

Original research article

## Study of Clinical Outcome of Aero- Digestive Tract Foreign Bodies in Children

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### Abstract

**Background:** Foreign bodies in aero-digestive tract are paediatric emergencies contributing to high morbidity and mortality requiring early prompt diagnosis and treatment. Most commonly seen in children. They comprise one of the preventable causes of accidental death in children.

**Methods:** The analysis is based on prospective study undertaken on 94 patients who came with history or features suggestive of foreign body ingestion or inhalation to Paediatric OPD and ENT OPD of Darbhanga medical college and Hospital, Laheriasarai. Study duration of two years. A detailed history, clinical examination, investigations like blood examination and radiology findings were recorded in a printed preformed questionnaire. Bronchoscopy / Endoscopy findings and outcome were also recorded for each patient.

**Conclusion:** Foreign bodies in the aero digestive tract are life threatening paediatric emergencies. Measure should be taken to prevent these accidents by, instructing parents to abstain from feeding dry fruits, nuts, and seeds to their children. Parents and care givers should be trained to treat choking episodes in children. Early diagnosis and treatment helps to reduce complications and mortality.

**Keywords;** Bronchoscopy, Foreign bodies, Dysphagia.

### Introduction

Foreign bodies in aero-digestive tract are paediatric emergencies contributing to high morbidity and mortality requiring early prompt diagnosis and treatment. Most commonly seen in children in their first 6 years of life, with peak incidence between 1 and 3 years<sup>3</sup>. Foreign body constitute a serious hazard in children as long as they use their mouth to explore their surroundings and are yet to develop risk free food ingestion habits. Foreign body may get lodged anywhere in the aero-digestive tract, but the consequences are more grave when they get impacted in airway. Foreign body aspirations comprise one of the preventable causes of accidental deaths in children. The true incidence, morbidity, mortality related to foreign body aspiration in India is not known. In United States, 5% of accident related deaths in children under the age of four are caused by foreign body aspiration, which is also leading cause of accidental death in the home among children under the age of 6. In Brazil foreign body aspiration is the third leading cause of accidental deaths. Foreign body aspiration is a life threatening emergency, frequently encountered in children, but commonly diagnosis is missed because there are no specific clinical manifestations. Definitive history of foreign body aspiration is not present in all cases. The main associated symptoms with aspiration include, cough, choking, increased frequency of respiration, bluish discoloration of extremities. Undiagnosed retained foreign bodies may present with complications such as

pneumonia, collapse and rarely fungal granuloma formation. Delayed diagnosis of foreign body is associated with increased risk of complications. The majority of aspirated foreign bodies are organic in nature, mainly food. Rigid bronchoscopy is the procedure of choice for removal of foreign bodies. Laryngeal and subglottic foreign bodies may need tracheostomy. Foreign body impactions in nasal cavity, a part of upper respiratory tract are commonly seen in paediatric population. They may present as foreign body noticed by parents, feeling of something in the nose foul smelling or blood stained discharge and in infants as irritability. Foreign body nose can be removed on OPD basis. Complications associated include infective rhinosinusitis, foreign body granuloma and septal perforation. Bleeding is the common complication following removal of the nasal foreign body. Ingestion of foreign bodies is also common, most of them pass spontaneously through upper gastro intestinal tract but sometimes they lodge in esophagus. Most common site of impaction is cricopharynx. Complications associated are mucosal ulceration, esophageal obstruction, perforation, intrinsic stenosis and esophageal diverticulum. Majority of ingested foreign bodies after reaching the stomach pass spontaneously through the entire gastrointestinal tract uneventfully.

### **Objectives**

To know the commonest and variable signs and symptoms of presentation of aerodigestive tract foreign bodies. To know the outcome of children with foreign body inhalation and ingestion.

