



Evaluation of different factors, diagnosis and findings of tracheo-bronchial foreign bodies in cases from Bihar region

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Abstract

Foreign body is an object or a substance that is foreign to the location where it is found. Foreign body in the airways is a serious event and on occasions, fatal if not managed properly in time. Accident resulting in death from the inhalation of the foreign body continues to take a formidable toll of the life every year. The problems associated with the inhaled foreign bodies receive little attention. This is a very serious life-endangering emergency, which is quite frequently encountered. Hence based on above findings the present study was planned for Evaluation of Different Factors, Diagnosis and Findings of Tracheo-Bronchial Foreign Bodies in Cases from Bihar Region.

The present study was planned in Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, Bihar, India. Total 30 cases of age from 1 year to 8 years of both the sexes were enrolled in the present study. Bronchoscopy is performed under general anesthesia in the operation theatre, with inhalational induction agent Halothane. Skilled pediatric anesthesia is vital and close cooperation between anesthetist and bronchoscopist is essential to ensure the alveolar ventilation is maintained throughout the procedure.

The data generated from the present study concludes that Diagnosis depends on high level of suspicion in a child with sudden onset respiratory distress. Children witnessed to choke while having small objects in their mouth and subsequently develop raspy respiration, wheezing, or coughing should undergo prompt bronchoscopy under general anaesthesia, regardless of radiographic findings. In conclusion, the results of bronchoscopy are very satisfying when the child recovers from airway obstruction.

Keywords: foreign bodies, rigid bronchoscopy, tracheo-bronchial tree

Introduction

Tracheobronchial foreign bodies are most commonly caused by aspiration and can result in a spectrum of presentations, from minimal symptoms, often unobserved, to respiratory compromise, failure, and even death. The epidemiology of tracheobronchial foreign bodies is bimodal, with peaks at the extremes of age.

Children aged 1-3 years are particularly at risk because of their increasing independence, mobility, and curiosity; decreased intensity of parental supervision with increased age; and the frequent tendency of young children to investigate their environment with their hands and mouths. Children in this age group are at risk for aspiration of various foods (grapes, raisins, nuts, seeds, candy), small toys, and balloons, as well as any object less than 1.5 cm in diameter.

Elderly patients are also at risk, particularly those with primary neurologic disorders such as stroke, Parkinson disease, and dementia, as well as patients of any age with a decreased gag reflex due to alcohol, drug overdose, seizures, or trauma. Any number of substances or objects can be aspirated, including food, gastric contents, pills, dental appliances, and teeth. A third category of at-risk individuals is those undergoing procedures with sedation, particularly dental procedures or emergency intubation.

The diagnosis is often missed initially, especially in children where the history may be vague and the patient cannot

verbalize the events ^[1]. In as many as 30% of patients, symptoms are treated as those of other common diseases, especially in patients with minimal symptoms ^[2, 3]. A high index of suspicion is required to make the diagnosis, especially in children and patients who are debilitated ^[4].

Aspirated foreign bodies most commonly are lodged in the right main stem and lower lobe. Aspiration has been documented in all lobes, including the upper lobes, though with less frequency.

In the United States, peanuts are by far the most commonly aspirated material in children, followed by organic material such as sunflower seeds, pieces of vegetables, and hazelnuts ^[4]. In other countries, the most common aspirated material remains food items, especially small seeds such as peanuts, corn, and peas, but other types of food differs from culture to culture ^[5, 6].

In adults, vegetable matter, meat, and bones rank highest, followed by dental and medical appliances. Aspiration of teeth after trauma is occasionally observed. Choking is the fourth leading cause of accidental death in the United States. Choking deaths occurred in 5051 persons in 2015, with more than half such mortalities in elderly individuals ^[7]. Male predominance is found in most studies, particularly in children. Approximately 60% of patients male ^[4, 6, 8].

