



## Review article

# A systematic review of paediatric foreign body ingestion: Presentation, complications, and management

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## ABSTRACT

**Background:** Foreign body ingestion is a common problem among paediatric populations. A variety of foreign bodies are ingested, some of which are particularly harmful and life threatening such as button batteries, magnets and bones. Common household items such as small toys, marbles, batteries and erasers are often ingested. The aim of this systematic review is to study the problem of foreign body ingestion among paediatric populations in terms of commonly ingested objects, and attempt to identify the link between location of impaction, associated symptoms, complications, spontaneous passage, methods and timing of removal.

**Methods:** A literature search of multiple databases including PubMed, Embase, Current Contents Connect and Medline were conducted for studies on foreign body ingestions. Based on strict inclusion and exclusion criteria, 17 studies were selected. A qualitative review of these studies was then performed to identify commonly ingested foreign bodies, symptoms, signs and complications of foreign body ingestion, rates of spontaneous passage and methods of retrieval of the ingested objects.

**Results:** Coins are the most commonly ingested foreign body. A variety of gastrointestinal symptoms such vomiting and drooling as well as respiratory symptoms such as coughing and stridor are associated with foreign body ingestion. The oesophagus, in particular the upper third, is the common site of foreign body obstruction. Objects in the stomach and intestine were spontaneously passed more frequently than at any other sites in the gastrointestinal system. Complications such as bowel perforations, infection and death are more commonly associated with ingestion of objects such as batteries and sharp objects such as bones and needles. Ingested objects are most commonly removed by endoscopic means.

**Conclusion:** Foreign body ingestion is a common paediatric problem. Batteries and sharp objects should be removed immediately to avoid complications while others can be observed for spontaneous passage. Endoscopy has a high success rate in removing ingested foreign bodies.

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## 1. Introduction

Foreign body ingestion is a common problem in paediatric populations with up to 75% of cases occurring in children under 4 years of age [1–4]. A variety of foreign bodies are ingested by children, some more harmful and life threatening than others. Typically, ingested foreign bodies include common household items such as small toys, marbles, batteries, erasers, etc. However, coins are reported to be the commonest type of object ingested by children, accounting for up to 70% cases of paediatric foreign body ingestion [5–9].

Most ingested foreign bodies either pass through the gastrointestinal system spontaneously [10,11] and without complication, or they may become impacted, most commonly at one of the sites of anatomic constriction in the oesophagus [12]. The commonest site of impaction is in the upper oesophagus, at the level of the cricopharyngeus muscle, accounting for over 75% of all cases of foreign body impaction [13]. Less frequently, objects may become impacted in the mid oesophagus at the level of the aortic arch or left main bronchus, or in the lower oesophagus at the gastro-oesophageal junction [14]. Foreign bodies that pass beyond the gastro-oesophageal junction usually pass through the alimentary tract without complications [14]. In fewer than 10% of cases, foreign bodies may impact within the intestines [15].

Foreign body impaction may result in complications such as mucosal abrasions within the gastrointestinal tract, bleeding, gastric outlet obstruction, oesophageal or gastrointestinal perforation and secondary mediastinitis, peritonitis, abscess or fistula formation [16–19]. Therefore, impaction is generally a strong indication for foreign body removal.

A variety of methods for identification and removal of an impacted coin have been studied and described such as the use of rigid and flexible oesophagoscopy, McGill's forceps, Foley catheter extraction and oesophageal bougienage [1,6,20,21].

### 1.1. Aim of this review

This systematic review is aimed at determining the significance of foreign body ingestion among paediatric populations in terms of location of impaction, associated symptoms or complications and methods of removal.

## 2. Methods

### 2.1. Search strategy

We followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses PRISMA guidelines in performing our systematic review. A systematic search of the databases MEDLINE (from 1950), PubMed (from 1946), EMBASE (from 1949) and Current Contents Connect (from 1980) was conducted through to September 20, 2012, to identify relevant articles for the systematic review. The search used the terms 'oesophageal', 'gastric', 'intestinal', 'ingested', 'foreign body', 'child' and 'paediatric' which were searched as keywords. The reference lists of relevant articles were also searched for appropriate studies. No language restrictions were used in either the search selection or study selection.

### 2.2. Study selection

We included studies that met the following inclusion criteria: (1) cases related specifically to ingestion of foreign bodies; (2) studies that assessed presenting symptoms, complications, anatomical locations, spontaneous passage and management; and (3) the total sample size of the study exceeded 100 patients. We excluded studies that did not meet the inclusion criteria. Fig. 1

shows our study selection strategy based on the extensive literature search.

### 2.3. Data extraction

The data extraction was performed using a standardized data extraction form, collecting information on the publication year, study design, temporal direction, total sample size, population type, country, age range, location of foreign body impaction, presenting symptoms, complications, spontaneous passage rates and extraction methods. Authors were not contacted for missing data (Table 1).

## 3. Results

### 3.1. Study characteristics

Seventeen studies were selected for our systematic review based on the inclusion and exclusion criteria applied. There were five studies from USA, three from Turkey, two from Hong Kong, two from Brussels and one each from Canada, United Kingdom, Greece, South Korea and South Africa. Fourteen of the 17 studies were retrospective case series and the remaining 3 were designed as a prospective cohort study. Only 2 of the 17 studies exclusively studied coin ingestion. Of the remaining 15, coins were identified as the most frequently ingested foreign body in 10 studies. Among these studies, sample sizes varied from a minimum of 101 to a maximum of 675. The summation of sample sizes from all included studies was 5559 children aged between one month and 18 years.

For each study, information on the three most common foreign bodies ingested with details of percentages (if available), the three main symptoms encountered, any complications from ingesting the foreign body, location of impaction of the foreign body, spontaneous passage rates and methods of removal of ingested foreign body were sought. Due to the breadth of topics on foreign body ingestion, not all papers provided all of the above information.

### 3.2. Presenting symptoms

Symptoms associated with foreign body ingestion varied between studies. They varied from gastrointestinal symptoms of vomiting, drooling, dysphagia, odynophagia, globus sensation to respiratory symptoms of coughing, stridor and choking to being completely asymptomatic. Of the 10 studies where coins were most frequently ingested and the 2 exclusively coin ingestion studies [22,23], vomiting and drooling were the predominant symptoms in 9 studies [15,22–30].

### 3.3. Anatomical location

The location of impaction of the ingested foreign body was recorded in 14 studies. Five studies found the foreign body most commonly impacted in the oesophagus [24,26,31–33] and 4 studies [15,27,29,30] reported the stomach as the most common site. In addition, where the study stated location of impaction within the oesophagus, the upper oesophagus was the most frequent site of impaction of foreign bodies in 5 studies [25,26,28,31,33].

### 3.4. Complications

Complications associated with the ingested foreign body were only discussed by under half (5/17) the studies [22,27,28,31,35] in our review. There was a wide variety of complications ranging from 1 case of mortality due to coin ingestion as described by

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