### **Review of Literature**

A foreign body is an exogenous or endogenous substance incongruous with the anatomy of the site of impaction. Although medically recorded histories are not available, foreign bodies in the aero-digestive tract are as old as mankind itself. Among the oldest reference is the one cited by the Greek fabulist Aesop in 560 BC, the episode of gluttonous eating wolf with an impacted bone which was skillfully removed by the crane, per viae naturales. Gustav Killian, a German otorhinologist is credited with being the -Father of Bronchoscopy and was the first to adapt the esophagoscope to the airways. In 1897, the first documented bronchoscopic procedure was performed for a foreign body extraction by Killian. He used Kirstein's laryngoscope and Mikulicz-Rosenhiem esophagoscope to remove foreign body from a 63 year old patient. With the work of Chavalier Jackson and Chavalier L Jackson broncho-esophagology got itself a separate identity and recognition in the world of medical science. In 1975 Baraka A et al. from their study on esophageal foreign bodies analyzed that among 54 patients, 45 were children. Of these 45 children, 28 were aged 2-4 years. Coins were the most common foreign body in children while in adults a bolus of meat was common. In children most of the foreign bodies were impacted in the upper oesophagus at the cricopharyngeal junction, which is the narrowest part of oesophagus. In 1988 Vane DW et al. from their study on Bronchoscopy for aspirated foreign bodies in Children Experience in 131 cases concluded that, one hundred thirty-one children underwent rigid bronchoscopy under general anesthesia for suspected aspirated foreign bodies. There were 79 boys and 52 girls, with a mean age of 2.1 years. Physical examination showed decreased breath sounds (n=130) and wheezing (n=119) over the affected site. Chest roentgenograms were diagnostic or suggestive of aspirated foreign bodies in 127 cases (97%). Radiopaque lesions were noted on roentgenograms in ten cases. Four infants had a preoperative hypoxic arrest. Two patients had negative results of bronchoscopy (1.5%). Extraction of the aspirated foreign body was carried out at laryngoscopy in two patients and by forceps under direct vision at bronchoscopy in 97 patients. Mu L et al. in 1991 defined late diagnoses of foreign body aspiration as occurring beyond 3 days between the aspiration of the foreign body, or onset of symptoms, and correct diagnosis. They reviewed a total of 210 cases. The causes creating late diagnosis of foreign body aspiration in children were as follows:

(1)parental negligence( 106,50%), (2)misdiagnosis by fellow professionals and pediatricians (39,19%), (3)normal chest x- ray(29,14%), (4)lack of typical symptoms and signs(26,14%), (5)mismanagement(8,4%) and (6) a negative bronchoscopic finding (2,1%). The most common complications encountered were obstructive emphysema (41%), mediastinal shift (34%), pneumonia(24%), and atelectasis (18%) in 186 patients who underwent a chest roentgenographic examination. The incidence of major complications was 64% in children who were diagnosed within 4-7 days; the complications rate was 70% in those with delay in diagnoses of 15-30 days and 95% in the cases with a delay in diagnosis of over 30 days after aspirating the foreign bodies. In 1999, Cheng W et al. from their study on foreign body ingestion in children showed that, foreign bodies were detected in 552(43%) of the 1265 children admitted. The age of children ranged from 6 months to 16 years (mean 5.2 years). The most common objects were coins (49%) and non metallic sharp objects(31%). Although x-rays could detect all metallic objects and 86 % of glass objects, the sensitivity of fish bone detection is only 26%. Absence of symptoms was common (50% in metallic group and 29% in non metallic sharp objects group). Forty –one percent of coins and 95% of non metallic sharp objects were lodged at the sites suitable for removal by direct laryngoscopy alone with success rate of 86% and 76% respectively. Little DC et al. in 2006, from their retrospective analysis on esophageal foreign bodies in paediatric population concluded that, the mean age of presentation was 3.24 years. Dysphagia (37%) and drooling (31%) were the most common symptoms. Foreign bodies were lodged in the superior esophagus in 73% and 88% of the objects were coins. Ballon extraction with flouroscopy was performed in 468 children. Eightypercent of the objects were successfully removed with a mean flouroscopy time of 2.2 minutes, 8% were advanced into the stomach. Foreign body impaction in nose predisposes to infective rhinosinusitis, foreign body granuloma, septal abscess, septal perforation. Bleeding is a common complication on attempted removal or following removal of foreign body from nose. Complication of foreign body and aspiration depends mainly on the delay in diagnosis and delay in performing bronchoscopy.

### **Material and methods**

The analysis is based on prospective study undertaken on 94 patients who came with history or features suggestive of foreign body ingestion or inhalation to Casualty, Paediatric OPD and ENT OPD of Darbhanga medical college and Hospital Darbhanga Laheriasarai, Bihar. Study duration of two years. Study Design: Observational case series hospital based study.

### **Inclusion Criteria**

Children of age 14 years and below presenting with history or features suggestive of foreign body aspiration or ingestion and its complications.

### **Exclusion Criteria**

Those who aren't willing for treatment, Children >14 years.

