

Does motivation matter? A systematic review and meta-analysis of outcomes following intentional foreign object ingestion.

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I. ABSTRACT

II. INTRODUCTION

Rationale

The global displacement crisis has reached unprecedented levels, with over 100 million forcibly displaced individuals reported by the United Nations High Commissioner for Refugees (UNHCR) as of May 2024 [1]. Refugees and asylum seekers often endure extreme hardships, compelling them to seek asylum in foreign countries [2, 3]. This vulnerable population frequently faces compounded mental health challenges due to traumatic pre-migration experiences, hazardous journeys, and difficult post-migration realities, including detention and instability of legal status [4–7].

Self-harm, encompassing various behaviours where individuals inflict harm on themselves, is a particularly alarming manifestation of these mental health challenges. Rates of self-harm are significantly elevated among asylum seekers and refugees compared to general populations, especially among those who are detained, with rates up to 216 times higher in offshore detention facilities than in the general population [8–10].

Methods of suicide and self-harm among refugees differ based on available means, cultural factors, and motivating factors [11]. Common methods include cutting, self-battery, attempted hanging, self-poisoning by medication or chemicals, and intentional ingestion of foreign objects [9].

Intentional ingestion of foreign objects (IIFO) is defined as non-accidental ingestion of a true foreign body (non-nutritive items) [12]. Most ingested foreign bodies (80–90%) pass spontaneously, but 10–20% require endoscopic removal and up to 1% need surgery. Timely assessment and intervention are critical [13, 14]. In refugee contexts, however, geographic isolation and limited access to advanced care complicate timely management, potentially increasing morbidity and mortality [15].

Globally, rates of IIFO are increasing. In the United States, rates doubled in 2017, with 14% of cases deemed intentional [16]. A 2009 review found intentional ingestions in up to 92% of adults from lower socioeconomic populations, suggesting that rates may be even higher among refugees and asylum seekers [17].

Management of IIFO has been evolving since 1635, when Daniel Schwaban recorded the first gastrotomy on a man who had swallowed a knife [18]. In 1738, Gorsauld is credited as the first surgeon to perform a cervical esophagotomy for the removal of a

foreign body (FB) [19]. In 1906, José Goyanes extracted a coin impacted in the esophagus using a rigid esophagoscope for the first time [20]. The early 20th century saw the emergence of rigid esophagoscopy as the first large-scale method for foreign body extraction, with further case series detailing technical refinements appearing in the literature [21, 22]. Among the most extraordinary documented cases is that by Chalk, who reported a psychiatric patient ingesting 2,533 objects weighing a total of 21,268 grams [23]. The largest single ingested item reported measured 28 cm in length [24].

Clinical outcomes are influenced by various factors, including patient age, comorbidities, object characteristics (size, shape, composition, anatomical location), and the time elapsed since ingestion and current guidance advises invasive foreign object extraction guidance based on these factors [13].

Literature to date largely focuses on IIFO in prisons or psychiatric contexts, with sparse data from displaced or asylum-seeking populations. In detention, where traditional communication channels are obstructed, ingestion may serve as a form of protest or distress signal [25]. Conversely, in psychiatric settings, ingestion may reflect mental illness or affective dysregulation [26–30].

Psychiatric conditions most frequently associated with intentional ingestion of foreign objects (IIFO) include psychosis, malingering, pica, and personality disorders [26, 31].

Malingering can present in various forms, particularly in prison populations where manipulation to trigger medical transfer is a noted motivation [26, 31, 32]. In such cases, the optimal management often involves brief medical intervention with minimal reinforcement, followed by prompt return to custody [33]. In contrast, individuals with obsessive-compulsive disorder (OCD) may describe escalating anxiety prior to ingestion followed by a sense of relief afterward [31].

In cases involving borderline personality disorder, Gitlin et al. [26] suggest that IIFO may function as an affect regulation strategy, particularly during episodes of perceived abandonment. While such behaviour may appear life-threatening, it should not be presumed to indicate suicidal intent [31].

In rare and severe cases, some authors have proposed a palliative care approach to repeated IIFO, recognising the limited prognosis associated with treatment-resistant psychiatric illness and the cumulative harms of repeated surgical intervention [34].

Despite the rising prevalence, the heterogeneity in populations engaging in, and the potential severity of IIFO, there is limited research exploring how motivations for ingestion differ across populations and how these motivations may influence clinical outcomes [35–37]. Varying motivations likely influence clinical management, including decisions around the need for endoscopic or surgical intervention. For instance, if ingestion is primarily intended as protest, patients may avoid behaviours that risk

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severe harm, potentially lowering the threshold for conservative management.

This systematic review aims to address these gaps by evaluating how motivation for IIFO influences clinical outcomes. Specifically, we aim to examine how different motivations impact rates of endoscopic and surgical interventions, in the hope of informing future clinical strategies and healthcare responses. The protocol adheres to PRISMA guidelines [38].

Objectives

This systematic review aims to quantify the rates of endoscopy, surgery, death, complication and conservative management following intentional ingestion of foreign objects in human populations. It also seeks to examine how individual factors—such as demographic/population characteristics, object characteristics and motivations for ingestion—influence the likelihood of these outcomes.

III. METHODS

Eligibility Criteria

This review included studies involving human participants of any age who had non-accidental ingestion of a true foreign body (non-nutritive items). Studies were only included if they reported on all of the following data: demographic data; motivations for ingestion; object characteristics; and outcomes (whether conservative, endoscopic, or surgical treatment was used). All settings were eligible, and a wide range of study designs were accepted, including observational studies.

A full list of eligibility criteria is available in Appendix A-A and a full list of exclusion criteria is available in Appendix A-B.

Information Sources

Relevant articles were identified through a systematic search of PubMed, Web of Science, Embase, Scopus, PsycINFO, CEN-TRAL and Google Scholar on 15th January 2025, with the assistance of a librarian. Included articles then had their bibliography's searched by the primary author (JGE) on 14th May 2025.

Search Strategy

The search was conducted using keywords and MeSH terms based on the concepts underpinning this review. The keywords and MeSH terms used can be found in Appendix B. The bibliography of each included article was manually searched for any further relevant articles.

Selection Process

All identified articles were collated and duplicate articles were identified and removed. Remaining articles underwent independent title and abstract screening conducted by the first author (JGE). To ensure consistency, a randomly selected 10% sample of these articles underwent independent screening by a second author (MS). Any discrepancies identified between these two reviewers were resolved by a third reviewer (GC). Inter-reviewer agreement was calculated using Cohen's Kappa. Remaining articles proceeded to full text review, where the same independent screening process was repeated on full text articles.

Data Collection Process

Data were initially extracted by a single reviewer (JGE) into Microsoft Excel [39]. Variables for extraction were developed iteratively through engagement with the literature and analysis of consistent reporting patterns. A preliminary review of the first 30 case reports informed the development of additional data categories, which were subsequently applied to the remaining reports.

Following initial extraction, data were imported into Python for further processing and analysis. The Python-based pipeline included data cleaning, validation, and transformation to ensure consistency across heterogeneous study formats. These structured data were then used to guide the extraction of aggregate data from case series. Studies were grouped for extraction based on their classification as case reports or case series. Where case series contained sufficiently granular data, cases were extracted individually and treated as case reports; otherwise, data were extracted at the aggregate level. Case grouping for analysis followed the criteria for inclusion as individual case reports or case series, as defined above. Relevant data from reviews and other literature types were recorded under the case report category.

Data Items

Outcome data were extracted for rates of endoscopy, surgery, conservative management, mortality, and complications. For the purposes of this study, "surgery" was defined as any operative intervention performed in a sterile operating theatre under general or regional anaesthesia, involving incision or surgical access to body cavities (including laparotomy, laparoscopy, thoracotomy, or cervical exploration) for the purpose of removing an ingested object or managing complications of ingestion. Procedures performed solely via flexible or rigid endoscopy through natural orifices were categorised as "endoscopy" and not considered surgical interventions.

Predictor variables were grouped in five subgroups: *Age, Gender, Demographic, Motivation, Object*. Full definitions of all variables are provided in Appendix C. The full dataset of extracted case-level and study-level data (including bias assessments), is available as Supplementary Tables S1 and S2 (provided as separate files).

Risk of Bias Assessment

Risk of bias was assessed manually for all included studies by a single reviewer (JGE), using the *Joanna Briggs Institute (JBI) Critical Appraisal Checklists for Case Reports and Case Series* [40]. Studies were first classified as either case reports or case series based on the level of granularity in the data. Each study was then evaluated using the corresponding JBI tool.

Effects Measures

Case Reports:

Univariate Association Testing: For binary outcomes (endoscopy, surgery, complications, and death), the effect measure used was the odds ratio (OR), calculated from 2x2 contingency tables. Each odds ratio was accompanied by a 95% confidence interval (CI) and a p-value from a chi-square test of independence.

This approach was used consistently across all pairwise comparisons between binary exposure variables (e.g., motivations,

object types, population characteristics) and binary outcome variables. Significant associations were identified at a threshold of $p < 0.05$ and reported alongside their respective ORs and CIs. Due to the small number of deaths observed, effect estimates for death should be interpreted with caution.

Logistic Regression Modelling: To explore which factors were independently associated with clinical outcomes, we performed multivariate logistic regression analyses for four outcomes of interest: endoscopy, surgery, complications, and death. For each outcome, we constructed a logistic regression model including the aforementioned groups of predictor variables: age group, gender, demographic, ingestion motivation, and object characteristics.

Age group, gender, and motivation variables were entered as one-hot encoded categorical variables with a reference category omitted. Population characteristics and object type variables were included as binary indicators. A constant term was included in each model. All variables were selected a priori based on clinical relevance and prior univariable (chi-square) analyses.

Missing values in predictor variables were imputed as zero. Models were fitted using maximum likelihood estimation via the `statsmodels` Python library. In the event that a model failed to converge or could not be fitted (as occurred for the death outcome due to small sample size), an empty result table was substituted to maintain consistency of reporting across outcomes.

For each predictor, we reported the odds ratio (OR) with corresponding 95% confidence interval (CI) and p-value. Results from all models were summarised in a single grouped wide table, with predictors grouped into their logical domains (age, gender, demographic, motivation, object). The intercept term (`extttconst`) was excluded from the summary table. Significant predictors ($p < 0.05$) were flagged with an asterisk.

