



John Michael P. Tagsa, MD  
Donnie Jan D. Segocio, MD

Department of Otolaryngology-Head and Neck Surgery  
Southern Philippines Medical Center

## Clinicodemographic Profile and Treatment Outcomes of Patients with Upper Aerodigestive Tract Foreign Bodies in the Southern Philippines Medical Center: A Five-Year Retrospective Review

### ABSTRACT

**Objective:** This study aims to describe the clinicodemographic profile of patients with foreign bodies in the upper aerodigestive tract and their treatment outcomes.

#### Methods:

**Design:** Retrospective Review of Records

**Setting:** Tertiary Government Training Hospital

**Participants:** Records of 304 patients diagnosed with aerodigestive foreign bodies

**Results:** Three hundred-four (304) patients were included. The median age was 5.26 years in the pediatric age group and 42.53 years in the adult age group, with a male-to-female ratio = 1.97:1. Foreign bodies were ingested in 291 (96%) patients while aspiration occurred in 13 (4%). Overall, 211 (69%) of cases involved the pediatric population (<19 years) and 93 (31%) the adult population. The most common foreign bodies reported were coins (63.5%), food (18.1%), and dentures (11.5%). Most esophageal foreign bodies (244/291; 83%) were seen at the cricopharyngeal level in all age groups. The foreign body was removed successfully in 288/291 (98%) of ingestion cases. All 13 cases of foreign body aspiration were successfully removed by bronchoscopy. All patients were discharged improved.

**Conclusion:** Most upper aerodigestive tract foreign bodies involved the pediatric age group. Predisposing conditions were mainly due to accidental ingestion and aspiration while playing in the pediatric population and negligence in eating among adults. Almost all ingestion cases were successfully treated with esophagoscopy, while all aspirations were treated successfully with bronchoscopy. Most intraoperative and postoperative complications who were managed conservatively by observation, although some cases required referral to other surgical departments and were treated surgically. All patients were discharged improved.

**Keywords:** *foreign body; aspiration, impaction; ingestion; upper aerodigestive tract; esophagoscopy; bronchoscopy*

Correspondence: Dr. John Michael P. Tagsa  
Department of Otolaryngology-Head and Neck Surgery  
Southern Philippines Medical Center  
JP Laurel Ave., Bajada, Davao City 8000  
Philippines  
Phone: +63 933 857 7020  
Email: dmc\_ent@yahoo.com

The authors declared that this represents original material that is not being considered or publication or has not been published or accepted for publication elsewhere, in full or in part, in print or electronic media; that the manuscript has been read and approved by both authors, that the requirements for authorship have been met by each author, and that the authors believe that the manuscript represents honest work.

Disclosures: The authors signed disclosures that there are no financial or other (including personal) relationships, intellectual passion, political or religious beliefs, and institutional affiliations that might lead to a conflict of interest.



Creative Commons (CC BY-NC-ND 4.0)  
Attribution - NonCommercial - NoDerivatives 4.0 International



**The upper aerodigestive tract** is a common area of foreign body impaction since it is where the narrowest regions, such as the glottis and the cricopharyngeal sphincter, are located.<sup>1</sup> Aspirated and ingested foreign materials can lead to potential complications because of their shape, size and site of impaction.<sup>1</sup> Children, inmates, and people with mental illnesses are more likely than others to suffer from impaction of foreign bodies in the upper aerodigestive tract, which is a significant medical problem.<sup>1,2</sup> It is common to find coins, fish and chicken bones, and dental prostheses.<sup>2,3</sup> Radiographic examination confirms the location of foreign bodies and their related complications.<sup>4</sup> Extractions with open-tube bronchoscopy and endoscopy are the preferred procedures for foreign body removal.<sup>2-4</sup>

While there has been much experience in managing upper aerodigestive tract foreign bodies in our institution, to the best of our knowledge, we have no compiled reports of their incidence, clinical profiles, and outcomes of treatment. This study aims to describe the clinicodemographic profile of patients with foreign bodies in the upper aerodigestive tract and their treatment outcomes.

## METHODS

With Department of Health XI Cluster Ethics Review Committee (DOH XI CERC) approval (CERC Protocol Number JREC-2022129), this retrospective series reviewed records of patients diagnosed with foreign bodies of the upper aerodigestive tract in the Southern Philippines Medical Center, Department of Otolaryngology – Head and Neck Surgery (ORL-HNS) from January 2015 to December 2019.

