bodies in the aero-digestive tract, an anterior-posterior (AP) and lateral chest X-ray or an AP and lateral soft tissue neck radiograph are recommended (7). Coughing (66.1%), choking (27%), breathing difficulties (26.6%), fever (22.2%), and hemoptysis (17.2%) are the most common non-choking foreign bodies. A foreign body aspiration typically yields positive outcomes. However, prompt recognition of the individual roles within an interprofessional group of specialists is recommended to maximize outcomes (8). Prospectively, all patients' clinical and radiological presentations of inhaled sharp FBs. Using a magnetic extractor and grasping forceps in rigid bronchoscopy, all of the sharp pins were safely and easily removed. The penetration syndrome, or sudden onset of choking and intractable cough, was the most common symptom following inhalation (70 percent) (9). Although numerous studies have been conducted on foreign body inhalation and ingestion, there are limited local data on the effects of foreign body inhalation in this context. Timely identification and intervention are pivotal in determining the overall outcome, emphasizing the critical importance of prompt medical attention in cases of foreign body inhalation. As a result, the purpose of this study is to investigate the effects of foreign body inhalation in a local tertiary care setting.

Thus, the objective of the study is to determine the outcome of foreign body inhalation in a tertiary care hospital.

Methodology

This Descriptive cross-sectional study was conducted at the Paediatric Medicine Department, Benazeer Bhutto Hospital, Rawalpindi, from January 2025 to April 2025. The sample size was calculated using the WHO sample size calculator, with the following assumptions: confidence level (1-α): 95%, Anticipated population proportion (P): 22%, and Absolute precision (d): 0.08. The required sample size was calculated to be **103 children**. A non-probability consecutive sampling technique was employed. Children aged 3–12 years Either gender Children presenting with clinical symptoms such as coughing, choking, wheezing, or respiratory distress Children with a confirmed history of inhaling a foreign body into the respiratory tract Children with foreign bodies in areas other than the respiratory tract Children with congenital anomalies of the upper airway (e.g., cleft lip, cleft palate) Children with severe comorbidities or medical conditions that could significantly affect study outcomes or complicate assessment of foreign body inhalation Following ethical approval, all eligible children presenting with suspected foreign body inhalation based on their clinical features were admitted during morning hours. A detailed preoperative evaluation was conducted, including a chest X-ray, a CT scan of the chest, and monitoring of heart rate, respiratory rate, and oxygen saturation (SpO_2). After identifying the location of the foreign body, patients were managed accordingly. In cases requiring bronchoscopy, procedures were performed in collaboration with the ENT and anesthesia departments. All outcomes of foreign body inhalation—including acute obstruction, chronic respiratory issues, infections, and respiratory system complications—were recorded on a pre-designed proforma (attached as annexure). Patients were followed up two weeks later in the pediatric outpatient department, where a repeat chest X-ray, oxygen saturation, detailed history, and physical examination were performed. Multidisciplinary care was provided where required. Data were analyzed using SPSS version 26. Quantitative variables, such as age, were expressed as mean ± standard deviation, whereas qualitative variables, including gender, clinical features, type of foreign body, and outcomes, were presented as frequencies and percentages. Outcomes of foreign body inhalation were stratified by age, gender, and type of foreign body at presentation. Post-stratification, the Chi-square test or Fisher's exact test was applied to assess associations, with a p-value ≤0.05 considered statistically significant.

Results

Data were collected from 103 patients; the mean age of children was 6.1 ± 2.3 years, with the majority falling in the 3–6-year age group (56.3%). A male predominance was observed, with 61 boys (59.2%) compared to 42 girls (40.8%). The most common presenting complaint was coughing (79.6%), followed by wheezing (65.0%) and choking (53.4%).
Respiratory distress was present in 36.9% of patients, while oxygen desaturation below 92% was documented in 18.4% of patients.
Chest X-ray abnormalities were found in 69.9% of cases, the most frequent being localized hyperinflation (31.1%), atelectasis (23.3%), and consolidation (15.5%). A CT scan was performed in 21.4% of patients, usually in cases where radiographs were inconclusive. Rigid bronchoscopy confirmed the presence of a foreign body in 96 children (93.2%), while seven patients (6.8%) had a negative bronchoscopy result. The right main bronchus was the most common site of impaction (45.6%), followed by the left main bronchus (28.1%) and trachea (19.4%). Organic objects, such as peanuts and seeds, constituted the majority (68.9%), while inorganic items, including metallic or plastic objects, were less frequent (24.3%). In 6.8% of cases, the foreign body was not retrieved.
Bronchoscopic removal was successful in 94 patients (91.3%) on the first attempt, while repeat procedures were required in 8.7% of cases.
Post-procedural complications were relatively uncommon, with pneumonia observed in 11.7%, atelectasis in 7.8%, and minor mucosal injury in 5.8% of cases. At the two-week follow-up, 92 children (89.3%) had complete recovery, whereas 11 patients (10.7%) reported persistent symptoms or recurrent infections.
Statistical analysis showed that organic foreign bodies were more frequently associated with coughing (85.9%) and wheezing (70.4%) compared to inorganic foreign bodies, and this difference reached statistical significance (p = 0.03 and p = 0.04, respectively). Persistent symptoms and complications were more common in younger children (3–6 years, 12.1% and 13.8%) compared to older children (7–12 years, 8.9% and 11.1%), although this difference did not reach significance (p = 0.07).

