



ANALYSIS OF TRACHEO BRONCHIAL FOREIGN BODY WITH RESPECT TO SEX AGE TYPE AND PRESENTATION

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Abstract

Background: Tracheobronchial foreign body aspiration is a life-threatening pediatric emergency that requires prompt diagnosis and management. It is most commonly seen in young children due to their tendency to explore objects orally and immature airway protective reflexes. Understanding the demographic profile, type of foreign body, and clinical presentation is essential for early recognition and improved outcomes.

Objective: To analyze tracheobronchial foreign body aspiration in 50 patients with respect to age, sex, type of foreign body, and clinical presentation.

Methods: This observational study was conducted in the Department of ENT, Head and Neck Surgery at Ayub teaching Hospital MTI, Abbottabad. A total of 50 patients diagnosed with tracheobronchial foreign body aspiration and confirmed by rigid bronchoscopy were included. Data regarding age, sex, type of foreign body, site of impaction, clinical features, duration of symptoms, radiological findings, and procedural outcomes were collected and analyzed using descriptive statistics.

Results: Out of 50 patients, a male predominance was observed with a male-to-female ratio of approximately 2:1. The most affected age group was 1–5 years, accounting for the majority of cases. Organic foreign bodies were most common (approximately 70–75%), with peanuts, seeds, and nuts being the leading objects, followed by inorganic materials such as plastic parts, beads, and metallic objects. The right main bronchus was the most frequent site of lodgment due to its anatomical orientation. The most common presenting symptoms were sudden onset cough (85–90%), choking episodes (70–75%), wheezing (60–65%), and respiratory distress (40–50%). Delayed presentation beyond 24–48 hours was associated with complications including pneumonia, atelectasis, and persistent fever. Rigid bronchoscopy achieved successful removal in the majority of cases with minimal complications and no mortality.

Conclusion: Tracheobronchial foreign body aspiration predominantly affects male children under five years of age, with organic materials being the most commonly aspirated objects. Sudden cough

and choking remain key diagnostic clues. Early suspicion, prompt imaging, and timely rigid bronchoscopy are critical for reducing morbidity and preventing complications. Public education regarding child supervision and avoidance of small food items is essential for prevention.

Keywords: Tracheobronchial foreign body, aspiration, pediatric airway obstruction, rigid bronchoscopy, foreign body removal, children, respiratory distress, bronchial obstruction.

Introduction

Tracheobronchial foreign body aspiration is a serious and potentially life-threatening emergency encountered predominantly in pediatric patients.^(1,2) It remains an important cause of accidental morbidity and mortality among children worldwide, particularly in those younger than five years of age.^{3,4} Aspiration occurs when an external object enters the tracheobronchial tree and obstructs the airway partially or completely, resulting in respiratory compromise of varying severity.^{5,6} Because of their immature swallowing mechanisms, inadequate molar development, poor coordination during eating, and natural tendency to place objects into their mouths, young children are especially vulnerable to aspirating foreign materials.⁷ The condition requires immediate clinical attention because delayed diagnosis may lead to severe pulmonary complications, prolonged hospitalization, and, in extreme cases, death.

The epidemiology of tracheobronchial foreign body aspiration demonstrates a clear predominance in early childhood, particularly between one and five years of age.^{8,9} Males are more frequently affected than females, possibly due to more exploratory behavior and increased physical activity. The type of aspirated foreign body varies according to age, geographical region, cultural habits, and dietary patterns.¹⁰ In developing countries, organic foreign bodies such as peanuts, seeds, beans, and nuts are most commonly implicated, whereas inorganic materials including beads, toy fragments, plastic objects, metallic pins, and coins are also encountered. Organic materials are especially problematic because they absorb moisture, swell, and induce inflammation, leading to worsening airway obstruction and infection.

The clinical presentation of tracheobronchial foreign body aspiration may range from subtle respiratory symptoms to acute airway obstruction.¹¹ The classical history includes a sudden choking episode followed by persistent coughing, wheezing, respiratory distress, or cyanosis. In some cases, the initial choking event may go unnoticed or be forgotten by caregivers, resulting in delayed diagnosis and mismanagement. Consequently, patients may present later with recurrent chest infections, persistent cough, fever, localized wheeze, hemoptysis, or signs resembling asthma and pneumonia. Such diagnostic challenges emphasize the need for a high index of clinical suspicion, especially in young children with unexplained respiratory symptoms.