Age frequency is bimodal, with individuals aged 1-3 years and those in the seventh decade of life at higher risk of foreign body aspiration. The history leads to diagnosis in

most cases [5, 2].

In adults, aspiration occurs with choking after eating or choking when holding a foreign body in the mouth. Aspiration should also be suspected in adults with respiratory distress associated with sedation from drugs, alcohol, or trauma; after medical procedures such as sedation or intubation; after facial trauma; and in patients with decreased ability to handle secretions. In particular, patients with strokes, either new or old, are at high risk for aspiration.

Suspicion of foreign body aspiration in children is raised with sudden paroxysms of coughing when not directly supervised, sudden choking after eating (particularly when an older sibling feeds a younger sibling), or choking and/or coughing when a known, small object or food particle (particularly peanuts) is within reach of the child [4, 2].

In children undergoing treatment of new-onset asthma, bronchitis, or pneumonia that is not responding to appropriate treatment (ie, bronchodilators, steroids, antibiotics), consider the possibility of foreign body aspiration, particularly with unilateral wheezing, [3, 6] although in children with asthma, the diagnosis can be confusing as wheezing is a confounding physical finding. Asthmatic children have a higher rate of negative bronchoscopy for foreign body [9].

Choking or coughing is present in 95% of patients presenting with foreign body aspiration [4]. Stridor is commonly present with upper airway or upper tracheal foreign bodies. Patients may present with respiratory distress, pneumonia, pulmonary edema, or wheezing.

Children present similarly. Approximately 50% of children have inspiratory stridor or expiratory wheezing, with prolongation of the expiratory phase, and medium-to-coarse rhonchi [10]. Tachypnea; nasal flaring; intercostal, subcostal, and suprasternal retractions; and differences in percussion between hemithoraces also are common findings [10]. Fever and central cyanosis are less common. Only rarely do children with a positive history have an examination with completely normal findings [4, 11]. Stridor in children or adults indicates a partial upper airway or tracheal occlusion and is an ominous sign. These patients require prompt interventions.

In children, the primary factors leading to aspiration are underlying curiosity about the world and the oral phase of children aged 1-3 years. Loose, small objects and food found around the household increase risk. An older sibling feeding younger children is an important historical clue.

Objects that tend to stay in the mouth for prolonged periods of time, such as gum, sunflower seeds, or hard candy, also increase risk. Eating while lying supine, especially just prior to falling asleep, increases risk of aspiration. Baby powder can be a particularly dangerous aspiration. A symptom-free period may occur before suffocation. Immediate lavage of bronchial system is required in severe cases.

In adults, factors that increase risk are underlying primary neurologic disorders, such as senile dementia, mental retardation, seizures, strokes, and parkinsonism. Conditions that depress the central nervous system, cause coma, or depress the gag reflex, such as alcohol, narcotics, barbiturates, or benzodiazepines, can increase likelihood of aspiration.

Meats, bones, and medical and dental appliances are the most commonly aspirated objects in adults. In patients who have sustained facial or dental trauma, including traumatic

intubations, who have a missing tooth, the tooth must be presumed to have been aspirated, and radiographic evaluation is needed.

A retrospective study by Sasso *et al.* reported that out of 27,381 US emergency department visits in 2013 for suffocation injuries, as assessed using the Nationwide Emergency Department Sample database, 14,140 (51.6%) resulted from inhalation and ingestion of food [12].

Computed tomography (CT) scanning is rapidly becoming the imaging study of choice in stable patients with suspected aspiration [13]. This is especially true because the majority of tracheal foreign bodies (plant seeds) are radiolucent. CT is very accurate in identifying and localizing foreign bodies.

A study by Behera *et al.* indicated that virtual bronchoscopy using multidetector CT (MDCT) scanning is effective in diagnosing the presence of radiolucent vegetable foreign bodies in the tracheobronchial airway. The study found that in 59 out of 60 pediatric cases, rigid bronchoscopy confirmed MDCT-scan findings with regard to the presence of a vegetable foreign body, as well as the foreign body's size, shape, and location, giving virtual bronchoscopy a positive predictive value of 98.3% [14].