Using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10 version 2019; <https://icd.who.int/browse10/2019/en>), records of all patients diagnosed with foreign body impaction of the upper aerodigestive tract: esophagus (T18.1), larynx (T17.3), trachea (T17.4), and bronchus (T17.5) of all ages of both sexes admitted under ORL-HNS of the Southern Philippines Medical Center from January 2015 to December 2019 and who required surgical intervention were considered for inclusion. Patients with foreign bodies lodged in the nose, nasopharynx, oral cavity, and oropharynx and those with incomplete medical records (which include the demographic profile, history of illness, physical examination, and surgical memorandum and technique) were excluded. Foreign bodies in the said areas do not require admission and are managed in the emergency room or outpatient clinic.

Complete enumeration of records of patients meeting inclusion and exclusion criteria was made. The demographic profile was limited to age and sex, history including the chief complaint, onset of symptoms available in the history sheet, relevant diagnostic procedures, surgical memorandum and techniques, and treatment outcomes retrieved from the chart.

All data were encoded using Microsoft Excel version 16.66.1 2016 (Microsoft Corp., Redmond, WA, USA). The study used descriptive

statistics such as mean and standard deviation for continuous data and frequencies and percentages for categorical data.

## RESULTS

Of the 304 patients admitted, there were 202 males (66%) and 102 females (34%) with a 1.97:1 male-to-female ratio. Two hundred eleven (69%) were pediatric patients (<19 y.o.) and 93 (31%) were adults. The age ranged from one month old to 80 years old. The mean age in the pediatric age group was 5.26 years (median = 4 years) with a standard deviation of 3.69 years. In the adult group, the mean age was 42.53 years (median = 40 years) with a standard deviation of 17.01 years.

Of the 304 foreign bodies, 291 (96%) were lodged in the esophagus and 13 (4%) in the airway. Among the pediatric age group who had esophageal foreign body impaction, a coin was seen in 175/198 cases (88%). The most common type of coin was a one-peso coin (64%) followed by a five-peso coin (14%). The other less common foreign bodies are summarized in *Table 1*.

Meanwhile, among adults, the most common foreign bodies were dentures (31%), balut white (27%) and food bolus (15%). Other less common foreign bodies are summarized in *Table 2*.

Of the foreign bodies in the airway, 13 occurred in the pediatric age group while none were recorded in the adult population. The foreign bodies were pin (n=4), whistle (n=4), plastic foil (n=2), thumb tack (n=2), and peanut (n=1).

Regarding predisposing factors, all the patients under 11 years of age allegedly accidentally ingested or aspirated the foreign body while playing. In general, in the pediatric population, other reasons include ill-fitting dentures (n=4), hasty eating (n=4), and sleeping (n=1). Hasty eating was the most common cause given by the adult group accounting for 45 (47%) of cases. Other reasons included ill-fitting dentures (25%), edentulous patients (18%), senile dementia (5%), sleeping (3%), and seizure disorder (1%).

Three percent (5/198) of pediatric patients under 1 year of age who had esophageal foreign bodies were brought to the emergency room in the asymptomatic stage. Those above 1 year complained of dysphagia and/or foreign body sensation in the throat. Odynophagia was the most frequent symptom among the adult population (46/93; 49%). Other symptoms complained of by adult patients were dysphagia (38%), vomiting (9%), and chest pain (4%).

In the pediatric population, coughing was the most common manifestation of tracheobronchial aspiration (9/13; 69%). Stridor was evident in 3/13 (23%). One patient, who was 18 years of age, was asymptomatic with a hairpin lodged in the right mainstem bronchus.

Chest radiographs were requested in all the cases of foreign body ingestion. A contrast study (Modified Barium Swallow) was requested in 8/291 (3%) cases. In 244/291 (83%) cases, the foreign body was located at the level of the first esophageal constriction. Chest radiographs were also requested in all the cases of foreign body aspiration but only 6/13

**Table 1.** Esophageal foreign bodies in the pediatric age group

Foreign Body	Frequency (Percentage)
Coin	175 (88%)
Others	
Denture (Wired/Non-wired)	7 (4%)
Fish spine	3 (2%)
Plastic/metallic toy part	3 (2%)
Chicken bone	2 (1%)
Button battery	1
Thumbtack	1
Food bolus	1
Button	1
Balut white	1
Earring	1
Lollipop	1
Safety pin	1
<b>TOTAL</b>	<b>198</b>