Case Series:

Meta-analysis of Proportions: To provide descriptive summary estimates of clinical outcomes across included case series, we conducted meta-analyses of proportions for five outcomes of interest: endoscopy, surgery, complications, death, and conservative management. For each outcome, we calculated the observed proportion within each series and performed a random-effects meta-analysis using the DerSimonian-Laird method to pool proportions on the logit scale. Between-study heterogeneity was quantified using the I^2 statistic and between-study variance (au^2). These analyses provided overall estimates of outcome frequencies across studies and informed interpretation of subsequent meta-regression analyses. All meta-analyses were conducted using custom Python code implementing standard meta-analytic formulas.

Meta-Regression: We anticipated that the number of independent case series would be small, limiting the feasibility of multivariable modelling. To increase the effective number of contributing series, we combined the series-level data with the aggregate case report data, collapsed to series level.

We then performed univariate meta-regression to explore associations between predictor variables (gender, demographic, ingestion motivations, object characteristics) and clinical outcomes (endoscopy, surgery, conservative management, complications, death). For each outcome, we modelled the logit-transformed proportion of cases using weighted least squares, with inverse variance weighting to account for differing series sizes.

Significant associations ($p < 0.05$) were reported for each predictor, grouped by conceptual domain. All other comparisons were noted as non-significant.

IV. RESULTS

Study Selection

A total of 808 records were identified through initial database searches: PubMed (317), Web of Science (277), Google Scholar (135), Embase (25), SCOPUS (24), PsycINFO (16), and Cochrane (14). 316 duplicates were identified and removed.

Title and abstract screening was undertaken, with JGE reviewing all 492 records. A random sample of 50 records was generated for independent screening MS. Cohen's Kappa was calculated for inter-reviewer agreement between JGE and MS, yielding a value of 0.38, indicating fair agreement. Where JGE and MS disagreed, 16 records were reviewed by GC. In total, 176 records were excluded, leaving 316 for full text review.

During full text review, JGE reviewed all 316 records. A random sample of 32 records was generated for independent review by MS. Inter-reviewer agreement was again calculated using Cohen's Kappa, yielding a value of 0.21, indicating fair agreement. Where JGE and MS disagreed, 5 records were reviewed by GC. In total, 276 records were excluded during full text review. 40 records were included and proceeded to bibliography search.

The bibliographies of the 40 included papers were searched by manually JGE. Relevant bibliography items were identified, collated, and evaluated against the eligibility criteria, yielding 194 results. These 194 results were reviewed by JGE. 164 bibliography search records were excluded, leaving 30 for inclusion.

Therefore, a total of 70 records were included in this study and proceeded to bias assessment. This process is illustrated in Figure 1.

Risk of Bias

Case Reports: 75 cases from 67 studies [32, 41–106] were evaluated using the JBI Checklist for Case Reports [40]. 4 cases were excluded. Cases were excluded at this stage as they failed to meet critical criteria in the following domains: current condition (2 cases, 50%), post intervention condition (2 cases, 50%), harms (2 cases, 50%), takeaway lessons (2 cases, 50%), history timeline (1 cases, 25%), and intervention treatment (1 cases, 25%). The excluded cases came from the following studies: [43, 79, 91]. Of the remaining cases (71), most clearly described intervention treatment (100%), history timeline (99%), post intervention condition (97%), takeaway lessons (97%), patient demographic (96%), and current condition (96%). Reporting was also strong for diagnostic assessment (92%), and harms (90%).

Case Series: Separately, 3 studies [107–109] were evaluated using the JBI Checklist for Case Series [40]. Reporting quality was generally high across all JBI domains. All included case series fully reported clear inclusion criteria, standard condition measurement, valid id method, complete inclusion, clear demographic reporting, clear clinical info reporting, clear outcome followup reported, and appropriate statistical analysis. However, fewer studies reported consecutive inclusion, and clear site demographic reporting.

Study Characteristics

A total of 67 studies were included in the synthesis. Case reports made up 64 studies [32, 41, 42, 44–78, 80–90, 92–106], yielding 71 cases. Case Series made up 3 studies [107–109], yielding 90 cases.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources.

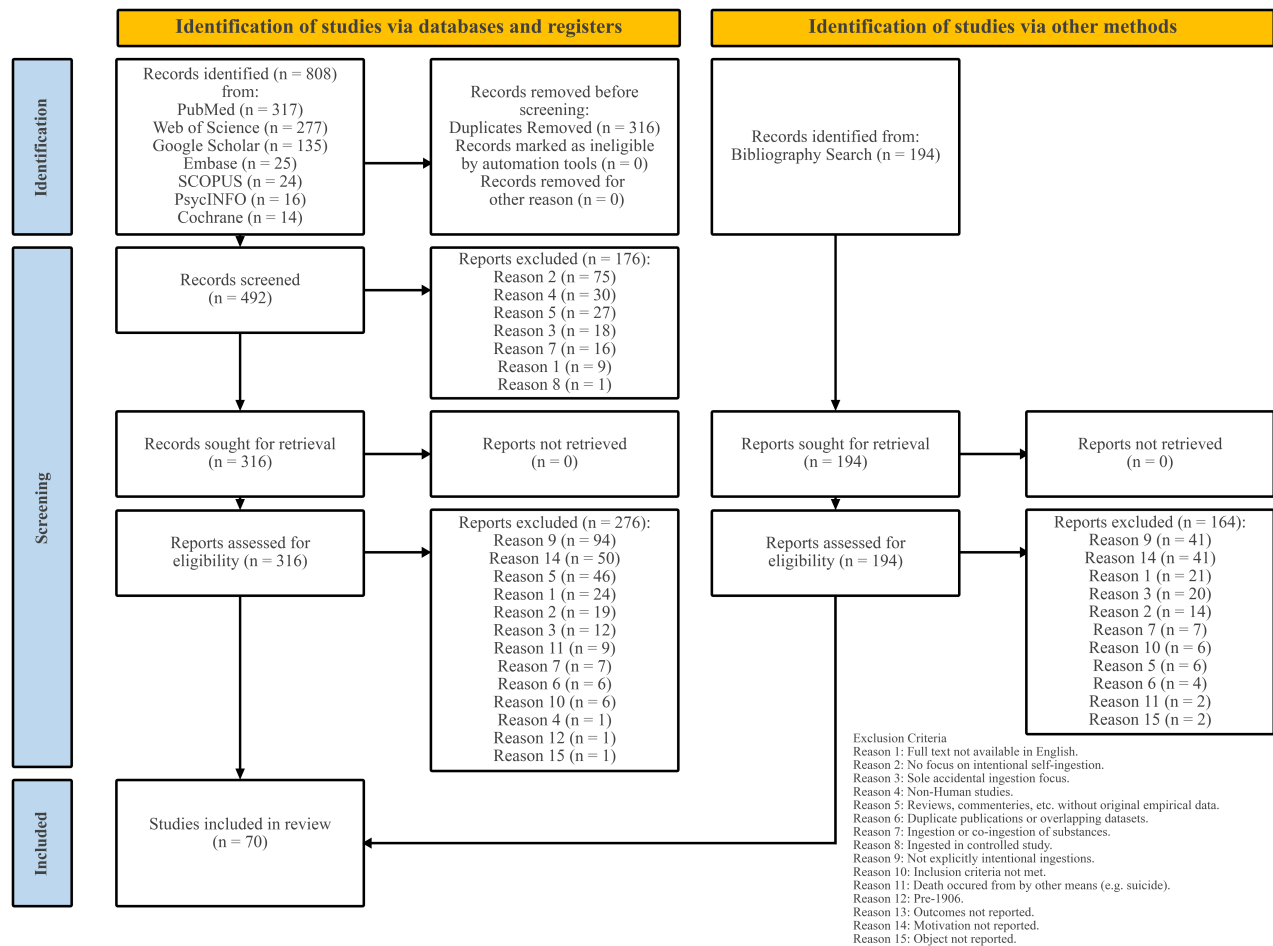


Fig. 1: PRISMA flow diagram summarising the study selection process.

Case Reports: A full list of group summary characteristics and outcomes is available in Table I.

Gender: 43 cases (60.6%) were male [32, 41, 42, 44, 45, 47, 48, 50, 52, 53, 56, 57, 61, 64–67, 69, 71, 72, 76–78, 81–84, 88, 89, 92, 94–98, 100, 103, 106], 27 cases (38.0%) were female [46, 49, 51, 54, 55, 58–60, 62, 63, 68, 70, 73–75, 80, 85–87, 90, 93, 99, 101, 102, 104], 1 case (1.4%) had no gender recorded [105].

Age Group: 25 cases (35.2%) were between 26 and 40 years of age [44, 47–49, 52, 54, 59, 60, 62, 65–67, 69, 72, 78, 82, 84, 88–90, 94, 98, 102, 104, 105], 18 cases (25.4%) were between 18 and 25 years of age [32, 41, 45, 50, 55, 61, 73, 74, 76, 82, 83, 87, 92, 99, 103], 12 cases (16.9%) were under 18 years of age [46, 58, 63, 68, 81, 85, 86, 95, 96, 101], 11 cases (15.5%) were between 41 and 60 years of age [42, 56, 57, 64, 70, 71, 77, 93, 97, 100, 106], 3 cases (4.2%) were over 60 years of age [51, 75, 80], 2 cases (2.8%) had no age documented [53].

Population: 35 cases (49.3%) had a psychiatric history [44, 46, 48–51, 57, 59, 62, 63, 65, 66, 69–73, 75–78, 81, 83, 84, 86, 87, 90, 93–95, 104–106], 19 cases (26.8%) had ingested previously [44, 48, 53, 55, 61, 63, 64, 69, 71, 72, 81, 90, 95, 97, 104–106], 12 cases (16.9%) were detained persons [32, 44, 47, 48, 82, 88, 94, 98], 7 cases (9.9%) were severely disabled [50, 75, 81, 86, 87, 104, 106], 4 cases (5.6%) were psychiatric inpatients [63, 105, 106], 3 cases (4.2%) were under the influence of alcohol [52, 61,

97], 2 cases (2.8%) were displaced people [41, 67].

Motivation: 34 cases (47.9%) had a psychiatric motivation [42, 44, 46, 48–50, 54, 55, 62–65, 69–78, 80, 81, 84, 86, 90, 93–95, 103, 106], 20 cases (28.2%) were motivated by self-harm intention [32, 42, 44, 45, 57, 59–61, 66, 80, 82, 83, 90, 94, 95, 105], 17 cases (23.9%) had a psychosocial motivation [41, 52, 55, 58, 68, 70, 76, 80, 85, 88, 89, 92, 96, 97, 99, 101, 102], 9 cases (12.7%) were motivated by protest [32, 56, 67, 82, 99], 9 cases (12.7%) had another documented motivation [46, 47, 64, 69, 87, 90, 98, 100, 104].