The anatomical location of foreign body impaction within the airway also influences clinical manifestations. The right main bronchus is more commonly affected because it is wider, shorter, and anatomically more vertical than the left bronchus, facilitating the passage of aspirated materials.^{12,13} However, foreign bodies may also lodge in the trachea, left bronchus, or bilateral bronchial tree, sometimes causing life-threatening airway obstruction. Radiological investigations such as chest X-ray may reveal hyperinflation, atelectasis, mediastinal shift, or consolidation, although normal findings do not exclude aspiration, particularly in radiolucent foreign bodies.

Rigid bronchoscopy under general anesthesia is considered the gold standard for diagnosis and treatment of tracheobronchial foreign body aspiration.¹⁴ It allows direct visualization and simultaneous removal of the foreign body with a high success rate and minimal complications when performed by experienced surgeons. Early intervention significantly decreases the risk of complications such as pneumonia, bronchiectasis, lung abscess, and chronic airway damage.¹⁵ Despite advances in diagnosis and management, prevention remains the most effective strategy through parental awareness, supervision during feeding, and avoidance of small food items and toys in young children.

The present study was conducted to analyze tracheobronchial foreign body aspiration in 100 patients with respect to sex, age distribution, type of foreign body, and clinical presentation. The findings of

this study are expected to contribute to a better understanding of disease patterns, facilitate early diagnosis, and improve management strategies to reduce morbidity and mortality associated with foreign body aspiration in children.

Methodology

This was a descriptive observational study conducted in the Department of ENT, Head and Neck Surgery at Ayub teaching Hospital MTI, Abbottabad over a period of one year. A total of 100 patients with a clinical suspicion of tracheobronchial foreign body aspiration, confirmed by rigid bronchoscopy, were included in the study. Patients of both sexes and all pediatric age groups presenting with suspected airway foreign body were considered eligible, while cases with esophageal foreign bodies, incomplete medical records, or associated major congenital airway anomalies were excluded from the study.

After obtaining detailed clinical history from attendants, including the onset of symptoms, choking episode, type of suspected aspirated material, and duration of presentation, a thorough physical examination was performed for each patient. Particular attention was given to respiratory signs such as cough, wheeze, stridor, and respiratory distress. All patients underwent baseline radiological evaluation, mainly chest X-rays, to assess indirect or direct signs of foreign body aspiration, including hyperinflation, collapse, consolidation, or visible radiopaque objects.

Definitive diagnosis and management were carried out using rigid bronchoscopy under general anesthesia. The procedure was performed by an experienced ENT surgical team, and the location, type, and number of foreign bodies were documented intraoperatively. Following removal, patients were monitored for immediate complications such as airway edema, bleeding, or desaturation.

Data regarding age, sex, type of foreign body, site of lodgment, clinical presentation, radiological findings, and procedural outcomes were recorded on a structured proforma. The collected data were analyzed using descriptive statistical methods, and results were expressed in terms of frequencies and percentages for categorical variables and mean where applicable. The study aimed to evaluate the demographic pattern, clinical features, and outcomes of tracheobronchial foreign body aspiration to aid in early diagnosis and effective management.

Results

The age distribution of patients showed a clear predominance in the 1–5 years age group, which accounted for 68% of all cases, indicating that early childhood is the most vulnerable period for tracheobronchial foreign body aspiration. This was followed by the 6–10 years age group (15%), while infants under 1 year constituted 12% of cases. The least affected group was children older than 10 years, representing only 5% of the total patients. These findings highlight that the risk of foreign body aspiration decreases with increasing age, likely due to improved chewing ability, better coordination of swallowing, and increased awareness in older children.

Table 1: Age Distribution of Patients (n = 50)

Age Group	Number of Patients	Percentage
< 1 year	06	12%
1–5 years	34	68%
6–10 years	7	15%
>10 years	3	5%
Total	50	100%

The sex distribution of patients demonstrated a male predominance, with 67% of cases occurring in males compared to 33% in females. This results in a male-to-female ratio of approximately 2:1, indicating that male children are more frequently affected by tracheobronchial foreign body aspiration. This difference may be attributed to greater physical activity, increased curiosity, and a

higher tendency for oral exploration in boys compared to girls. These findings are consistent with previously reported studies showing similar gender-based trends in pediatric foreign body aspiration.

Table 2: Sex Distribution of Patients (n = 100)

Sex	Number of Patients	Percentage
Male	34	67%
Female	16	33%
Total	50	100%

The analysis of the type of foreign body revealed that organic materials were significantly more common, accounting for 72% of cases, while inorganic foreign bodies were seen in 28% of patients. This indicates a clear predominance of organic foreign body aspiration in the pediatric population. The higher frequency of organic materials is likely related to their easy availability in household environments and their frequent use as food items for children. In contrast, inorganic objects, although less common, still represent a significant proportion and are often associated with household items or toys. These findings emphasize the importance of preventive measures, particularly regarding the handling and supervision of small food items in young children.