**Table 2.** Esophageal foreign bodies in the adult age group

Foreign Body	Frequency (Percentage)
Denture (Wired/Non-wired)	29 (31%)
Balut White	25 (27%)
Food Bolus	14 (15%)
Others	
Fish spine	9 (10%)
Chicken bone	9 (10%)
Seed	1
Safety pin	1
Wire	1
Medicine foil wrapper	2
Bottle cap	1
Metallic object	1
<b>TOTAL</b>	<b>93</b>

**Table 3.** Tracheobronchial tree foreign body locations seen intraoperatively

Location	Frequency (Percentage)
Left Main Bronchus	3 (23%)
Right Main Bronchus	5 (38%)
Subglottis	1 (8%)
Trachea	1 (8%)
Secondary Bronchus	2 (15%)
Glottis	1 (8%)
<b>TOTAL</b>	<b>13</b>

(46%) of the foreign bodies were seen radiographically. Two patients underwent chest CT scans and both had whistle impaction.

All cases of foreign body ingestion underwent rigid esophagoscopy. In 288/291 cases (98%), the foreign body was removed successfully. Most of the foreign bodies were seen at the cricopharyngeal level in all age groups. In two of the cases, no foreign body (coin) was seen but these were eventually passed out in their stools. All 13 cases of foreign body aspiration were successfully removed by bronchoscopy. *Table 3* shows their intraoperative locations.

Esophageal mucosal abrasions were detected intraoperatively in 12/198 (6%) of pediatric cases and 49/93 (53%) of adult cases. Esophageal mucosal lacerations were noted in two cases; both were discharged without complications. A 45-year-old patient had an esophageal perforation from an accidentally ingested wire. He was referred to thoracovascular surgery and underwent right posterolateral thoracotomy, esophagostomy, removal of foreign body, primary repair of esophageal perforation, and bilateral closed tube thoracostomy. He was eventually discharged improved after 30 days. There were no injuries or complications in any of the patients who underwent bronchoscopy, from whom all foreign bodies were successfully removed.

**DISCUSSION**

The objective of this study was to determine the clinicodemographic profile and the treatment outcomes of esophagoscopy and bronchoscopy of patients with upper aerodigestive tract foreign bodies. A 10-year retrospective single-center local study by Abrenica and Chua reviewed the clinical profile of foreign body ingestion and aspiration in a tertiary government hospital.<sup>4</sup> Most were cases of foreign body ingestion (98%). Our study showed similar results, with 96% cases of foreign body ingestion and 4% of aspiration. In their study, pediatric patients were most involved (70%) based on age ( $\leq 18$  years). Eighty-one percent (81%) of their pediatric patients were seven years of age, and accidental swallowing or aspiration of the foreign body while playing was always the cause.<sup>4</sup> A retrospective study by Cevik *et al.* mentioned that “more than half of foreign body in the aerodigestive tract affect children younger than four years (70.3%)”<sup>5</sup> because of the uncoordinated actions of chewing and swallowing, which improves at five years of age. Safari and Manesh opined that the predominance in young children may be due to a lack of molar teeth, poor swallowing, a tendency to put objects in their mouth, playing with objects in their mouth, talking, crying, or moving while eating, having weak protective laryngeal reflexes, and a desire to explore the environment.<sup>2</sup> Abrenica and Chua also mentioned “the propensity of small children to put whatever comes into their grasp into their mouth and carelessness in child’s care like allowing children to play while eating, giving food such as peanut or hard candies to children who do not have the proper molar teeth, and improper supervision of small children playing in the vicinity of infants” place them at risk for foreign body ingestion and aspiration.<sup>4</sup> Our study also had a majority of cases (211; 69%) belonging to the pediatric population. The most common risk identified in the history was accidental ingestion/aspiration of the foreign body while playing, which is consistent with the previous literature.<sup>2-5</sup>

For the adult group, Abrenica and Chua attributed the risk of foreign bodies in the upper aerodigestive tract to hasty eating, ill-fitting dentures, improper preparation of food, senile dementia, alcohol intoxication, and incomplete dentition.<sup>4</sup> The results of our present study are comparable with theirs since 47% of the adult population had



foreign body impaction due to hasty eating. Their study also showed that most cases were males, with a male-to-female ratio of 2.4:1.<sup>4</sup> A similar finding with a slightly lower male-to-female ratio (1.5:1) was reported by Cevik *et al.*, with a male predominance of 62%.<sup>5</sup> Similarly, our present study had 202 males (66%) with a 1.97:1 male-to-female ratio. This male predominance can be attributed to their adventurous and impulsive behavior as reported by Chiu *et al.*<sup>6</sup>