Sample size calculation done by using open Epi software version 2.3.1. at 95% confidence level. According to study by Gilyoma et al. Bronchopneumonia was most common complication following aspiration i.e, in 71.4% of patients with complications, which is taken as p for the calculation. A detailed history, clinical examination, investigations like blood examination and radiology findings were recorded in a printed preformed questionnaire. Bronchoscopy/ Endoscopy findings and outcome were also recorded for each patient.16 children presented to the hospital with history of foreign body in nose noticed by parents or history given by child by self. Detailed history and clinical findings were recorded. In co-operative children foreign bodies were removed on OPD basis without any anesthesia. Soft foreign bodies were removed using Tilley's nasal dressing forceps. Rounded foreign bodies

were removed using foreign body scoop. The procedure was done under general anaesthesia with patient in supine position. In some patients procedure is done under sedation and oxygenation. In some of these children foreign body is retrieved using forceps or hook after locating with endoscope. In patients with history of dysphagia, drooling of secretions and x-ray suggestive of foreign body in cricopharynx or esophagus, foreign body is removed by esophagoscope under anaesthesia. Routine blood investigation and a check x-ray just before the commencement of procedure were done to confirm the position of foreign body.

## Results

Total 94 patients with history or features suggestive of foreign body aspiration and ingestion were considered for the study. Among them 16 patients presented with nasal foreign body, 21 patients presented with history or features of tracheo-bronchial foreign body and 57 patients with digestive tract foreign body

FBSite	Frequency	Percent
Digestive tract	57	60.6
Nasal	16	17.0
Tracheobronchial	21	22.3
Total	94	100.0

Among 94 patients 81 patients presented to the hospital with definitive history of foreign body ingestion or inhalation accounting to a total of 86.2% (fig-19). All cases of nasal foreign body presented with history of foreign body inhalation. Only 10 (47.6%) among 21 patients presented with definitive history of tracheobronchial foreign bodies, while in remaining patients diagnosis is made based on clinical presentation and radiological investigations. 55 (96.5%) out of 57 of digestive tract foreign bodies presented with history of foreign body ingestion

**SEX DISTRIBUTION** Male outnumbered females in our study accounting for 58.5% of all cases. Males constituted 56.1% of digestive tract foreign body, 37.5% of nasal foreign bodies and 81% of trachea-bronchial foreign bodies. All cases of nasal foreign bodies presented with history of foreign body in nose noticed by mother or told by the child. The most common symptoms observed for tracheobronchial foreign bodies were cough (71.4%) followed by hurried breathing (61.9%), history of foreign body aspiration (47.6%). Majority of the digestive tract foreign bodies presented with history of foreign body constituting 96.4% of cases. Other complaints noted were vomiting in 9 children (15.7%), difficulty in swallowing in 8 patients (15.7%), pain abdomen in three cases (5.2%). One child brought with complaint of missing molar tooth. Foreign body was removed successfully in all children. In 13 (81.25%) children foreign body in nose were removed using foreign body scoop, Tilley's nasal dressing forceps. In three (18.75%) children foreign body was removed by nasal endoscopy under sedation, among them one child had history of button battery in nose and other two children were irritable. Out of 21 patients with tracheobronchial foreign body, 20 (95.2%) underwent rigid bronchoscopy. Foreign body was successfully removed in 17 (80.9%) patients. In one (4.76%) patient foreign body was split into pieces and couldn't be retrieved completely. In one child (4.76%) bronchoscopy revealed tracheal foreign body for which child required tracheostomy. In one (4.76%) child bronchoscopy revealed fungal granuloma, for which child underwent thoracotomy later. In one (4.76%) patient foreign body was removed by laryngoscopy, 13 patients required endoscopy for the removal of foreign body, among them in 11 children foreign body was retrieved from cricopharynx and in two children from mid esophagus. In 44 remaining children foreign body was in the abdomen. In children with tracheobronchial foreign bodies, 5 children required ionotrope support at admission, among

them one child died (20%) one child had HIE and cardiac arrest but revived went DAMA (20%) and remaining 16 children who didn't require ionotrope all were discharged safely. Though ionotrope requirement is associated with poor outcome proportionally, this association was found statistically insignificant, Pearson chi – square value 7.074, p value .029. One out of sixteen children(6.25%) had purulent nasal discharge due to infective rhinitis following foreign body impaction. Five out of sixteen (31.35%) children developed nasal bleeding as a complication following removal.

**POST BRONCHOSCOPY COMPLICATIONS:**Most common immediate post bronchoscopy complication was bronchospasm noticed in 85.7% of patients and most common late complication was pneumonia seen in 9.5% of cases.