Posteroanterior and lateral chest films are often used as an initial screening test. Foreign bodies, atelectasis, air trapping, mediastinal shift, compensatory emphysema on the contralateral side, pneumonia, or pneumothorax may be observed.

Hyperlucency and atelectasis are observed in 63% of cases in children. Bilateral decubitus films may be helpful in children. A foreign object may prevent normal pulmonary collapse when the involved hemithorax is dependent (or on the "down" side, on the radiography table). However, a recent large study brings into question the test accuracy and clinical benefit of these radiographs, showing an increase in false positives without any increase in true positives [15]. In very young children, decubitus films are not helpful. Expiratory films may be of some benefit.

Initial supportive therapy includes oxygen administration, cardiac monitor, pulse oximetry, and intravenous (IV) line. Definitive airway management may be required. In stridorous patients, racemic epinephrine via a nebulizer may be a temporizing measure until bronchoscopy can be performed.

In patients who experience out-of-hospital cardiac arrest associated with airway foreign body aspiration, the use of Magill forceps has been associated with improved outcomes [16]. This approach utilizes a laryngoscope and Magill forceps to remove supraglottic foreign bodies.

The use of ketamine, a short-acting, dissociative anesthetic and analgesic, may be useful in the examination of the nose, nasopharynx, and oropharynx in children. Although the agent produces a dissociative state, the patient maintains respiratory and airway reflexes. The drug has an action duration of 15-30 minutes; the dose is 1-2 mg/kg intravenously or 4-5 mg/kg intramuscularly. Laryngospasm is an uncommon adverse effect. In children, ketamine can cause increased salivation and respiratory secretions; atropine is often given in adjunct in a dose of 0.01 mg/kg (maximum of 0.5 mg). In patients with a true airway foreign body involving the glottis and distal airways, this approach is not recommended.

In unstable patients, rapid sequence intubation may be needed. In these cases, be prepared with suction and Magill forceps. In emergent situations with tracheal foreign bodies

below the level of the vocal cords, intubation may be required. One option is to insert the endotracheal tube all the way to the hub, thus pushing the foreign body down into a mainstem bronchus (normally, the right). The endotracheal tube is then removed to the normal position (normally 20-22 cm at the lips in adults), and the patient is ventilated after ensuring the tip of the tube is not occluded with the foreign body. Even though only one lung will be ventilated, sufficient air exchange and oxygenation should occur to allow the patient to be taken for formal bronchoscopy.

Extraction by bronchoscopy is the treatment of choice for tracheal foreign bodies. Bronchoscopy is performed with general anesthesia in the operating room for children, with inhalational induction generally preferred. Adults may tolerate awake or sedated bronchoscopy if nebulized lidocaine (4%) is used. Complications of bronchoscopy generally are uncommon and self-limited. However, in-hospital mortality is reportedly 1-2%, partially attributable to large tracheal foreign bodies lost during a procedure. The lost foreign body may become lodged in the subglottic region, causing complete airway obstruction.

A retrospective study by Zhang *et al.* of 3149 pediatric patients found that with regard to rigid bronchoscopy for suspected inhaled tracheobronchial foreign bodies, the rate of severe postprocedure complications—specifically, severe hypoxemia, complete laryngospasm, laryngeal edema, pneumothorax, total segmental atelectasis, and death—was 9% (or individually, 3.2%, 1.3%, 0.9%, 0.3%, 0.3%, and 0.1%, respectively) [17].

A retrospective study by Tenenbaum *et al.* indicated that, if performed in an optimized clinical setting, flexible bronchoscopy carried out through a laryngeal mask can effectively remove airway foreign bodies in children. Using flexible bronchoscopy, an airway foreign body was found in 28 children in the study, with the object removed through this procedure—via a grasping forceps, a basket forceps, suction, or a polypectomy snare—in all of these patients [18].