In all age groups, the most frequent foreign body lodgment locations were the upper esophagus/cricopharyngeal constriction (78%) and the right main bronchus (38%) in both our study and that of Cevik *et al.*, where foreign body aspiration also involved the right main bronchus in 41.6% of cases.<sup>5</sup> More cases of aspiration being located in the right main bronchus may be due to its more comprehensive diameter and direct extension of the trachea.<sup>5</sup> Abrenica and Chua similarly reported esophageal foreign bodies lodged in the cricopharyngeal constriction in 52-82% of all age groups.<sup>4</sup> However, they had contrasting results for foreign body aspiration, with more foreign bodies seen in the left main bronchus (43%).<sup>4</sup> In the study of Kumar *et al.*, it was explained that the location of the foreign body depends upon the age and position at the time of the aspiration.<sup>7</sup> In the same study, they emphasized that before the age of 15, the angle formed by the main bronchi with the trachea is equal, leading to an equal possibility of foreign objects entering either bronchus. However, this angle changes because of development after the age of 15, and the right bronchus becomes more aligned with the trachea. This alignment creates a relatively straight path from the larynx to the bronchus.<sup>7</sup>

Cevik *et al.* found that the most frequent inorganic foreign bodies in children were coins, beads, pins, toys and small school equipment.<sup>5</sup> In the same study, coins were the most common foreign body in the digestive tract, whereas seeds were the most frequently detected foreign body in the respiratory tract. Abrenica and Chua identified coins and dentures as the most ingested foreign bodies in the pediatric and adult groups, respectively.<sup>4</sup> In their cases of tracheobronchial foreign bodies, seeds were the most frequently aspirated (23%),<sup>4</sup> similar to the study by Cevik *et al.*<sup>5</sup> Their findings on ingestion of foreign bodies are similar to ours. However, all our aspiration cases (13) involved pediatric patients, and most foreign bodies retrieved were inorganic, such as pins and whistles. Only one foreign body was organic (peanut), in contrast to the study of Cevik *et al.*, where most aspirated objects were organic (seeds and peanuts).<sup>5</sup> A similar finding to our study was seen by Blanco Ramos *et al.* where organic foreign bodies were more frequent in older patients and those with alcohol abuse, and inorganic foreign body aspirations were typical in the younger population where they accidentally aspirate small objects introduced into the mouth as entertainment.<sup>8</sup> These differences may also be due to variations in social environment, food, and playing habits in the cultures where these literatures were studied.<sup>4,5,8</sup>

The symptoms of foreign bodies in the upper aerodigestive tract may vary in presentation from an asymptomatic state to respiratory

distress, acute respiratory distress, dysphonia, vomiting, and dysphagia, depending on the object's location, age and size.<sup>5</sup> Abrenica and Chua reported dysphagia and foreign body sensation in the throat as the most common symptom of foreign body ingestion while cough was the most common manifestation of tracheobronchial aspiration and these findings are consistent with our study.<sup>4</sup> Asymptomatic patients with a negative history of witnessed aspiration or ingestion pose a concern as shown by Laks and Barzilay, where asymptomatic patients led to delays in the diagnosis, especially in children who can't express themselves.<sup>9</sup> Only those with a positive history of witnessed aspiration or ingestion did not pose a diagnostic dilemma despite not presenting any signs or symptoms.<sup>9</sup>

Delays in diagnosis and treatment can result in potentially fatal consequences. Clinical history, physical examination, and radiographic examinations are used to make decisions in these circumstances. Radiography is still the primary diagnostic method used to assess patients with suspected foreign bodies in their upper aerodigestive tract with a sensitivity of up to 80%.<sup>3</sup> To ensure a thorough evaluation, radiographs of the anterior and posterior neck, anterior and posterior chest and abdomen are recommended.<sup>3,5</sup> In our institution, we do not routinely request for abdominal views especially if the patient is still able to identify the location of the foreign body in the neck or chest. Additionally, abdominal views are only taken if there are no foreign bodies detected on the neck and chest x-rays. Lateral and anteroposterior radiographs are required because certain foreign bodies, especially those with discoid shapes, may not be visible in a single projection.<sup>3</sup> In the same study of Safari and Manesh, plain radiography can confirm the presence of bone, cartilage spicules, or air-fluid levels that indicate the presence of food products.<sup>3</sup> In our study, we performed plain chest and cervical radiographs in anteroposterior views and lateral views in all cases. Contrast radiographs (Modified Barium Swallow) were also used in some of our cases to detect radiolucent esophageal foreign bodies or if the clinical and initial radiographic findings were incongruent. Fifteen percent (15%) of foreign body aspiration cases were not visible on plain radiographs. Hence, indirect signs must be sought on X-rays, such as atelectasis, pneumonia, or obstructive emphysema.<sup>4</sup> CT is only requested if the foreign body is radiolucent, radiography is not helpful, and we need additional critical information to manage complex cases.<sup>9</sup> Both cases that used CT scans had whistle impaction, which was not radiographically visualized, and no indirect signs were appreciated on plain radiographs. Despite these available diagnostic modalities, endoscopy is still the gold standard since it is performed for both diagnosis and treatment.<sup>9</sup>