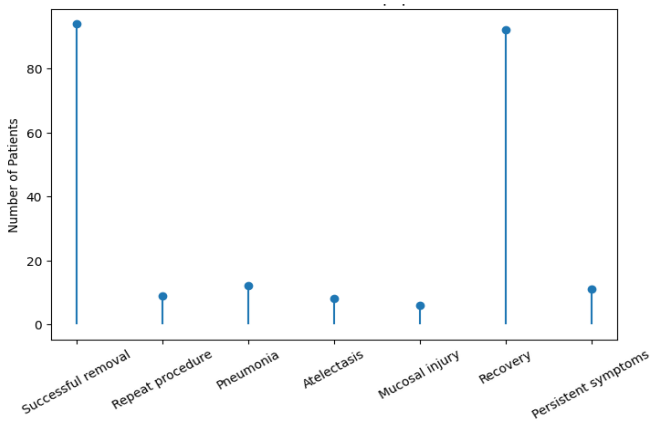

Figure 1: Clinical Outcomes of Foreign Body Inhalation

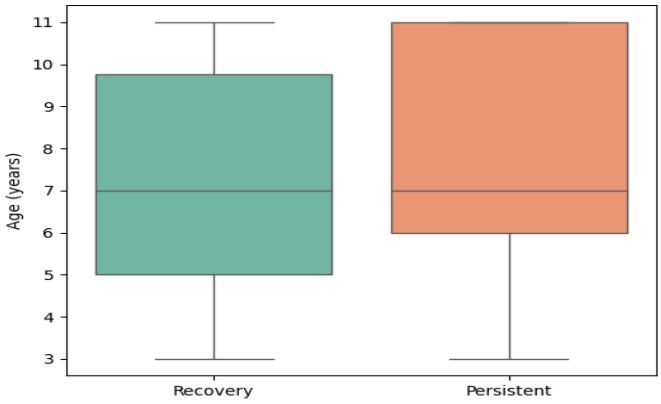

Figure 2: Age distribution according to outcomes

Table 1. Baseline Characteristics and Clinical Presentation of Patients with Foreign Body Inhalation (n = 103)

Variable	n (%) / Mean ± SD
Age (years)	6.1 ± 2.3
Age 3–6 years	58 (56.3%)
Age 7–9 years	27 (26.2%)
Age 10–12 years	18 (17.5%)
Gender	
Male	61 (59.2%)
Female	42 (40.8%)
Clinical presentation	
Coughing	82 (79.6%)
Wheezing	67 (65.0%)
Choking	55 (53.4%)
Respiratory distress	38 (36.9%)
Oxygen desaturation (<92%)	19 (18.4%)

Table 2. Diagnostic Findings, Type and Site of Foreign Bodies (n = 103)

Variable	n (%)
Radiological findings	
Chest X-ray abnormality present	72 (69.9%)
– Localized hyperinflation	32 (31.1%)
– Atelectasis	24 (23.3%)
– Consolidation	16 (15.5%)
CT scan performed	22 (21.4%)
Bronchoscopy results	
Positive for foreign body	96 (93.2%)
Negative bronchoscopy	7 (6.8%)
Site of impaction	
– Right main bronchus	47 (45.6%)
– Left main bronchus	29 (28.1%)
– Trachea	20 (19.4%)
– Other	7 (6.8%)
Nature of foreign body	
Organic (peanuts, seeds, food)	71 (68.9%)
Inorganic (plastic, metal, pen caps)	25 (24.3%)
Not retrieved	7 (6.8%)

Table 3. Clinical Outcomes of Foreign Body Inhalation (n = 103)

Outcome Category	n (%)
Bronchoscopy outcome	
Successful removal (1st attempt)	94 (91.3%)
Repeat the procedure required	9 (8.7%)
Complications	
Post-bronchoscopy pneumonia	12 (11.7%)
Atelectasis	8 (7.8%)
Mucosal injury	6 (5.8%)
Follow-up (2 weeks)	
Complete recovery	92 (89.3%)
Persistent symptoms/infection	11 (10.7%)
Mortality	0 (0.0%)

Table 4. Associations of Foreign Body Inhalation with Demographics and Clinical Features (n = 103)