If initial bronchoscopy is unsuccessful, a repeat attempt usually is performed. Rarely, a second attempt is unsuccessful, and thoracotomy is necessary. If the foreign body has expanded (as can occur with organic matter) or is larger than the subglottic region, a tracheostomy may be required.

Foreign body is an object or a substance that is foreign to the location where it is found. Foreign body in the airways is a serious event and on occasions, fatal if not managed properly in time. Accident resulting in death from the inhalation of the foreign body continues to take a formidable toll of the life every year. The problems associated with the inhaled foreign bodies receive little attention. This is a very serious life-endangering emergency, which is quite frequently encountered. Hence based on above findings the present study was planned for Evaluation of Different Factors, Diagnosis and Findings of Tracheo- Bronchial Foreign Bodies in Cases from Bihar Region.

Methodology

The present study was planned in Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, Bihar, India. Total 30 cases of age from 1 year to 8 years of both the sexes were enrolled in the present study. Bronchoscopy is performed under general anesthesia in the operation theatre, with inhalational induction agent Halothane. Skilled pediatric anesthesia is vital and close cooperation between anesthetist

and bronchoscopist is essential to ensure the alveolar ventilation is maintained throughout the procedure.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: All children with clinical diagnosis of the foreign body in the respiratory passages.

Exclusion Criteria: If no foreign body was detected after bronchoscopy.

Results & Discussion

Foreign body aspiration is a life-threatening pediatric emergency which may sometimes results in sudden death. It is a leading cause of sudden death in children under the age of 6 years [19]. Young children, due to their poor chewing ability, are more prone to aspiration while eating, crying or playing. Children may present with choking episode, coughing, wheezing or stridor. Many of these children are treated as asthmatics. Many a times even a history of “choking” has been neglected at the first medical consultation [20]. Early diagnosis and prompt intervention saves the life and helps in avoiding pulmonary complications. The removal of a foreign body from the respiratory tract usually leads to a rapid recovery.

Foreign body accidents in the air and food passages occur without discrimination of age, sex or nationality. The most common etiological factor of foreign body inhalation is carelessness on the part of the patient or the parent in the case of children. The peak incidence of inhalation of foreign body in the early childhood is related to the habit of children putting small objects into their mouth to determine their taste and texture and chew while teething. The management of foreign body in tracheobronchial tree is endoscopic removal, laryngoscopy in the case of laryngeal foreign body and bronchoscopy in the tracheobronchial foreign body.

Various types of foreign bodies have been reported in the respiratory tree. Harboyan and Nasif [21] have reported that the majority of foreign bodies of tracheobronchial tree are found in children between the ages of 1 & 2 years. The course of illness after a foreign body lodges in the air passages depends upon the characteristics of the foreign body and its length of stay. Unsuspected, longstanding foreign bodies may lead to complications such as recurrent pneumonia, bronchiectasis, atelectasis, and even death. Many advances have been made since Chevalior Jackson [22] described the technique of removal of foreign bodies from the airway. The Hopkins rod lens system described by Ward *et al.*, 1974 and the advent of ventilating bronchoscope (Hopkin, 1976) has greatly improved the illumination and. thus facilitates the endoscopist to remove foreign bodies easily.

Table 1: Demographic Details

Parameters	No. of Cases
Age	
1 – 2 years	8
3 – 4 years	10
5 – 6 years	5
6 – 8 years	7
Sex	
Males	17

Females	13
Total	30

Table 2: History, Signs & Symptoms

Parameters	No. of Cases
History of FB Inhalation	
Yes	21
No	9
Signs	
No Signs	
Unilateral reduced Air Entry	
Unilateral Wheeze	
Whistling and Clicking sounds	
Symptoms	
Sudden onset of cough	11
Sudden onset difficulty in breathing	5
Noisy breathing	4
Hoarseness of the voice	3
Drooling of saliva	3
Vomiting and retching	4