Object Characteristics: 50 cases (70.4%) ingested a large diameter object (>2.5cm) [32, 41, 42, 44, 45, 47, 48, 50, 53, 54, 57–61, 63, 64, 67, 69, 71, 72, 74–78, 82–90, 93, 95, 97, 98, 102, 104–106], 44 cases (62.0%) ingested multiple objects [46, 48–51, 55–58, 64–66, 68–74, 76–78, 80–86, 92–97, 100, 101, 103, 105, 106], 33 cases (46.5%) ingested a sharp object [32, 44, 48, 49, 52, 54, 55, 57, 61–66, 69–72, 74, 76, 78, 82–84, 92, 103, 106], 31 cases (43.7%) ingested a long object (>5cm) [42, 45, 47, 50, 54, 57, 59–61, 63, 64, 66, 67, 72, 74–76, 78, 83, 84, 86, 88, 90, 93, 97, 98, 103, 104, 106], 9 cases (12.7%) ingested a magnet [46, 56, 58, 81, 85, 86, 95, 96, 101], 2 cases (2.8%) ingested a button battery [53, 56].

Outcomes: 48 cases (67.6%) experienced a complication [45, 46, 48, 50–54, 56–58, 60–68, 72, 74–78, 81–86, 90, 92, 93, 95–99, 101–104], 43 cases (60.6%) underwent surgery [32,

42, 44–46, 50, 51, 54, 57–63, 65–67, 72, 74–76, 78, 81–85, 92, 95–97, 99, 101–105], 31 cases (43.7%) underwent endoscopy [41, 47, 48, 50, 52–54, 56, 57, 59, 62, 67, 69–71, 74, 80, 81, 86–90, 93–95, 98, 100, 102, 106], 7 cases (9.9%) were managed conservatively [49, 55, 63, 64, 68, 73, 77], 2 cases (2.8%) died [64, 77].

TABLE I: Grouped summary of variables and outcomes.

Variable	Count	Percentage	References
<i>Gender</i>			
Male	43	60.6%	[32, 41, 42, 44, 45, 47, 48, 50, 52, 53, 56, 57, 61, 64–67, 69, 71, 72, 76–78, 81–84, 88, 89, 92, 94–98, 100, 103, 106]
Female	27	38.0%	[46, 49, 51, 54, 55, 58–60, 62, 63, 68, 70, 73–75, 80, 85–87, 90, 93, 99, 101, 102, 104]
Unknown	1	1.4%	[105]
<i>Age Group</i>			
<18	12	16.9%	[46, 58, 63, 68, 81, 85, 86, 95, 96, 101]
18–25	18	25.4%	[32, 41, 45, 50, 55, 61, 73, 74, 76, 82, 83, 87, 92, 99, 103]
26–40	25	35.2%	[44, 47–49, 52, 54, 59, 60, 62, 65–67, 69, 72, 78, 82, 84, 88–90, 94, 98, 102, 104, 105]
41–60	11	15.5%	[42, 56, 57, 64, 70, 71, 77, 93, 97, 100, 106]
60+	3	4.2%	[51, 75, 80]
Unknown	2	2.8%	[53]
<i>Population</i>			
Detained Person	12	16.9%	[32, 44, 47, 48, 82, 88, 94, 98]
Psychiatric Inpatient	4	5.6%	[63, 105, 106]
Displaced Person	2	2.8%	[41, 67]
Under Influence of Alcohol	3	4.2%	[52, 61, 97]
Psychiatric History	35	49.3%	[44, 46, 48–51, 57, 59, 62, 63, 65, 66, 69–73, 75–78, 81, 83, 84, 86, 87, 90, 93–95, 104–106]
Severely Disabled	7	9.9%	[50, 75, 81, 86, 87, 104, 106]
Previous Ingestor	19	26.8%	[44, 48, 53, 55, 61, 63, 64, 69, 71, 72, 81, 90, 95, 97, 104–106]
<i>Motivation</i>			
Intent to harm	20	28.2%	[32, 42, 44, 45, 57, 59–61, 66, 80, 82, 83, 90, 94, 95, 105]
Protest	9	12.7%	[32, 56, 67, 82, 99]
Psychiatric	34	47.9%	[42, 44, 46, 48–50, 54, 55, 62–65, 69–78, 80, 81, 84, 86, 90, 93–95, 103, 106]
Psychosocial	17	23.9%	[41, 52, 55, 58, 68, 70, 76, 80, 85, 88, 89, 92, 96, 97, 99, 101, 102]
Other	9	12.7%	[46, 47, 64, 69, 87, 90, 98, 100, 104]
<i>Object</i>			
Button Battery	2	2.8%	[53, 56]
Magnet	9	12.7%	[46, 56, 58, 81, 85, 86, 95, 96, 101]
Long (>5cm)	31	43.7%	[42, 45, 47, 50, 54, 57, 59–61, 63, 64, 66, 67, 72, 74–76, 78, 83, 84, 86, 88, 90, 93, 97, 98, 103, 104, 106]
Large (>2.5cm) Diameter	50	70.4%	[32, 41, 42, 44, 45, 47, 48, 50, 53, 54, 57–61, 63, 64, 67, 69, 71, 72, 74–78, 82–90, 93, 95, 97, 98, 102, 104–106]
Sharp	33	46.5%	[32, 44, 48, 49, 52, 54, 55, 57, 61–66, 69–72, 74, 76, 78, 82–84, 92, 103, 106]
Multiple	44	62.0%	[46, 48–51, 55–58, 64–66, 68–74, 76–78, 80–86, 92–97, 100, 101, 103, 105, 106]
<i>Outcome</i>			
Endoscopy	31	43.7%	[41, 47, 48, 50, 52–54, 56, 57, 59, 62, 67, 69–71, 74, 80, 81, 86–90, 93–95, 98, 100, 102, 106]
Surgery	43	60.6%	[32, 42, 44–46, 50, 51, 54, 57–63, 65–67, 72, 74–76, 78, 81–85, 92, 95–97, 99, 101–105]
Death	2	2.8%	[64, 77]
Conservative	7	9.9%	[49, 55, 63, 64, 68, 73, 77]
Complication	48	67.6%	[45, 46, 48, 50–54, 56–58, 60–68, 72, 74–78, 81–86, 90, 92, 93, 95–99, 101–104]

Case Series: 3 case series were included in the synthesis [107–109], yielding 90 cases. The mean age for this cohort is 24.0 (range: 17.0–50.0) years. 100.0% were male gender (90); 0.0% were female gender (0); 0.0% were unknown gender (0). 90 cases (100.0%) were detained at the time of ingestion [107–109], 88 cases (98.3%) were intentional ingestions [107–109], 30 cases (33.2%) had a psychiatric history documented [107–109], 2 cases (2.2%) had a history of prior ingestion [107]. 0 recorded cases were psychiatric inpatients. 0 recorded cases were displaced people. 0 recorded cases were under the influence of alcohol at the time of ingestion. 0 recorded cases had a severe disability history.

Motivation: 70 cases (78.3%) reported protest motivation [107–109], 12 cases (13.3%) reported psychiatric motivation [108], 6 cases (6.7%) reported self-harm motivation [107, 108]. 0 recorded cases reported psychosocial motivation. 0 recorded cases unknown. 0 recorded cases reported other motivation. 0 recorded cases reported other motivation with known psychiatric history. 0 recorded cases reported other with severe disability history.

Object Characteristics: 68 cases (75.6%) involved sharp object ingestion [107–109], 32 cases (35.6%) involved long (>5cm) object ingestion [109], 25 cases (27.8%) involved ingestion of multiple objects [107, 109], 17 cases (18.9%) involved short (<5cm) object ingestion [107, 109], 16 cases (17.8%) involved short (<5cm) sharp object ingestion [107]. 0 recorded cases involved button battery ingestion. 0 recorded cases involved magnet ingestion. 0 recorded cases involved large diameter (>2.5cm) object ingestion. 0 recorded cases involved long (>5cm) sharp object ingestion.

Outcomes: 47 cases (52.2%) underwent endoscopic intervention [107, 109], 29 cases (32.2%) were managed conservatively [107, 108], 15 cases (16.7%) underwent surgical intervention [107–109], 7 cases (7.8%) had an 'other' outcome [107, 109], 6 cases (6.7%) had an injury that required intervention [109], 6 cases (6.7%) had an injury that required intervention [109], 2 cases (2.2%) had a perforation [107, 109], 2 cases (2.2%) underwent endoscopy and surgery [107, 109], 1 case (1.1%) died [107], 1 case (1.1%) had an obstruction [107].

Synthesis

Case Reports:

Chi-Squared Tests: A full table of grouped case-level chi-squared test results for the is available in Table II. In the age group subgroup, 41–60 age group was significantly associated with surgery (OR = 0.19, 95% CI [0.04, 0.78], $p = 0.034$); 41–60 age group was significantly associated with death (OR = nan, 95% CI [nan, nan], $p = 0.018$). In the motivation subgroup, intent to harm motivation was significantly associated with surgery (OR = 5.10, 95% CI [1.28, 20.33], $p = 0.032$); other motivation was significantly associated with surgery (OR = 0.15, 95% CI [0.03, 0.77], $p = 0.031$). There were no significant associations with outcomes in the gender, object, and population subgroups.

Multivariate Logistic Regression: A full table of grouped series level logistic regression results is available in Table ???. In the motivation subgroup, intent to harm motivation was significantly associated with surgery (OR = 15.95, 95% CI [1.32, 192.48], $p = 0.029$). In the object subgroup, long (>5cm) object ingestion was significantly associated with surgery (OR = 7.66, 95% CI [1.04, 56.32], $p = 0.045$); multiple object ingestion was significantly associated with complication (OR = 14.79, 95%

CI [2.08, 105.31], $p = 0.007$); long (>5cm) object ingestion was significantly associated with complication (OR = 16.50, 95% CI [1.76, 154.43], $p = 0.014$). In the population subgroup, detained person was significantly associated with complication (OR = 0.04, 95% CI [0.00, 0.69], $p = 0.028$). There were no significant associations with outcomes in the age group, and gender subgroups.