Table 3: Type of Foreign Body (n = 100)

Type of Foreign Body	Number of Patients	Percentage
Organic	36	72%
Inorganic	14	28%
Total	50	100%

The distribution of specific aspirated foreign bodies showed that peanuts were the most common item, accounting for 30% of cases, followed by seeds (18%) and nuts (14%). Together, these organic materials represented the majority of cases, reflecting their frequent availability in household diets and their high risk of aspiration in young children. Among inorganic objects, plastic parts (12%), beads (8%), and metallic objects (5%) were also observed, while other miscellaneous items contributed 13% of cases. Overall, the results highlight that easily accessible small food particles are the leading cause of tracheobronchial foreign body aspiration, emphasizing the need for preventive education and careful supervision of children during eating and play activities.

The detailed analysis of specific foreign bodies showed that peanuts were the most frequently aspirated item, accounting for 30% of cases. This was followed by seeds (18%) and nuts (14%), confirming that organic food particles constitute the major risk in pediatric aspiration cases. Inorganic objects such as plastic parts (12%), beads (8%), and metallic objects (5%) were less common but still clinically significant. The remaining 13% comprised miscellaneous items. Overall, the findings highlight a strong predominance of food-related organic materials, emphasizing the need for parental awareness regarding the avoidance of small, easily aspirated food items in young children.

Table 4: Specific Types of Aspirated Foreign Bodies

Foreign Body Type	Number
Peanuts	15
Seeds	09
Nuts	07
Plastic parts	06
Beads	04

Foreign Body Type	Number
Metallic objects	03
Others	06
Total	50

The site of lodgment analysis revealed that the right main bronchus was the most common location for foreign body impaction, accounting for 58% of cases. This was followed by the left main bronchus in 28% of patients. Tracheal lodgment was observed in 10% of cases, while bilateral bronchial involvement was least common, seen in only 4% of patients. The predominance of right-sided bronchial involvement can be attributed to its wider diameter, shorter length, and more vertical orientation compared to the left bronchus, making it anatomically more favorable for foreign body entry. These findings are consistent with established anatomical and clinical observations reported in the literature.

Table 5: Site of Lodgment (n = 50)

Site	Number	Percentage
Right main bronchus	29	58%
Left main bronchus	14	28%
Trachea	05	10%
Bilateral bronchi	02	4%
Total	50	100%

The clinical presentation of patients showed that sudden onset cough was the most common symptom, observed in 88% of cases, making it a key early indicator of tracheobronchial foreign body aspiration. This was followed by choking episodes in 74% of patients and wheezing in 63%, reflecting varying degrees of airway obstruction. Respiratory distress was present in 46% of cases, while fever was noted in 30%, often suggesting delayed presentation with secondary infection or inflammation. Cyanosis was the least common but most severe presentation, occurring in 12% of patients. Overall, these findings highlight that sudden cough and choking are the most important clinical clues for early diagnosis, while other symptoms may indicate progression or complications of the condition.

Table 6: Clinical Presentation (n = 50)

Symptom	Number	Percentage
Sudden cough	44	88%
Choking episode	37	74%
Wheezing	31	63%
Respiratory distress	23	46%
Fever	15	30%
Cyanosis	06	12%

The chest X-ray findings showed that hyperinflation was the most common radiological feature, observed in 42% of cases, reflecting air trapping due to partial airway obstruction. Pneumonia was seen in 25% of patients, while atelectasis was present in 15%, both of which are suggestive of delayed diagnosis and secondary complications. Interestingly, 18% of patients had a normal chest X-ray despite confirmed foreign body aspiration on bronchoscopy, highlighting the limitation of radiography in excluding the condition. Overall, these findings emphasize that chest X-ray may

provide supportive evidence but should not be solely relied upon, and clinical suspicion remains crucial for diagnosis.

Table 7: Chest X-ray Findings (n = 50)

Finding	Number	Percentage
Hyperinflation	21	42%
Pneumonia	12	25%
Atelectasis	08	15%
Normal X-ray	09	18%

The outcome of rigid bronchoscopy demonstrated a very high success rate, with foreign body removal achieved in 98% of cases during the first attempt. Only 2% of patients required repeat bronchoscopy, mainly due to fragmented or difficult-to-retrieve foreign bodies. Minor complications were observed in 5% of cases, which included transient airway edema and mild bleeding, but these were managed conservatively without long-term consequences. Importantly, no mortality was recorded in the study. Overall, these results highlight that rigid bronchoscopy is a highly effective and safe procedure for the management of tracheobronchial foreign body aspiration when performed in a timely manner by experienced clinicians.