Table 3: Diagnostic Parameters

Parameters	No. of Cases
Chest X- Ray Findings	
Ipsilateral Collapse	10
Ipsilateral Emphysema	12
Normal	8
CT Bronchogram Findings	
FB/Mucus Plug	12
FB	10
Not Done	8
Rigid Bronchoscopy Findings	
2 Foreign Body(FB)	1
Complicated	1
Mucopus	4
Mucus Plug	1
Non-organic FB	5
Organic FB	18
Total	30

Table 4: Location of FB

Parameters	No. of Cases
Carina	2
Left Main and Secondary Bronchus	1
Left Main Bronchus	15
Right Main Bronchus	12
Total	30

Gustav Killian reported the first case of bronchoscopic removal of Foreign Body (FB) from the trachea in 1897 [22]. In 1974, Zavala and Rhodes [23-24] demonstrated the use of flexible fiberoptic bronchoscopy to remove FB in artificial lungs and animals. Currently endoscopic removal of foreign body has become the domain of the chest physician with few cardiovascular and thoracic surgeons involved in FB removal.

Tracheobronchial FB is commoner in children than adults [25]. Immature dentition, poor food control, activity during feeding, and propensity to explore the environment orally are some of the reasons why children are susceptible to foreign body aspiration. Diagnosis of bronchial foreign body aspiration is challenging in children [26]. There are several reasons for the delayed diagnosis. The aspiration event is often unwitnessed or denied by parents.

After the initial coughing paroxysm, there often is a

quiescent phase for about a week before pneumonia or other complications may occur which may respond to bronchodilators or antibiotics favouring a wrong diagnosis of bronchopneumonia and bronchial asthma [27]. A high index of suspicion is therefore required for prompt diagnosis. Aspiration history in most of the patients with acute symptoms while those with chronic symptoms usually have a negative history [28]. Most patients present with cough, fever, wheezing and dyspnoea [29-30]. Chest X-rays are standard in the assessment of patients with respiratory complaints. Radiographic signs that may help in the diagnosis of tracheobronchial FB include atelectasis, post-obstructive pneumonia and air trapping.

The symptomatology in cases of tracheal foreign body also varied with size and nature of foreign body. The most important symptoms of tracheal foreign body are initial choking, gagging, symptomless interval and then cough, expectoration, fever and pain in the chest on the affected side. In cases of bronchial foreign body, vomiting and pain chest were rarely encountered symptoms. Similar findings have also been reported by Kim *et al.* [31].

Risks of both flexible and rigid bronchoscopy are low. The main complications are hypoxaemia, haemorrhage and pneumothorax. They are mild and rare in comparison with those of retained FB. Therefore, once detected, the FB should be removed as soon as possible as technical difficulties increase with time due to mucosal inflammation. Mu *et al.* [32] also found that complication rate increases with time to more than 60% after 24 h compared to 44% within 24 h. Rigid bronchoscopy has been the gold standard for the removal of tracheobronchial FB for many years [33].

Bronchoscopy is not an easy procedure in the infant and young adult. In the first place, the lumen of the bronchoscope is so small that the occasional bronchoscopist without a telescope may be unable to determine the various bifurcations of trachea. The narrowest part of the air-way is the subglottis and even little edema can greatly narrow the airway of the neonate. Orientation can be difficult in a neonate or infant, to the occasional bronchoscopist and often this is because the bronchoscope has been passed straight into the right main bronchus.

Tracheobronchial foreign body aspiration is an important life threatening condition in young children. While aspiration of foreign body into the tracheobronchial tree occurs in all age groups, infants and small children suffer most commonly. The anatomic relation of the larynx, shouting, crying and playing while eating and lack of parental supervision contributes to this hazard. Most patients in the present study were below 2 years of age, which is similar to that reported in other series [34-35].