Case Series:

Meta-analysis of Proportions: A plot of case series meta-analysis of pooled outcome proportions is shown in Figure 2. We performed meta-analyses of proportions for endoscopy, surgery, and conservative. The pooled proportion of patients undergoing endoscopy was 41.6% (95% CI 0.6%–98.9%), with substantial heterogeneity ($I^2 = 94.9\%$). The pooled proportion of patients undergoing surgery was 17.8% (95% CI 10.4%–28.8%), with low heterogeneity ($I^2 = 17.4\%$). The pooled proportion of patients conservative management was 76.2% (95% CI 60.2%–87.1%), with low heterogeneity ($I^2 < 0.5\%$). Meta-analyses could not be performed for death and complication because fewer than two studies reported data on these outcomes.

Meta Regression: A full table of grouped aggregate series-level results for univariate meta-regression is available in Table V. In the gender subgroup, male gender was associated with a reduced likelihood of conservative management (OR = 0.87, 95% CI [0.78, 0.97], $p = 0.040$). All other comparisons in this subgroup were non-significant. In the population subgroup, being a detained person was associated with an increased likelihood of conservative management (OR = 1.62, 95% CI [1.11, 2.37], $p = 0.040$). All other comparisons in this subgroup were non-significant. In the motivation subgroup, intent to harm was associated with a reduced likelihood of conservative management (OR = 0.82, 95% CI [0.77, 0.87], $p = 0.014$); intent to harm was associated with an increased likelihood of undergoing surgery (OR = 1.12, 95% CI [1.05, 1.18], $p = 0.015$); psychiatric motivation was associated with an increased likelihood of undergoing surgery (OR = 1.07, 95% CI [1.03, 1.11], $p = 0.017$); psychosocial motivation was associated with a reduced likelihood of conservative management (OR = 0.82, 95% CI [0.70, 0.96], $p = 0.040$); another documented motivation was associated with a reduced likelihood of conservative management (OR = 0.69, 95% CI [0.51, 0.92], $p = 0.040$); another documented motivation was associated with an increased likelihood of undergoing surgery (OR = 1.25, 95% CI [1.02, 1.52], $p = 0.041$); psychosocial motivation was associated with an increased likelihood of undergoing surgery (OR = 1.12, 95% CI [1.01, 1.25], $p = 0.041$). All other comparisons in this subgroup were non-significant. In the object subgroup, Sharp object ingestion was associated with a reduced likelihood of conservative management (OR = 0.80, 95% CI [0.65, 1.00], $p = 0.049$). All other comparisons in this subgroup were non-significant.

Investigation of Heterogeneity: We explored heterogeneity across study results using two complementary approaches.

First, meta-analyses of proportions were conducted for each outcome of interest across included case series. Between-study heterogeneity was quantified using the I^2 statistic and τ^2 variance. The degree of heterogeneity varied substantially across outcomes:

- Substantial heterogeneity ($I^2 = 95$)

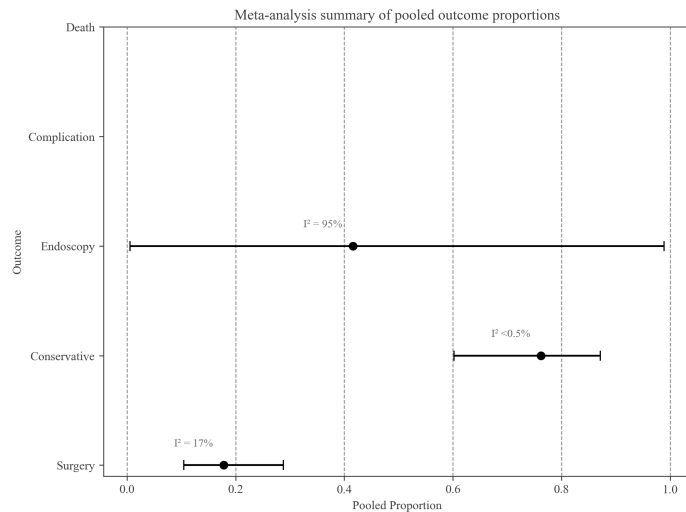


Fig. 2: Case series meta-analysis of pooled outcome proportions.

- Heterogeneity was moderate for surgery ($I^2 = 17$)
- Heterogeneity was low ($I^2 = 0$)
- Meta-analyses could not be meaningfully conducted for death and complications due to insufficient data.

Second, to investigate potential sources of heterogeneity, we performed univariate meta-regressions for each outcome. Given the small number of case series available, we combined series-level data with collapsed aggregate case reports to increase the number of contributing studies. Meta-regressions examined associations between outcome proportions and patient-level predictors including gender, population characteristics, ingestion motivations, and object type.

Significant associations between certain predictors and outcomes were identified, particularly in relation to motivation and surgery or conservative management outcomes. This suggests that clinical heterogeneity in patient characteristics likely contributed to observed between-study differences.

No additional subgroup or sensitivity analyses were performed, given the limited number of studies and inconsistent reporting of potential study-level moderators.

Sensitivity Analyses: Formal sensitivity analyses were not performed due to the limited number of included case series and the small number of studies available for several outcomes. Given the small number of eligible series and heterogeneity in reporting, the meta-analyses of proportions and meta-regressions were considered primarily descriptive in nature.

To partially address robustness, we incorporated aggregate case report data into the meta-regression models to increase the effective number of series contributing to each outcome. This allowed exploratory assessment of predictor-outcome relationships across a larger pooled dataset. However, no additional sensitivity analyses (e.g. leave-one-out analyses, exclusion of small studies, or alternative meta-analytic models) were conducted, as such analyses would not have been statistically meaningful in the context of the available data.

TABLE II: Grouped case-level chi-squared test results.

Variable	Endoscopy	Surgery	Death	Conservative	Complication
<i>Gender</i>					
Male	1.34 [0.51, 3.53] (p=0.722)	0.99 [0.37, 2.62] (p=1.000)	—	0.22 [0.04, 1.25] (p=0.157)	1.28 [0.47, 3.52] (p=0.824)
Female	0.82 [0.31, 2.18] (p=0.887)	0.92 [0.34, 2.44] (p=1.000)	—	4.77 [0.86, 26.63] (p=0.132)	0.93 [0.34, 2.59] (p=1.000)
Unknown	—	—	—	—	—
<i>Age Group</i>					
<18	0.37 [0.09, 1.50] (p=0.267)	2.21 [0.54, 8.99] (p=0.425)	—	2.16 [0.37, 12.72] (p=0.736)	2.76 [0.55, 13.81] (p=0.348)
18–25	0.28 [0.08, 0.95] (p=0.065)	2.90 [0.84, 9.97] (p=0.147)	—	1.20 [0.21, 6.80] (p=1.000)	1.34 [0.41, 4.34] (p=0.847)
26–40	2.17 [0.81, 5.85] (p=0.195)	0.96 [0.36, 2.61] (p=1.000)	—	0.28 [0.03, 2.45] (p=0.421)	0.78 [0.28, 2.18] (p=0.831)
41–60	2.62 [0.69, 9.95] (p=0.262)	0.19 [0.04, 0.78] (p=0.034)*	—	2.44 [0.41, 14.57] (p=0.648)	0.51 [0.14, 1.90] (p=0.512)
60+	0.63 [0.05, 7.32] (p=1.000)	1.32 [0.11, 15.25] (p=1.000)	—	—	0.96 [0.08, 11.13] (p=1.000)
Unknown	—	—	—	—	0.47 [0.03, 7.84] (p=1.000)
<i>Population</i>					
Detained Person	0.99 [0.28, 3.53] (p=1.000)	0.86 [0.24, 3.08] (p=1.000)	—	—	0.63 [0.17, 2.26] (p=0.704)
Psychiatric Inpatient	0.44 [0.04, 4.54] (p=0.861)	2.25 [0.22, 22.99] (p=0.861)	—	—	0.15 [0.01, 1.50] (p=0.200)
Displaced Person	—	0.67 [0.03, 12.84] (p=1.000)	—	—	0.50 [0.03, 9.77] (p=1.000)
Under Influence of Alcohol	0.88 [0.07, 10.69] (p=1.000)	1.00 [0.08, 12.27] (p=1.000)	—	—	—
Psychiatric History	0.84 [0.30, 2.33] (p=0.942)	1.29 [0.46, 3.59] (p=0.827)	0.74 [0.04, 12.33] (p=1.000)	0.99 [0.20, 4.86] (p=1.000)	0.75 [0.26, 2.21] (p=0.806)
Severely Disabled	4.02 [0.72, 22.47] (p=0.202)	0.83 [0.17, 4.04] (p=1.000)	—	—	1.25 [0.22, 7.02] (p=1.000)
Previous Ingestor	0.83 [0.26, 2.65] (p=0.986)	0.74 [0.23, 2.36] (p=0.832)	1.61 [0.09, 27.40] (p=1.000)	1.69 [0.30, 9.38] (p=0.877)	0.34 [0.10, 1.23] (p=0.179)
<i>Motivation</i>					
Intent to harm	0.53 [0.17, 1.67] (p=0.419)	5.10 [1.28, 20.33] (p=0.032)*	—	—	0.97 [0.31, 3.01] (p=1.000)
Protest	0.32 [0.06, 1.69] (p=0.302)	5.68 [0.66, 48.72] (p=0.170)	—	—	4.47 [0.52, 38.51] (p=0.279)
Psychiatric	1.37 [0.52, 3.61] (p=0.699)	0.49 [0.18, 1.33] (p=0.248)	—	6.86 [0.78, 60.48] (p=0.120)	0.61 [0.22, 1.70] (p=0.487)
Psychosocial	0.86 [0.28, 2.63] (p=1.000)	0.65 [0.21, 1.99] (p=0.644)	—	1.17 [0.21, 6.69] (p=1.000)	0.89 [0.28, 2.84] (p=1.000)
Other	2.96 [0.68, 12.95] (p=0.259)	0.15 [0.03, 0.77] (p=0.031)*	7.62 [0.43, 134.24] (p=0.595)	1.17 [0.12, 10.99] (p=1.000)	0.55 [0.13, 2.29] (p=0.656)
<i>Object</i>					
Button Battery	—	—	—	—	—
Magnet	1.04 [0.25, 4.24] (p=1.000)	2.53 [0.49, 13.17] (p=0.444)	—	—	—
Long (>5cm)	0.84 [0.33, 2.18] (p=0.912)	2.32 [0.86, 6.30] (p=0.154)	1.27 [0.08, 21.10] (p=1.000)	0.47 [0.08, 2.60] (p=0.630)	2.14 [0.74, 6.19] (p=0.245)
Large (>2.5cm) Diameter	1.46 [0.49, 4.32] (p=0.679)	1.60 [0.55, 4.66] (p=0.556)	—	0.24 [0.05, 1.19] (p=0.160)	0.98 [0.32, 3.05] (p=1.000)
Sharp	0.35 [0.13, 0.94] (p=0.061)	2.07 [0.78, 5.50] (p=0.221)	1.16 [0.07, 19.24] (p=1.000)	1.61 [0.33, 7.78] (p=0.844)	1.20 [0.44, 3.25] (p=0.923)
Multiple	0.46 [0.17, 1.21] (p=0.181)	1.09 [0.41, 2.91] (p=1.000)	—	4.11 [0.47, 36.14] (p=0.341)	2.40 [0.86, 6.66] (p=0.150)

OR: Odds Ratio. CI: Confidence Interval. p: p-value. * indicates $p < 0.05$. — indicates missing or unreported values.