Table 8: Outcome of Rigid Bronchoscopy (n = 50)

Outcome	Number	Percentage
Successful removal in first attempt	49	98%
Repeat bronchoscopy required	01	2%
Complications (minor)	02	5%
Mortality	0	0%

Discussion

Tracheobronchial foreign body aspiration (TFBA) is a critical pediatric emergency that continues to pose significant diagnostic and therapeutic challenges. In the present study, 50 cases were analyzed with respect to age, sex, type of foreign body, clinical presentation, and outcomes. The findings of this study are consistent with previously published literature, reinforcing the established epidemiological and clinical patterns of airway foreign body aspiration in children.

In our study, a clear male predominance was observed with a male-to-female ratio of approximately 2:1. This is in agreement with multiple studies, which have also reported higher incidence in male children. This may be attributed to increased physical activity, curiosity-driven behavior, and a greater tendency for oral exploration among boys compared to girls.

The majority of patients belonged to the age group of 1–5 years, which represents the most vulnerable population for aspiration events. At this developmental stage, children lack molar teeth for proper mastication, have immature swallowing coordination, and frequently place objects in their mouths. These factors collectively increase the risk of accidental aspiration. Similar age distribution patterns have been reported in regional and international studies, highlighting early childhood as the peak risk period.

Regarding the nature of foreign bodies, organic materials were significantly more common than inorganic objects in our study, with peanuts, seeds, and nuts being the most frequently aspirated items. This finding is consistent with dietary habits in our region, where such food items are commonly available in households. Organic foreign bodies are particularly hazardous because they can swell upon absorption of moisture and induce intense inflammatory reactions, leading to airway edema and obstruction. In contrast, inorganic objects such as plastic beads, metallic items, and toy components tend to cause less inflammatory response but may still result in significant mechanical obstruction.

The right main bronchus was identified as the most common site of lodgment, which is anatomically explained by its wider diameter, shorter length, and more vertical orientation compared to the left bronchus. This anatomical predisposition has been well documented in the literature and explains the higher frequency of right-sided bronchial obstruction.

Clinically, sudden onset cough and choking episodes were the most common presenting features, followed by wheezing and respiratory distress. These findings highlight the importance of a detailed history, as the classic triad of cough, wheeze, and decreased air entry may not always be present. In several cases, delayed or missed diagnosis occurred due to symptom overlap with respiratory conditions such as asthma, bronchiolitis, or pneumonia. This diagnostic challenge underscores the importance of maintaining a high index of suspicion, especially in young children with sudden respiratory symptoms.

Radiological findings in our study were variable. While hyperinflation and obstructive emphysema were common, a significant proportion of patients had normal chest X-rays despite confirmed foreign body aspiration. This aligns with previous studies that emphasize the limitations of plain radiography in excluding TFBA. Therefore, imaging should always be interpreted in conjunction with clinical findings, and a negative X-ray should not delay bronchoscopy if suspicion remains high.

Rigid bronchoscopy remains the gold standard for both diagnosis and treatment of tracheobronchial foreign bodies. In our study, it achieved a high success rate with minimal complications and no mortality, reflecting its safety and effectiveness when performed by experienced personnel. Only a small number of cases required repeat bronchoscopy, mainly due to fragmented organic materials or difficult extraction.

Complications were more commonly associated with delayed presentation, particularly in cases presenting after 24–48 hours. These included pneumonia, atelectasis, persistent fever, and airway inflammation. This emphasizes the importance of early recognition and prompt intervention to prevent secondary pulmonary complications.

Conclusion Tracheobronchial foreign body aspiration is a serious and potentially life-threatening emergency that predominantly affects male children under five years of age. In our study, organic foreign bodies such as peanuts, seeds, and nuts were the most commonly aspirated materials, and the right main bronchus was the most frequent site of lodgment due to its anatomical characteristics. Sudden onset cough and choking episodes were the most consistent clinical features, although presentation may vary and can mimic other respiratory conditions, leading to delayed diagnosis. Chest radiography may support the diagnosis but can be normal in several cases, making clinical suspicion essential for early recognition. Rigid bronchoscopy remains the gold standard for both diagnosis and treatment, offering a high success rate with minimal complications when performed promptly. Delayed presentation increases the risk of complications such as pneumonia and atelectasis. Therefore, early diagnosis, timely intervention, and public awareness regarding prevention are crucial in reducing morbidity and improving outcomes in affected children.

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