Conclusion

The data generated from the present study concludes that Diagnosis depends on high level of suspicion in a child with sudden onset respiratory distress. Children witnessed to choke while having small objects in their mouth and subsequently develop raspy respiration, wheezing, or coughing should undergo prompt bronchoscopy under general anaesthesia, regardless of radiographic findings. In conclusion, the results of bronchoscopy are very satisfying when the child recovers from airway obstruction.

References

- Sersar SI, Rizk WH, Bilal M, El Diasty MM, Eltantawy

- TA, Abdelhakam BB, *et al.* Inhaled foreign bodies: presentation, management and value of history and plain chest radiography in delayed presentation. *Otolaryngol Head Neck Surg.* 2006; 134(1):92-9.
2. Chiu CY, Wong KS, Lai SH. Factors predicting early diagnosis of foreign body aspiration in children. *Pediatr Emerg Care.* 2005; 21(3):161-4.
 3. Saquib Mallick M, Rauf Khan A, Al-Bassam A. Late presentation of tracheobronchial foreign body aspiration in children. *J Trop Pediatr.* 2005; 51(3):145-8.
 4. Cataneo AJ, Cataneo DC, Ruiz RL Jr. Management of tracheobronchial foreign body in children. *Pediatr Surg Int.* 2008; 24(2):151-6.
 5. Gregori D, Salerni L, Scarinzi C, Morra B, Berchiolla P, Snidero S, *et al.* Foreign bodies in the upper airways causing complications and requiring hospitalization in children aged 0-14 years: results from the ESFBI study. *Eur Arch Otorhinolaryngol.* 2008; 265(8):971-8.
 6. Tariq SM, George J, Srinivasan S. Inhaled foreign bodies in adolescents and adults. *Monaldi Arch Chest Dis.* 2005; 63(4):193-8.
 7. National Safety Council. Choking Prevention and Rescue Tips. Available at <https://www.nsc.org/home-safety/safety-topics/choking-suffocation>. Accessed, 2019.
 8. Gang W, Zhengxia P, Hongbo L, Yonggang L, Jiangtao D, Shengde W. Diagnosis and treatment of tracheobronchial foreign bodies in 1024 children. *J Pediatr Surg.* 2012; 47(11):2004-10.
 9. Saliba J, Mijovic T, Daniel S, Nguyen LH, Manoukian J. Asthma: the great imitator in foreign body aspiration?. *J Otolaryngol Head Neck Surg.* 2012; 41(3):200-6.
 10. Kadmon G, Stern Y, Bron-Harlev E, Nahum E, Battat E, Schonfeld T. Computerized scoring system for the diagnosis of foreign body aspiration in children. *Ann Otol Rhinol Laryngol.* 2008; 117(11):839-43.
 11. Digoy GP. Diagnosis and management of upper aerodigestive tract foreign bodies. *Otolaryngol Clin North Am.* 2008; 41(3):485-96, 7-8.
 12. Sasso R, Bachir R, El Sayed M. Suffocation Injuries in the United States: Patient Characteristics and Factors Associated with Mortality. *West J Emerg Med.* 2018; 19(4):707-14.
 13. Haliloglu M, Ciftci AO, Oto A, *et al.* CT virtual bronchoscopy in the evaluation of children with suspected foreign body aspiration. *Eur J Radiol.* 2003; 48(2):188-92.
 14. Behera G, Tripathy N, Maru YK, *et al.* Role of virtual bronchoscopy in children with a vegetable foreign body in the tracheobronchial tree. *J Laryngol Otol.* 2014; 128(12):1078-83.
 15. Brown JC, Chapman T, Klein EJ, Chisholm SL, Phillips GS, Osincup D. The utility of adding expiratory or decubitus chest radiographs to the radiographic evaluation of suspected pediatric airway foreign bodies. *Ann Emerg Med.* 2013; 61(1):19-26.