TABLE III: Grouped logistic regression results.

Variable	Endoscopy	Surgery	Death	Conservative	Complication
<i>Age Group</i>					
<18	0.42 [0.03, 6.07] (p=0.523)	7.58 [0.52, 110.28] (p=0.138)	—	—	2.54 [0.15, 42.66] (p=0.518)
18–25	0.52 [0.03, 8.35] (p=0.646)	2.77 [0.16, 49.35] (p=0.488)	—	—	0.44 [0.03, 7.15] (p=0.566)
26–40	2.75 [0.19, 39.78] (p=0.458)	2.60 [0.16, 41.61] (p=0.500)	—	—	2.17 [0.15, 31.84] (p=0.572)
41–60	4.40 [0.25, 78.83] (p=0.314)	0.16 [0.01, 3.60] (p=0.252)	—	—	0.07 [0.00, 1.57] (p=0.093)
<i>Gender</i>					
Male	1.98 [0.47, 8.36] (p=0.355)	1.32 [0.25, 7.05] (p=0.743)	—	0.05 [0.00, 4.48] (p=0.187)	3.12 [0.46, 21.08] (p=0.242)
<i>Population</i>					
Detained Person	0.99 [0.12, 7.86] (p=0.991)	0.06 [0.00, 1.04] (p=0.053)	—	—	0.04 [0.00, 0.69] (p=0.028)*
Psychiatric History	0.64 [0.09, 4.44] (p=0.650)	2.39 [0.21, 26.70] (p=0.479)	—	—	0.43 [0.04, 4.22] (p=0.467)
Severely Disabled	5.50 [0.55, 54.89] (p=0.147)	1.13 [0.10, 12.92] (p=0.923)	—	—	0.87 [0.05, 14.73] (p=0.925)
Previous Ingestor	0.45 [0.09, 2.28] (p=0.338)	0.56 [0.08, 3.79] (p=0.555)	—	—	0.56 [0.09, 3.38] (p=0.526)
<i>Motivation</i>					
Intent to harm	0.63 [0.13, 3.02] (p=0.565)	15.95 [1.32, 192.48] (p=0.029)*	—	—	0.28 [0.04, 1.80] (p=0.180)
Protest	0.41 [0.03, 4.85] (p=0.477)	5.20 [0.18, 152.56] (p=0.339)	—	—	135.93 [0.93, 19764.29] (p=0.053)
Psychiatric	3.18 [0.56, 18.19] (p=0.194)	0.10 [0.01, 1.23] (p=0.072)	—	—	0.56 [0.10, 3.29] (p=0.526)
Psychosocial	1.06 [0.16, 7.18] (p=0.953)	0.49 [0.05, 4.84] (p=0.542)	—	—	0.41 [0.04, 3.96] (p=0.445)
Other	1.33 [0.20, 8.70] (p=0.764)	0.13 [0.01, 1.90] (p=0.135)	—	—	0.55 [0.07, 4.71] (p=0.589)
<i>Object</i>					
Large (>2.5cm) Diameter	2.11 [0.38, 11.74] (p=0.394)	1.08 [0.16, 7.22] (p=0.939)	—	—	1.00 [0.12, 8.35] (p=0.997)
Sharp	0.31 [0.07, 1.47] (p=0.141)	3.19 [0.45, 22.44] (p=0.243)	—	—	0.65 [0.10, 4.17] (p=0.647)
Multiple	0.38 [0.08, 1.85] (p=0.231)	2.08 [0.35, 12.27] (p=0.418)	—	10.82 [0.01, 8968.26] (p=0.487)	14.79 [2.08, 105.31] (p=0.007)*
Long (>5cm)	0.24 [0.05, 1.25] (p=0.090)	7.66 [1.04, 56.32] (p=0.045)*	0.00 [0.00, 73589776336.35] (p=0.395)	0.03 [0.00, 3.74] (p=0.155)	16.50 [1.76, 154.43] (p=0.014)*

OR: Odds Ratio. CI: Confidence Interval. p: p-value. * indicates $p < 0.05$. — indicates missing or unreported values.

TABLE IV: Grouped results

Variable	Karp <i>et al.</i> [108]	Lee <i>et al.</i> [109]	Elghali <i>et al.</i> [107]	Case Reports
<i>Total Cases</i>	19	52	19	71
<i>Gender</i>	19	52	19	71
Male	19 (100)	52 (100)	19 (100)	43 (61)
Female	0 (0)	0 (0)	0 (0)	27 (38)
Unknown	0 (0)	0 (0)	0 (0)	1 (1)
<i>Age</i>				
Minimum	17	25	19	7
Mean	24	—	24	31
Median	—	35	—	28
Maximum	40	50	27	100
<i>Population</i>	37	61	23	82
Detained Person	19 (100)	52 (100)	19 (100)	12 (17)
Psychiatric Inpatient	0 (0)	0 (0)	0 (0)	4 (6)
Displaced Person	—	—	—	2 (3)
Under Influence of Alcohol	—	—	—	3 (4)
Psychiatric History	18 (95)	9 (18)	2 (12)	35 (49)
Severely Disabled	—	0 (0)	—	7 (10)
Previous Ingestor	—	—	2 (11)	19 (27)
<i>Motivation</i>	19	50	19	89
Intent to harm	4 (21)	0 (0)	2 (11)	20 (28)
Protest	3 (16)	50 (97)	17 (89)	9 (13)
Psychiatric	12 (63)	0 (0)	0 (0)	34 (48)
Psychosocial	0 (0)	0 (0)	0 (0)	17 (24)
Other	0 (0)	0 (0)	0 (0)	9 (13)
<i>Object</i>				
Button Battery	—	0	0	2
Magnet	—	0	0	9
Long (>5cm)	—	32	0	31
Large (>2.5cm) Diameter	—	—	—	50
Sharp	19	33	16	33
Multiple	—	24	1	44
<i>Outcome</i>	19	58	21	131
Endoscopy	—	46 (88)	1 (5)	31 (44)
Surgery	5 (26)	6 (12)	4 (21)	43 (61)
Death	0 (0)	0 (0)	1 (5)	2 (3)
Complication	—	6 (12)	—	48 (68)
Conservative	14 (74)	0 (0)	15 (79)	7 (10)

n (%)

TABLE V: Grouped univariate meta-regression results for series-level data.

Variable	Conservative	Surgery	Endoscopy	Complication	Death
<i>Gender</i>					
Male	0.87 [0.78, 0.97] (p=0.040)*	1.01 [0.78, 1.32] (p=0.860)	1.18 [0.53, 2.65] (p=0.230)	—	—
<i>Population</i>					
Detained Person	1.62 [1.11, 2.37] (p=0.040)*	0.94 [0.85, 1.04] (p=0.128)	1.06 [0.67, 1.67] (p=0.351)	—	—
Psychiatric History	0.89 [0.49, 1.60] (p=0.237)	1.08 [1.00, 1.17] (p=0.055)	0.95 [0.33, 2.73] (p=0.661)	—	—
Displaced Person	—	—	—	—	—
<i>Motivation</i>					
Intent to harm	0.82 [0.77, 0.87] (p=0.014)*	1.12 [1.05, 1.18] (p=0.015)*	0.92 [0.26, 3.32] (p=0.563)	—	—
Psychiatric	0.89 [0.62, 1.27] (p=0.154)	1.07 [1.03, 1.11] (p=0.017)*	0.96 [0.44, 2.06] (p=0.590)	—	—
Psychosocial	0.82 [0.70, 0.96] (p=0.040)*	1.12 [1.01, 1.25] (p=0.041)*	0.91 [0.20, 4.25] (p=0.590)	—	—
Other	0.69 [0.51, 0.92] (p=0.040)*	1.25 [1.02, 1.52] (p=0.041)*	0.84 [0.05, 15.40] (p=0.590)	—	—
Protest	1.04 [0.01, 71.82] (p=0.931)	0.95 [0.84, 1.08] (p=0.231)	1.06 [0.68, 1.65] (p=0.357)	—	—
<i>Object</i>					
Sharp	0.80 [0.65, 1.00] (p=0.049)*	1.07 [0.70, 1.64] (p=0.575)	1.20 [0.03, 45.16] (p=0.631)	1.00 [0.63, 1.59] (p=0.984)	—
Multiple	—	1.06 [0.62, 1.80] (p=0.404)	0.97 [0.28, 3.39] (p=0.837)	—	—
Long (>5cm)	—	1.03 [0.30, 3.53] (p=0.788)	1.12 [0.17, 7.29] (p=0.588)	—	—

OR: Odds Ratio. CI: Confidence Interval. p: p-value. * indicates $p < 0.05$. — indicates missing or unreported values.

Assessment of Reporting Bias

Risk of bias due to missing results (arising from reporting biases) was not formally assessed through funnel plot inspection or quantitative methods such as Egger's test, as the number of included case series per outcome was too small to support these analyses (fewer than 10 series per outcome). Furthermore, case series are prone to selective reporting and variable outcome definitions, which may contribute to reporting bias; however, the heterogeneity in reporting precluded a more formal assessment.

For the meta-regressions, the inclusion of aggregate case report data partially mitigated the risk of missing results at the series level but could not address potential reporting biases within the individual case reports or across studies. Overall, the potential for reporting bias remains a limitation of the syntheses presented in this review and should be considered when interpreting results.

Certainty of Evidence

We did not perform a formal assessment of certainty in the body of evidence (e.g. using the GRADE approach), as the included evidence was primarily derived from case reports and case series, which are inherently subject to a high risk of bias and lack of control groups. Additionally, heterogeneity across studies was substantial for several outcomes, and reporting was inconsistent across series.

The small number of available case series per outcome, the inclusion of aggregate case report data, and the observational nature of the data all limit the certainty of the synthesized results. As such, the findings of this review should be interpreted as exploratory and hypothesis-generating, rather than providing high-confidence estimates of effect.