## Discussion

Foreign bodies in the nasal cavities are second most common site of foreign bodies of the Ear Nose Throat. In our study children between 1-3 years comprised 50% of cases which correlating with study by Adedeji TO et al. In our study female children outnumbered male children not in accordance with studies by Ahmad M et al. Foreign bodies on right side were more common accounting for 62.5 %cases similar to the studies ofAdedeji TO et al. In 13 children foreign body in nose were removed using foreignbody scoop, Tilley's nasal dressing forceps. In three children foreign body is removed by nasal endoscopy under sedation. Most common foreign bodies retrieved were beads and seeds not correlating with other studies. Most common complication post removal was bleeding. Foreign body aspiration is a life threatening emergency, frequently encountered in children, but commonly missed diagnosis because there are no specific clinical manifestations. It is more common in children less than 3 years of age. In our study children of age 3 years and below comprised 61.1 % of all cases which is in accordance to studies by FragaAM et al. Honnursab BA et al. and Bittencourt PF et al. Factors contribute to high incidence of foreign body aspiration in this age group include social factors like carelessness of parents, children's habit of putting objects in their mouth, crying/playing during eating and anatomical factors like absence of molar teeth, inadequate control of deglutition. It is more commonly seen in males than females. In our study males comprised 80.9% of all cases. In most cases parents do not witness the accident, in our study only 10(47.6%) patients presented with definitive history of foreign body aspiration. Most cases with suspicion of foreign body present for treatment within 24 hours of accident. In our study 42.8% of children presented to hospital within 24 hours of onset of symptoms which confirmed the earlier findings of Vane DW et al., FragaAM et al. and Bittencourt PF et al. The earliest presentation in our study is within one and half hour of onset of symptoms and late presentation is after one year. Common symptoms in our study were cough, hurried breathing which is not in agreement with studies by FragaAM et al. and Mallick MS et al. who witnessed choking associated with cough as the most common symptom. The most common sign observed was decreased air entry which was in agreement with other studies Cyanosis was seen only in few (14.2 %) cases similar to studies by Chin CY et al. and Tang FL et al. A simple chest X-ray is the first procedure that can be carried out in suspicion of foreign body aspiration, but the value of chest X-ray in making the diagnosis of foreign body aspiration remains controversial. In our study normal chest x-ray was found in 23.8.% of cases, similar to other studies by Schmidt et al.[16%] ,Fraga AM et al.[11.8%]Bittencourt et al ,suggesting that a normal chest x-ray does not always exclude the diagnosis of foreign body. The most common x-ray finding in our study was obstructive emphysema seen in 42.8% of cases, similar to study by Mallick MS et al. but against to other study by FragaAM et al. who concluded collapse as the most common x-ray finding. Rigid bronchoscopy under general anesthesia is regarded as procedure of choice for the removal of aspirated foreign bodies. Out of 21 patients 20 underwent rigid bronchoscopy foreign body was successfully removed in 17 patients. In one

patient foreign body was split into pieces and couldn't be retrieved completely. In one child bronchoscopy revealed tracheal foreign body for which child required tracheostomy. In one child bronchoscopy revealed fungal granuloma, for which child underwent thoracotomy and lobectomy later. Presence of foreign body was confirmed by x-ray or endoscopy in 19 patients contributing to 33% of cases similar to study by Singh B et al. Out of 57 patients, 13 patients required endoscopy for the removal of foreign body. Among them in 11 children foreign body was retrieved from cricopharynx and in two children from mid esophagus. The incidence of cricopharyngeal foreign bodies was about 84.6% of total esophageal foreign bodies which is in acceptance to studies by Singh B et al. Cheng W et al. Shivakumar AM et al. and Little DC et al. One among 11 upper esophageal foreign body was a pin retrieved by forceps under anesthesia. Two foreign bodies retrieved from middle third of esophagus were coin and peanut. Peanut was impacted in a post-operative case of tracheoesophageal fistula, which on endoscopy also showed esophageal stricture requiring dilatation. No complications related to foreign body were noticed in these children. Three children developed bronchospasm as post surgical complication.

### Conclusion

Foreign bodies in the aerodigestive tract are life threatening paediatric emergencies contributing to high mortality and morbidity. Measure should be taken to prevent this accidents by instructing parents to abstain from feeding dry fruits, nuts and seeds to their children especially less than 2 years of age. Parents should be advised not to give toys with detachable small parts, coins and marbles to young children.

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