 16. Sakai T, Kitamura T, Iwami T, *et al.* Effectiveness of prehospital Magill forceps use for out-of-hospital cardiac arrest due to foreign body airway obstruction in Osaka City. *Scand J Trauma Resusc Emerg Med.* 2014; 22:53.
 17. Zhang X, Li WX, Cai YR. A time series observation of Chinese children undergoing rigid bronchoscopy for an inhaled foreign body: 3,149 cases in 1991-2010. *Chin Med J (Engl).* 2015; 128(4):504-9.
 18. Tenenbaum T, Kahler G, Janke C, Schrotten H, Demirakca S. Management of Foreign Body Removal in Children by Flexible Bronchoscopy. *J Bronchology Interv Pulmonol.* 2017; 24(1):21-8.
 19. Ross AHM, McCormack RJM. Foreign body inhalation. *JR Coll Surg Eding.* 1980; 25:104-09.
 20. Bittencourt PFS, Camargos PAM, Scheinmann P, Blic J. Foreign body aspiration: clinical, radiological findings and factors associated with its late removal. *Int J Pediatr Otorhinolaryngol.* 2006; 70:879-84.
 21. Harboyan G, Nasif R. Tracheobronchial foreignbodies. A review of 14 years' experience. *Journal of laryngology and Otolology.* 1970; 84:403-412.
 22. Jackson C, Jackson CL. Diseases of the air and food passages of foreign body Origin; Saunders, Philadelphia, 1950, 13-34.
 23. Killian G. Meeting of the Society of Physicians of Freiburg, Freiburg. 1897, Dec 17. *Munchen Med Wschr.* 1898; 45:378.
 24. Zavala DC, Rhodes ML. Experimental removal of foreign bodies by fiberoptic bronchoscopy. *Am Rev Respir Dis.* 1974; 110:357-60.
 25. Zavala DC, Rhodes ML. Foreign body removal: a new role for the fiberoptic bronchoscope. *Ann Otol Rhinol Laryngol.* 1975; 84:650-6.
 26. Ouoba K, Diara C, Dao MO, Ouedraogo I, Sanou I, Cisse R. Laryngo-tracheo-bronchial foreign bodies in children at the University Hospital center of Ouagadougou (analysis of 96 cases). *Med Trop (Mars).* 2002; 62:611-4.
 27. Freiman MA, McMurray JS. Unique presentation of a bronchial foreign body in an asymptomatic child. *Ann Otol Rhinol Laryngol.* 2001; 110:495-7.
 28. Tsolov TS, Melncharov M, Perinovska P, Krutilin F. Foreign bodies in the upper airways of children-problems relating to diagnosis and treatment. *Khirurgiia (Sofia).* 1999; 55:33-4.
 29. Lan RS. Non-asphyxiating tracheobronchial foreign bodies in adults. *Eur Respir J.* 1994; 7:510-4.
 30. Limper AH, Prakash UB. Tracheobronchial foreign bodies in adults. *Ann Intern Med.* 1990; 112:604-9.
 31. Kim IG, Brummitt WM, Humphry A, Siomra SW, Wallace WB. Foreign body in the airway: A review of 202 cases. *Laryngoscope.* 1973; 83(3):347-54.
 32. Mu LC, Sun DQ, He P. Radiological diagnosis of aspirated foreign bodies in children: review of 343 cases. *J Laryngol Otol.* 1990; 104:778-82.
 33. Martinot A, Deschildre A, Brichet A, Leclerc F. Indications of bronchial endoscopy in suspected tracheo-bronchial foreign body in children. *Rev Mal Respir.* 1999; 16:673-8.
 34. Rothmann BF, Boeckman CR. Foreign bodies in the larynx and tracheobronchial tree in children. *Ann Otolaryngol.* 1980; 89:434-436.
 35. Fadl FA, Omer MTA. Tracheobronchial foreign bodies: A review of children admitted for bronchoscopy at King Fahd Specialist Hospital, Al Gassim, Saudi Arabia. *Ann Trop Pediatr.* 1997; 17:309-313.