V. DISCUSSION

Data Availability

Data collection, manipulation and analysis in this review were conducted using Python [110]. Specific packages used include: *Pandas* [111], [112]. The data and code used in this systematic review are available on http://github.com/jackgedge/iifo_systematic_review at http://github.com/jackgedge/iifo_systematic_review.

Case Reports: For case reports, the JBI Checklist for Case Reports was used. This tool assesses eight domains of reporting quality, including whether patient demographics were clearly described, a timeline of clinical history was provided, the presenting condition and diagnostic assessment were outlined, and whether the intervention, post-intervention condition, and any adverse events were reported. The final domain evaluates whether the case provides meaningful takeaway lessons.

In addition to manual JBI appraisal, a logic-based validation filter was applied to all case reports using *Python Pandas* [111]. This secondary filter assessed whether key variables — specifically, outcomes, object characteristics, and motivation — were completely unreported. For each domain, a binary flag was generated:

- *Outcome_Unknown* was marked 1 if all outcome-related fields were either missing or marked as unknown.
- *Object_Unknown* was marked 1 if all object-related fields (excluding *Object_Other_Long*) were missing or unknown.
- *Motivation_Unknown* was predefined in the dataset and indicated absence of motivational information.

If any of these flags were triggered, the corresponding JBI item most affected by the missing domain was marked as not reported (e.g., *Post_Intervention_Condition_Described* or *History_Timeline* set to N). Finally, an *Overall Appraisal* score of *Exclude* was assigned, indicating high risk of bias and exclusion from analysis. This ensured that only case reports with sufficient information to meaningfully contribute to the review question were retained.

Case Series: For case series, the JBI Checklist for Case Series was applied. The JBI Checklist for Case Series assesses 10 domains of methodological and reporting quality. These include whether the case series defined clear inclusion criteria, applied valid and consistent methods to identify the condition, and included participants consecutively and completely. The checklist also evaluates whether participant demographics and clinical information were clearly reported, whether outcomes or follow-up results were adequately described, and whether the study setting was detailed. Finally, it considers whether the statistical analysis used was appropriate for the data presented.

In addition to manual JBI appraisal, a logic-based exclusion filter was applied using *Python Pandas* [111]. This filter assessed whether key variables — specifically, motivation, object characteristics, and outcomes — were unreported for the entire study population. For each of these domains, a derived rate variable was calculated:

- *Outcome_Unknown_Rate* was marked as 1 if all outcome-related fields were missing or marked as unknown (i.e. the entire population had an unknown outcome).
- *Motivation_Unknown_Rate* indicated whether motivation was absent or only partially reported across cases within the study.
- *Object_Unknown_Rate* was derived if all object-related fields were missing or unknown.

If any of these indicators were flagged, the corresponding JBI checklist item (e.g., *Clear_Outcome_Followup_Reported*, *Clear_Demographic_Reporting*, or *Clear_Clinical_Info_Reporting*) was marked as N, and the study received an *Overall Appraisal* of *Exclude*. This logic-based validation ensured that case series lacking essential variables could be systematically excluded from the final analysis, maintaining consistency with the review question and minimising risk of bias in the dataset.

REFERENCES

- [1] UNHCR. *UNHCR: A record 100 million people forcibly displaced worldwide* | UN News. <https://news.un.org/en/story/2022/05/1118772>. May 2022. (Visited on 10/29/2024).
- [2] UNHCR. *Convention and Protocol Relating to the Status of Refugees*. <https://www.unhcr.org/media/convention-and-protocol-relating-status-refugees>. 2010. (Visited on 10/29/2024).
- [3] Amnesty International. *Refugees, Asylum Seekers and Migrants - Amnesty International*. <https://www.amnesty.org/en/what-we-do/refugees-asylum-seekers-and-migrants/>. 2024. (Visited on 10/29/2024).

- [4] Harmit Athwal. "I don't have a life to live': deaths and UK detention". In: *Race & Class* 56.3 (Jan. 2015), pp. 50–68. ISSN: 0306-3968. DOI: 10.1177/0306396814556224. (Visited on 10/29/2024).
- [5] Maria Sundvall et al. "Assessment and treatment of asylum seekers after a suicide attempt: a comparative study of people registered at mental health services in a Swedish location". In: *BMC Psychiatry* 15.1 (Dec. 2015), p. 235. ISSN: 1471-244X. DOI: 10.1186/s12888-015-0613-8. (Visited on 10/29/2024).
- [6] Angela Nickerson et al. "The association between visa insecurity and mental health, disability and social engagement in refugees living in Australia". In: *European Journal of Psychotraumatology* (Dec. 2019). ISSN: 2000-8198. (Visited on 10/29/2024).
- [7] Francesco Bevione et al. "Risk of suicide and suicidal behavior in refugees. A meta-review of current systematic reviews and meta-analyses". In: *Journal of Psychiatric Research* 177 (Sept. 2024), pp. 287–298. ISSN: 0022-3956. DOI: 10.1016/j.jpsychires.2024.07.024. (Visited on 10/29/2024).
- [8] M. von Werthern et al. "The impact of immigration detention on mental health: a systematic review". In: *BMC Psychiatry* 18.1 (Dec. 2018), p. 382. ISSN: 1471-244X. DOI: 10.1186/s12888-018-1945-y. (Visited on 10/29/2024).
- [9] Kyli Hedrick et al. "Self-harm in the Australian asylum seeker population: A national records-based study". In: *SSM - Population Health* 8 (Aug. 2019), p. 100452. ISSN: 23528273. DOI: 10.1016/j.ssmph.2019.100452. (Visited on 10/29/2024).
- [10] Global Detention Project. *United Kingdom Immigration Detention Profile*. <https://www.globaldetentionproject.org/countries/europe/united-kingdom>. 2024. (Visited on 11/02/2024).
- [11] Vladeta Ajdacic-Gross et al. "Methods of suicide: international suicide patterns derived from the WHO mortality database". In: *Bulletin of the World Health Organization* 86.9 (June 2008), p. 726. DOI: 10.2471/BLT.07.043489. (Visited on 10/29/2024).
- [12] Aymeric Becq, Marine Camus, and Xavier Dray. "Foreign body ingestion: dos and don'ts". In: *Frontline Gastroenterology* 12.7 (Dec. 2021), pp. 664–670. ISSN: 2041-4137, 2041-4145. DOI: 10.1136/flgastro-2020-101450. (Visited on 05/15/2025).
- [13] Steven O. Ikenberry et al. "Management of ingested foreign bodies and food impactions". In: *Gastrointestinal Endoscopy* 73.6 (June 2011), pp. 1085–1091. ISSN: 00165107. DOI: 10.1016/j.gie.2010.11.010. (Visited on 11/18/2024).
- [14] Michael Birk et al. "Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline". In: *Endoscopy* 48.05 (Feb. 2016), pp. 489–496. ISSN: 0013-726X, 1438-8812. DOI: 10.1055/s-0042-100456. (Visited on 11/08/2024).
- [15] Melanie Vujkovic. "The suffering of Omid: How a burns victim died despite injuries that were 'very survivable'". In: *ABC News* (Mar. 2019). (Visited on 10/29/2024).
- [16] Antony Hsieh et al. "Trends and clinical features of intentional and accidental adult foreign body ingestions in the United States, 2000 to 2017". In: *Gastrointestinal Endoscopy* 91.2 (Feb. 2020), 350–357.e1. ISSN: 0016-5107, 1097-6779. DOI: 10.1016/j.gie.2019.09.010. (Visited on 11/02/2024).
- [17] Renee Palta et al. "Foreign-body ingestion: characteristics and outcomes in a lower socioeconomic population with predominantly intentional ingestion." In: *Gastrointestinal endoscopy* 69.3 Pt 1 (Mar. 2009), pp. 426–433. ISSN: 1097-6779 0016-5107. DOI: 10.1016/j.gie.2008.05.072.
- [18] F. G. Moehlau. "Gastrostomy in the Seventeenth Century". In: *Buffalo Medical Journal* 35.5 (Dec. 1895), pp. 395–397. ISSN: 1040-3817.
- [19] James H Saint. "Surgery Of The Esophagus". In: *Archives of Surgery* 19.1 (July 1929), pp. 53–128. ISSN: 0272-5533. DOI: 10.1001/archsurg.1929.01150010056003. (Visited on 04/15/2025).
- [20] J. L. Barros et al. "Foreign body ingestion: management of 167 cases". In: *World Journal of Surgery* 15.6 (1991), pp. 783–788. ISSN: 0364-2313. DOI: 10.1007/BF01665320.
- [21] William Lerche. "THE ESOPHAGOSCOPE IN REMOVING SHARP FOREIGN BODIES FROM THE ESOPHAGUS". In: *Journal of the American Medical Association* LVI.9 (Mar. 1911), p. 634. ISSN: 0002-9955. DOI: 10.1001/jama.1911.02560090004002. (Visited on 04/15/2025).
- [22] Chevalier L. Jackson. "Foreign bodies in the esophagus". In: *The American Journal of Surgery* 93.2 (Feb. 1957), pp. 308–312. ISSN: 00029610. DOI: 10.1016/0002-9610(57)90783-3. (Visited on 04/15/2025).
- [23] S. G. Chalk. "Foreign Bodies In The Stomach: Report Of A Case In Which More Than Two Thousand Five Hundred Foreign Bodies Were Found". In: *Archives of Surgery* 16.2 (Feb. 1928), p. 494. ISSN: 0272-5533. DOI: 10.1001/archsurg.1928.01140020045003. (Visited on 04/15/2025).
- [24] G. C. Ricote et al. "Fiberendoscopic removal of foreign bodies of the upper part of the gastrointestinal tract". In: *Surgery, Gynecology & Obstetrics* 160.6 (June 1985), pp. 499–504. ISSN: 0039-6087.
- [25] Raffaella Puggioni. "Speaking through the body: detention and bodily resistance in Italy". In: *Citizenship Studies* 18.5 (July 2014), pp. 562–577. ISSN: 1362-1025. DOI: 10.1080/13621025.2014.923707. (Visited on 10/29/2024).
- [26] David F. Gitlin et al. "Foreign-body ingestion in patients with personality disorders". In: *Psychosomatics* 48.2 (2007), pp. 162–166. ISSN: 0033-3182. DOI: 10.1176/appi.psy.48.2.162.
- [27] Samuel Tromans et al. "Deliberate ingestion of foreign bodies as a form of self-harm among inpatients within forensic mental health and intellectual disability services". In: *Journal of Forensic Psychiatry & Psychology* 30.2 (Apr. 2019), pp. 189–202. ISSN: 1478-9949. DOI: 10.1080/14789949.2018.1530287.
- [28] Firas Shaker Mahmoud Al-Faham and Samer Makki Mohamed Al-Hakkak. "The largest esophageal foreign body in adults: A case report". In: *Annals of Medicine and*