Extraction is the definitive treatment of foreign body impaction in the upper aerodigestive tract using rigid and flexible bronchoscopes.<sup>3,4</sup> Once the diagnosis is made, foreign bodies that have become arrested in the esophagus should be removed since they are unlikely to pass on their own. The study of Abrenica and Chua highlighted that the object can cause swelling and make it even harder to remove later.<sup>4</sup> The same

study also mentioned that “esophageal foreign bodies be guarded as true emergencies when the airway is compromised, there is imminent danger of perforation, or if it is felt that the foreign body may migrate to a more dangerous position.”<sup>4</sup> In the same way, tracheobronchial foreign bodies should always be regarded as emergency cases. A thoracotomy is an option in cases of endoscopic failure.<sup>9</sup> Although both flexible and rigid endoscopy have been used with excellent success and low complication rates to remove esophageal foreign bodies, flexible endoscopy can be conducted under local anesthetic and is a less time-consuming treatment.<sup>10</sup> In our study, all cases of foreign body ingestion underwent rigid esophagoscopy. The foreign body was removed successfully in 98% of cases comparable to success rates for open tube esophagoscopy reported by Cevik *et al.* and Abrenica and Chua of 97% and 95%, respectively.<sup>4,5</sup> In two of our cases, no foreign body (coin) was seen, but they were eventually passed out in the stools. All cases of foreign body aspiration were successfully removed by bronchoscopy.

Complications of endoscopy may be due to inexperience in the introduction of the esophagoscope or traction on the presenting part of the foreign body without determining the possible results of such traction.<sup>4</sup> In this study, esophageal mucosal abrasions were detected intraoperatively in pediatric and adult cases. It was not, however, specified if the foreign body impaction or the instrumentation caused it.

Complications of foreign body aspiration may happen pre-operatively, intra-operatively or post-operatively. These may include respiratory distress, bronchial pneumonia, pneumothorax, bradycardia and cardiac arrest.<sup>4</sup> In our study, no injuries or complications were noted in patients who underwent bronchoscopy. In the study of Wiemers *et al.*, the overall complication rate of rigid and flexible bronchoscopy was 19.1% vs. 24.2% and respiratory complications occurred significantly less frequently during rigid bronchoscopy (9.2% vs. 16.3%).<sup>11</sup> Hence they concluded that bronchoscopy is a safe procedure when done by a skilled surgeon.

Prevention is still the most critically important step to control complications from happening. Raising awareness, formulating policies, and promulgating preventive measures are proven ways to decrease the incidence of such cases.<sup>12</sup>

Our study has several limitations that must be taken into consideration. Firstly, since we reviewed records, our data was secondary and may not accurately reflect the patient’s actual medical histories, physical exam findings, and laboratory results. Secondly, there may be inconsistencies in our data due to differences in how the information was recorded and interpreted by different individuals. Therefore, inaccuracies in our data must be allowed. Thirdly, our study only included patients who underwent esophagoscopy or bronchoscopy to remove foreign bodies from their upper aerodigestive tract, which may not be representative of all patients with foreign bodies in this area. This sampling bias limits the generalizability of our findings to a larger population. Additionally, our study did not analyze

specific risk factors that could lead to complications, such as age, sex, duration from admission to scope, and type of foreign body. Future studies should consider these factors. Finally, our sample size was based on convenience and temporal parameters, rather than a sample size calculation. We recommend expanding the sample size through multicenter research by collaborating with other major hospitals in the Davao Region.