Variable	Successful Removal n (%)	Persistent Symptoms n (%)	Complications n (%)	p-value
Type of Foreign Body				
Organic (n = 71)	64 (90.1%)	7 (9.9%)	10 (14.1%)	0.03*
Inorganic (n = 25)	23 (92.0%)	2 (8.0%)	3 (12.0%)	
Age Group				
3–6 years (n = 58)	51 (87.9%)	7 (12.1%)	8 (13.8%)	0.07
7–12 years (n = 45)	41 (91.1%)	4 (8.9%)	5 (11.1%)	
Gender				
Male (n = 61)	56 (91.8%)	5 (8.2%)	8 (13.1%)	0.64
Female (n = 42)	38 (90.5%)	4 (9.5%)	5 (11.9%)	

Discussion

Foreign body inhalation (FBI) remains a significant pediatric emergency with considerable morbidity, particularly in developing countries where delays in recognition and management are common. This is a retrospective analysis of 103 children with suspected FBI to evaluate clinical characteristics, diagnostic findings, treatment, and outcome. Our results provide valuable insights into the patterns and implications of this disorder in a referral center. The median age of affected children in our cohort was 6.1 years, with the majority falling between the ages of 3 and 6 years. This agrees with other research findings that younger children are at a high risk because they tend to generate objects orally, develop immature protective airway reflexes, and often lack parental supervision. A majority of the cases were male (59.2 percent), consistent with prior research, which suggests that boys are more frequently affected, likely due to their more active behavior and increased exposure to risk-taking activities (10).

The most frequent symptoms of the presentations included cough, wheezing, and choking, as it happens in the classical FBI triad described in the literature. Not every patient exhibits all three components of the triad, and some cases were initially misdiagnosed as asthma or pneumonia, highlighting the diagnostic challenges. The radiological results were unusually high in almost 7 out of 10 patients; however, not all patients could be determined by a chest X-ray, further demonstrating

the significance of bronchoscopy as the gold standard (11). The most common site of impaction was at the right main bronchus (45.6%), which may be due to anatomical considerations, as it is vertical and broader than the left main bronchus. The prevalence of organic foreign bodies, such as peanuts and seeds, represented the highest frequency (68.9%), which is in accordance with South Asian dietary habits, which involve consuming the foreign bodies in question. There appeared to be a stronger correlation between organic materials and symptomatic presentation, such as cough and wheezing, as they can cause airway inflammation and secondary infection, as opposed to inert inorganic items. Successful bronchoscopy was accommodated in most cases (91.3%), and only 9.7% reported repeat procedures (12). Post-bronchoscopy pneumonia and atelectasis observed in a few patients were just among the complications noted, although no death was recorded during the period of study. This is consistent with the observations of tertiary centers, where success rates are high when procedures are performed by an experienced team with adequate facilities. The zero-mortality rate in our sample may be attributed to early detection, timely treatment, and access to ENT and anesthesia services within our facility (13-15).

Nearly 90% of patients had fully recovered at the two-week follow-up. Nevertheless, a minority still had chronic cough and frequent infections, presumably due to either airway damage or airway obstruction at the time of treatment. The prior literature has also discussed the significance of tight follow-up, as delayed complications may arise (such as bronchiectasis) when the disease is not well-controlled promptly (16). In general, our findings demonstrate the relevance of early suspicion and immediate bronchoscopy in clinically suspected FBI cases. Education of the masses about these dangers of asphyxiation by small objects, notably caregivers who have small children, is of paramount importance (17). Preventive strategies such as discouraging the practice of giving small nuts or seeds to toddlers, parental education, and early referral to specialized centers may help reduce the burden of this condition (18-20). Our study was conducted at a single tertiary care hospital and may not fully reflect community-level patterns. The cross-sectional design also limited long-term outcome assessment, as follow-up was restricted to two weeks. Larger, multicenter studies with more extended follow-up periods are needed to understand late complications better and to evaluate preventive measures comprehensively.

Conclusion

It is concluded that foreign body inhalation remains a significant pediatric emergency, most commonly affecting children aged 3–6 years with a slight male predominance. Coughing, choking, and wheezing were the leading symptoms, with organic foreign bodies, such as peanuts and seeds, being the most frequent culprits. The right main bronchus was the most common site of impaction. Prompt bronchoscopy proved to be highly effective for diagnosis and management, with a high success rate of removal and a low complication profile. At two-week follow-up, the majority of patients achieved complete recovery, and no mortality was observed. These findings emphasize the importance of early suspicion, rapid referral to specialized centers, and parental education to minimize morbidity and prevent life-threatening outcomes of foreign body inhalation in children.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication
Approved

Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MSH (Resident Pediatrics)
Manuscript drafting, Study Design,
MBH (House Officer)
Review of Literature, Data entry, Data analysis, and drafting an article.
KZ (Women Medical Officer)
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MAB (Resident Paeds Medicine)
Study Design, manuscript review, and critical input.
FH (Medical officer)
Manuscript drafting, Study Design,

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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