- Surgery* (2012) 54 (June 2020), pp. 82–84. ISSN: 2049-0801. DOI: 10.1016/j.amsu.2020.04.039.
- [29] Ioannis Pantazopoulos et al. “Intentional ingestion of batteries and razor blades by a prisoner: A true emergency?” In: *International Journal of Prisoner Health* 18.3 (2022), pp. 316–322. ISSN: 1744-9200. DOI: 10.1108/IJPH-06-2021-0054.
- [30] Guy Aitchison and Ryan Essex. “Self-harm in immigration detention: political, not (just) medical”. In: *Journal of Medical Ethics* 50.11 (Nov. 2024), pp. 786–793. ISSN: 0306-6800, 1473-4257. DOI: 10.1136/jme-2022-108366. (Visited on 10/29/2024).
- [31] Brittany A. Poynter et al. “Hard to swallow: a systematic review of deliberate foreign body ingestion.” In: *General hospital psychiatry* 33.5 (Oct. 2011), pp. 518–524. ISSN: 1873-7714 0163-8343. DOI: 10.1016/j.genhosppsych.2011.06.011.
- [32] J. E. Losanoff, K. T. Kjossev, and H. E. Losanoff. “Oesophageal “cross”—a sinister foreign body”. In: *Journal Of Accident & Emergency Medicine* (1997). DOI: 10.1136/emj.14.1.54.
- [33] Kari E. Blaho et al. “Foreign Body Ingestions in the Emergency Department: Case Reports and Review of Treatment”. In: *Journal of Emergency Medicine* 16.1 (Jan. 1998), pp. 21–26. ISSN: 0736-4679, 1090-1280. DOI: 10.1016/S0736-4679(97)00229-1. (Visited on 04/14/2025).
- [34] Paresh A. Jaini, James Haliburton, and A. John Rush. “Management Challenges of Recurrent Foreign Body Ingestions in a Psychiatric Patient: A Case Report.” In: *Journal of psychiatric practice* 29.2 (Mar. 2023), pp. 167–173. ISSN: 1538-1145 1527-4160. DOI: 10.1097/PRA.0000000000000694.
- [35] Dinesh Bhugra, Thomas K. J. Craig, and Kamaldeep Bhui. *Mental Health of Refugees and Asylum Seekers*. OUP Oxford, Aug. 2010. ISBN: 978-0-19-955722-6.
- [36] Elisa Haase et al. “Prevalence of suicidal ideation and suicide attempts among refugees: a meta-analysis”. In: *BMC Public Health* 22.1 (Apr. 2022), p. 635. ISSN: 1471-2458. DOI: 10.1186/s12889-022-13029-8. (Visited on 10/29/2024).
- [37] Kyli Hedrick and Rohan Borschmann. “Self-harm among unaccompanied asylum seekers and refugee minors: protocol for a global systematic review of prevalence, methods and characteristics”. In: *BMJ Open* 13.6 (June 2023), e069237. ISSN: 2044-6055, 2044-6055. DOI: 10.1136/bmjopen-2022-069237. (Visited on 10/29/2024).
- [38] Matthew J Page et al. “The PRISMA 2020 statement: an updated guideline for reporting systematic reviews”. In: *BMJ* (Mar. 2021), n71. ISSN: 1756-1833. DOI: 10.1136/bmj.n71. (Visited on 12/10/2024).
- [39] Microsoft Corporation. *Microsoft Excel*. 2025.
- [40] S Moola et al. “Chapter 7: Systematic reviews of etiology and risk”. In: *JBIM Manual for Evidence Synthesis*. JBI, 2020. ISBN: 978-0-648-84880-6. DOI: 10.46658/JBIMES-20-08. (Visited on 05/07/2025).
- [41] Seval Akay et al. “A Deliberately Swallowed Foreign Body: Money Package”. In: *Endoscopy* (2015). DOI: 10.1055/s-0035-1569668.
- [42] Firas Shaker Mahmoud Al-Faham and Samer Makki Mohamed Al-Hakkak. “The Largest Esophageal Foreign Body In Adults: A Case Report”. In: *Annals Of Medicine And Surgery* (2012) (2020). DOI: 10.1016/j.amsu.2020.04.039.
- [43] Raya Al Shaaibi and Ibrahim Al Waili. “Laparoscopic Retrieval Of Ingested Foreign Body”. In: *Oman Medical Journal* (2021). DOI: 10.5001/omj.2021.35.
- [44] A. O. Alao and B. Abraham. “Foreign Body Ingestions In A Schizophrenic Patient”. In: *West African Journal Of Medicine* (2006). DOI: 10.4314/wajm.v25i3.28286.
- [45] Syed Muhammad Ali. “Duodenal Perforation by Swallowed Toothbrush: Case Report and Review of Literature”. In: *Open Access Journal of Surgery* 4.2 (May 2017). ISSN: 24761346. DOI: 10.19080/OAJS.2017.04.555632. (Visited on 04/14/2025).
- [46] Alaa Ali and Saeed Alhindi. “A Child With A Gastrocolic Fistula After Ingesting Magnets: An Unusual Complication”. In: *Cureus* (2020). DOI: 10.7759/cureus.9336.
- [47] Ahmed Ali et al. “Endoscopic Retrieval Of An Ingested Mobile Phone From The Stomach Of A Prisoner: When Gastroenterologists Answer The Call”. In: *Cureus* (2022). DOI: 10.7759/cureus.33053.
- [48] Sharie Apikotoa, Helen Ballal, and Ruwan Wijesuriya. “Endoscopic Foreign Body Retrieval From The Caecum - A Case Report And Push For Intervention Guidelines”. In: *International Journal Of Surgery Case Reports* (2022). DOI: 10.1016/j.ijscr.2022.106755.
- [49] A. Ataya, A.H. Alraiyes, and M.C. Alraiyes. “Razor blades in the stomach”. In: *QJM: An International Journal of Medicine* 106.8 (Aug. 2013), pp. 783–784. ISSN: 1460-2725. DOI: 10.1093/qjmed/hcs165. (Visited on 04/14/2025).
- [50] Yahya Atayan et al. “Lighter Ingestion as an Uncommon Cause of Severe Vomiting in a Schizophrenia Patient”. In: *Case Reports in Gastrointestinal Medicine* 2016 (2016), p. 6301302. ISSN: 2090-6528. DOI: 10.1155/2016/6301302.
- [51] N. Beecroft et al. “An unusual case of pica”. In: *International Journal of Geriatric Psychiatry* 13.9 (Sept. 1998), pp. 638–641. ISSN: 0885-6230. DOI: 10.1002/(sici)1099-1166(199809)13:9<638::aid-gps837>3.0.co;2-n.
- [52] Lbl Benoist et al. “A Jackass And A Fish: A Case Of Life-Threatening Intentional Ingestion Of A Live Pet Catfish *Corydoras Aeneus*”. In: *Acta Oto-Laryngologica Case Reports* (2019). DOI: 10.1080/23772484.2018.1555436.
- [53] P Berry and S Kotha. “Crying Wolf: The Danger Of Recurrent Intentional Foreign Body Ingestion”. In: *Frontline Gastroenterology* (2021). DOI: 10.1136/flgastro-2021-101888.
- [54] Sanjay K. Bhasin et al. “7” long knife for 7 years in the duodenum: a rare case report and review of literature”. In: *International Surgery Journal* 1.1 (2014), pp. 29–32. ISSN: 2349-2902. (Visited on 04/14/2025).
- [55] Prosanta Bhattacharjee and Om Singh. “Repeated ingestion of sharp-pointed metallic objects”. In: *Archives of Iranian medicine* 11 (Oct. 2008), pp. 563–5.
- [56] Sriya Bhumi et al. “Esophageal Button Battery Retrieval: Time-In May Not Be Everything”. In: *Cureus* (2024). DOI: 10.7759/cureus.58327.
- [57] Cristina Camacho Dorado et al. “Metallic bezoar after suicide attempt”. In: *Cirugia Espanola* 96.8 (Oct. 2018),