In conclusion, the clinical profile of 304 cases of esophageal and tracheobronchial foreign bodies for the past five years was described. Most patients belonged to the pediatric age group similar to the reported literature. Diagnoses were established based on history and symptomatology and supported by imaging, primarily by radiographic examination. Predisposing conditions were mainly due to accidental ingestion and aspiration while playing in the pediatric population and negligence in eating among adults. Almost all ingestion cases were successfully treated with esophagoscopy while all aspirations were treated successfully with bronchoscopy. Most intraoperative and postoperative complications were managed conservatively by observation, although some cases required referral to other surgical departments and were treated surgically. All patients who were discharged improved.

REFERENCES

- Murty P, Ingle VS, Ramakrishna S, Shah FA, Varghese P. Foreign bodies in the upper aerodigestive tract. *J Sci Res Med Sci.* 2001 Oct;3(2):117-20. PubMed PMID: 24019718; PubMed Central PMCID: PMC3174712.
- Pinto A, Muzj C, Gagliardi N, Pinto F, Setola FR, Scaglione M, et al. The Role of imaging in assessing impacted foreign bodies in the hypopharynx and cervical esophagus. *Semin Ultrasound CT MR.* 2012 Oct;33(5):463-70. DOI: 10.1053/j.sult.2012.06.009; PubMed PMID: 22964412.
- Safari M, Manesh MRH. Demographic and clinical findings in children undergoing bronchoscopy for foreign body aspiration. *Ochsner J.* 2016 Summer;16(2):120-4. PubMed PMID: 27303219; PubMed Central PMCID: PMC4896653.
- Abrenica B, Chua H. Esophageal and tracheobronchial foreign bodies: A ten-year retrospective study. *Philipp J Otolaryngol Head Neck Surg.* 2004;19(1-2):33-40. Available from: <https://pjohns.pso-hns.org/index.php/pjohns/issue/view/119/65>.
- Cevik M, Gökdemir MT, Boleken ME, Sogut O, Kurkcuoglu C. The characteristics and outcomes of foreign body ingestion and aspiration in children due to lodged foreign body in the aerodigestive tract. *Pediatr Emerg Care.* 2013 Jan;29(1):53-7. DOI:10.1097/PEC.0b013e31827b5374; PubMed PMID: 23283264.
- Chiu CY, Wong KS, Lai SH, Hsia SH, Wu CT. Factors predicting early diagnosis of foreign body aspiration in children. *Pediatr Emerg Care.* 2005 Mar;21(3):161-4. PMID: 15744193.
- Kumar S, Al-Abri R, Sharma A, Al-Kindi H, Mishra P. Management of pediatric tracheo bronchial foreign body aspiration. *Oman Med J.* 2010 Oct;25(4):e019. DOI: 10.5001/omj.2010.99. PubMed PMID: 28845222; PubMed Central PMCID: PMC5556322.
- Blanco Ramos M, Botana-Rial M, García-Fontán E, Fernández-Villar A, Gallas Torreira M. Update in the extraction of airway foreign bodies in adults. *J Thorac Dis.* 2016 Nov;8(11):3452-3456. DOI: 10.21037/jtd.2016.11.32; PubMed PMID: 28066626; PubMed Central PMCID: PMC5179474.
- Segocio DJ, Dayanghirang CD, Cachuela JE. A 15-Year Occult Foreign Body in the Subglottic Area of a 50-Year-Old Woman. *Philipp J Otolaryngol Head Neck Surg.* 2016 Jul-Dec; 31(2):47-50. DOI: <https://doi.org/10.32412/pjohns.v31i2.239>.
- Lee CH, Chen TH, Ko JY, Yeh TH, Hsu WC, Kang KT. Ear, nose, and throat foreign bodies in adults: A population-based study in Taiwan. *J Formos Med Assoc.* 2019 Sep;118(9):1290-1298. DOI: 10.1016/j.jfma.2019.05.003; PubMed PMID: 31133521.
- Wiemers A, Vossen C, Lücke T, Freitag N, Nguyen TM, Möllenberg L, Pohunek P, Schramm D. Complication rates in rigid vs. flexible endoscopic foreign body removal in children. *Int J Pediatr Otorhinolaryngol.* 2023 Mar;166:111474. DOI: 10.1016/j.ijporl.2023.111474; PubMed PMID: 36753891.
- Sadan N, Raz A, Wolach B. Impact of community educational programs on foreign body aspiration in Israel. *Eur J Pediatr.* 1995 Oct;154(10):859-62. DOI: 10.1007/BF01959798; PubMed PMID: 8529689.