- p. 515. ISSN: 2173-5077. DOI: 10.1016/j.ciresp.2018.02.015.
- [58] J. A. Cauchi and R. N. Shawis. "Multiple magnet ingestion and gastrointestinal morbidity". In: *Archives of Disease in Childhood* 87.6 (Dec. 2002), pp. 539–540. ISSN: 1468-2044. DOI: 10.1136/ad.87.6.539.
- [59] Wen-Jung Chang and Wen-Yi Chiu. "Gastric Foreign Body: A Comb". In: *Clinical Case Reports* (2017). DOI: 10.1002/ccr3.957.
- [60] David Cox, Peter Donohue, and Vanda Costa. "A swallowed toothbrush causing perforation 2 years after ingestion". In: *British Journal of Hospital Medicine (London, England: 2005)* 68.10 (Oct. 2007), p. 559. ISSN: 1750-8460. DOI: 10.12968/hmed.2007.68.10.27330.
- [61] G Csaky et al. "Laparoscopic Removal Of A Foreign Body From The Jejunum". In: *Surgical Laparoscopy & Endoscopy* (1998). DOI: 10.1097/00019509-199802000-00016.
- [62] Jhony Alejandro Delgado Salazar et al. "Ingestion of razor blades, a rare event: a case report in a psychiatric patient". In: *Journal of Surgical Case Reports* 2020.5 (May 2020), rjaa094. ISSN: 2042-8812. DOI: 10.1093/jscr/rjaa094. (Visited on 04/14/2025).
- [63] Divsalar P., Mousa S.H., and Abbasi M.H. "Repeated Intentional Swallowing Of Foreign Objects By An Adolescent Girl Case Report". In: *International Journal Of High Risk Behaviors And Addiction* (2023). DOI: 10.5812/ijhrba-134720.
- [64] Mohammad Ali Emamhadi et al. "Sudden Death Following Oral Intake of Metal Objects (Acuphagia): a Case Report". In: *Emergency (Tehran, Iran)* 6.1 (2018), e16. ISSN: 2345-4563.
- [65] Farbod Farhadi et al. "This is a successful removal of more than 450 pieces of metal objects from a patient's stomach: a case report". In: *Journal of Medical Case Reports* 18.1 (Aug. 2024), p. 381. ISSN: 1752-1947. DOI: 10.1186/s13256-024-04672-3.
- [66] Emily Fry and Francis L. Counselman. "A right scrotal abscess and foreign body ingestion in a schizophrenic patient". In: *The Journal of Emergency Medicine* 38.5 (June 2010), pp. 587–592. ISSN: 0736-4679. DOI: 10.1016/j.jemermed.2007.07.018.
- [67] Andrew W. Gardner et al. "Double Duodenal Perforation Following Foreign Body Ingestion". In: *Bmj Case Reports* (2017). DOI: 10.1136/bcr-2017-223182.
- [68] R. D. Goldman et al. "A Bizarre Bezoar: Case Report And Review Of The Literature". In: *Pediatric Surgery International* (1998). DOI: 10.1007/s003830050492.
- [69] D. Guinan et al. "Intentional Foreign Body Ingestion: A Complex Case Of Pica". In: *Case Reports In Gastrointestinal Medicine* (2019). DOI: 10.1155/2019/7026815.
- [70] John C. Hardy et al. "Loose Screws: Removal of Foreign Bodies From the Lower Gastrointestinal Tract". In: *Cureus* 15.8 (Aug. 2023). ISSN: 2168-8184. DOI: 10.7759/cureus.43093. (Visited on 03/30/2025).
- [71] Maham Jehangir, Christopher Mallory, and Jonathan R. Medverd. "Digital Tomosynthesis For Detection Of Ingested Foreign Objects In The Emergency Department: A Case Of Razor Blade Ingestion". In: *Emergency Radiology* (2019). DOI: 10.1007/s10140-018-01664-x.
- [72] Shengjian Jin et al. "Metallic foreign bodies ingestion by schizophrenic patient: a case report". In: *Annals of Medicine and Surgery* 85.4 (Apr. 2023), p. 1270. ISSN: 2049-0801. DOI: 10.1097/MS9.0000000000000497. (Visited on 03/30/2025).
- [73] Sujita Kumar Kar, Abhilove Kamboj, and Rajesh Kumar. "Pica and psychosis - clinical attributes and correlations: a case report". In: *Journal of Family Medicine and Primary Care* 4.1 (2015), pp. 149–150. ISSN: 2249-4863. DOI: 10.4103/2249-4863.152277.
- [74] P. L. Kariholu et al. "Pica - a case of acuphagia or hyalophagia?" In: *The Indian Journal of Surgery* 70.3 (June 2008), pp. 144–146. ISSN: 0972-2068. DOI: 10.1007/s12262-008-0040-x.
- [75] T Kerestes and J Smith. "Paper or Plastic? A Foreign Body Ingestion Leading to Small Bowel Obstruction. A Case Report". In: *ARC Journal of Clinical Case Reports* 5.2 (2019). ISSN: 24559806. DOI: 10.20431/2455-9806.0502002. (Visited on 04/14/2025).
- [76] Jarek Kobiela et al. "Vast collection of foreign bodies in the stomach presenting as acute gastrointestinal bleeding in a patient with schizophrenia". In: *Endoscopy* 47.S 01 (July 2015), E356–E357. ISSN: 0013-726X, 1438-8812. DOI: 10.1055/s-0034-1392611. (Visited on 04/14/2025).
- [77] A. Kumar and A. R. Jazieh. "Case report of sideroblastic anemia caused by ingestion of coins". In: *American Journal of Hematology* 66.2 (Feb. 2001), pp. 126–129. ISSN: 0361-8609. DOI: 10.1002/1096-8652(200102)66:2<126::AID-AJH1029>3.0.CO;2-J.
- [78] Ranesh Kumar et al. "Intentional Foreign Body Ingestion". In: *Internal And Emergency Medicine* (2019). DOI: 10.1007/s11739-019-02183-4.
- [79] Jun Hyung Lee et al. "What Is The Role Of Plain Radiography In Patients With Foreign Bodies In The Gastrointestinal Tract?" In: *Clinical Imaging* (2012). DOI: 10.1016/j.clinimag.2011.11.017.
- [80] Quan-Peng Li et al. "Endoscopic retrieval of 28 foreign bodies in a 100-year-old female after attempted suicide". In: *World Journal of Gastroenterology* 19.25 (July 2013), pp. 4091–4093. ISSN: 2219-2840. DOI: 10.3748/wjg.v19.i25.4091.
- [81] Steven Liu et al. "Magnetic foreign body ingestions leading to duodenocolonic fistula". In: *Journal of Pediatric Gastroenterology and Nutrition* 41.5 (Nov. 2005), pp. 670–672. ISSN: 0277-2116. DOI: 10.1097/01.mpg.0000177703.99786.c9.
- [82] J. E. Losanoff and K. T. Kjossev. "Gastrointestinal 'crosses'. A new shade from an old palette." In: *Archives of surgery (Chicago, Ill. : 1960)* 131.2 (Feb. 1996), pp. 166–169. ISSN: 0004-0010. DOI: 10.1001/archsurg.1996.01430140056015.
- [83] Telila Mesfin et al. "Ingestion of Metallic Materials Found in the Stomach and First Part of the Duodenum of a Schizophrenic Man: Case Report". In: *International Medical Case Reports Journal* 15 (2022), pp. 681–684. ISSN: 1179-142X. DOI: 10.2147/IMCRJ.S386883.
- [84] S. Misra et al. "Metallic sewing needle ingestion presenting as acute abdomen". In: *Nigerian Journal of Clinical Practice* 16.4 (2013), pp. 540–543. ISSN: 1119-3077. DOI: 10.4103/1119-3077.116879.

- [85] Hussein Naji et al. "Bowel Injuries Caused By Ingestion Of Multiple Magnets In Children: A Growing Hazard". In: *Pediatric Surgery International* (2012). DOI: 10.1007/s00383-011-3026-x.
- [86] Yasuharu Ohno et al. "Gastroduodenal fistula caused by ingested magnets". In: *Gastrointestinal Endoscopy* 61.1 (Jan. 2005), pp. 109–110. ISSN: 0016-5107. DOI: 10.1016/s0016-5107(04)02387-9.
- [87] A. Peixoto, P. Pereira, and G. Macedo. "Gastrointestinal: Voluntary Padlock Ingestion". In: *Journal Of Gastroenterology And Hepatology* (2017). DOI: 10.1111/jgh.13828.
- [88] Nafees Ahmad Qureshi et al. "Endoscopic Retrieval of an Intentionally Ingested Mobile Phone in an Adult: First Case Report of its Kind". In: *Annals of Clinical Case Reports* 1 (2016).
- [89] Carlo Galdino Riva et al. "Unusual Foreign Body Impacted In The Upper Oesophagus: Original Technique For Transoral Extraction". In: *Bmj Case Reports* (2018). DOI: 10.1136/bcr-2018-225241.
- [90] Timothy Sakellaridis et al. "An Unusual Case Of A Swallowed Thermometer Perforated In The Mediastinum". In: *Annals Of Thoracic Surgery* (2008). DOI: 10.1016/j.athoracsur.2007.07.027.
- [91] J Sharma, S Riyaz, and Wj Kilpatrick. "Multi-Disciplinary Approach To Managing Deliberate Foreign Body Ingestion On The Medical Floor". In: *Journal Of The Academy Of Consultation-Liaison Psychiatry* (2022). DOI: 10.1016/j.jaclp.2022.10.025.
- [92] Sanju Sobnach et al. "Penetrating Cardiac Injury Following Sewing Needle Ingestion". In: *Heart, Lung & Circulation* (2011). DOI: 10.1016/j.hlc.2011.01.006.
- [93] Noran Sultan et al. "A Plastic Bezoar Causing Bowel Obstruction: A Case Of Table Cover Ingestion". In: *International Journal Of Surgery Case Reports* (2024). DOI: 10.1016/j.ijscr.2024.109506.
- [94] V. S. Tammana, N. Valluru, and A. Sanderson. "All The Wrong Places: An Unusual Case Of Foreign Body Ingestion And Inhalation". In: *Case Reports In Gastroenterology* (2012). DOI: 10.1159/000346287.
- [95] Y Tanrikulu et al. "Ingestion Of Multiple Magnets For Suicide". In: *Hong Kong Journal Of Emergency Medicine* (2015). DOI: 10.1177/102490791502200107.
- [96] Ee Tein Tay, Gerard Weinberg, and Terry L. Levin. "Ingested magnets: the force within". In: *Pediatric Emergency Care* 20.7 (July 2004), pp. 466–467. ISSN: 1535-1815. DOI: 10.1097/01.pec.0000134926.03030.a7.
- [97] Niresh Thapa, Subi Basnyat, and Muna Maharjan. "Ingestion Of Bell Clappers By A Shaman In Jumla, Nepal: A Case Report". In: *Injma; Journal Of The Nepal Medical Association* (2019). DOI: 10.31729/jnma.4055.
- [98] Gorana Trgo et al. "Successful Endoscopic Removal Of A Lighter Swallowed 17 Months Before". In: *Case Reports In Gastroenterology* (2012). DOI: 10.1159/000338839.
- [99] J. P. Tupesis et al. "A Penny For Your Thoughts: Small Bowel Obstruction Secondary To Coin Ingestion". In: *Journal Of Emergency Medicine* (2004). DOI: 10.1016/j.jemermed.2004.03.013.
- [100] C Wadhwa et al. "The Mule With Golden Eggs: Retrieval Of Unusual Foreign Body". In: *Journal Of Digestive Endoscopy* (2015). DOI: 10.4103/0976-5042.159247.
- [101] Barbara E. Wildhaber, Claude Le Coultre, and Bernard Genin. "Ingestion of magnets: innocent in solitude, harmful in groups". In: *Journal of Pediatric Surgery* 40.10 (Oct. 2005), e33–35. ISSN: 1531-5037. DOI: 10.1016/j.jpedsurg.2005.06.022.
- [102] Bartosz Wnęk, Aleksandra Łożyńska-Nelke, and Jacek Karoń. "Foreign Body In The Gastrointestinal Tract Leading To Small Bowel Obstruction—Case Report And Literature Review". In: *Polski Przegląd Chirurgiczny* (2015). DOI: 10.1515/pjs-2015-0006.
- [103] Malik Amjad Yasin et al. "Metal in stomach: a rare cause of gastric bezoar". In: *BMJ Case Reports* 2009 (Feb. 2009), bcr06.2008.0278. ISSN: 1757-790X. DOI: 10.1136/bcr.06.2008.0278. (Visited on 04/14/2025).
- [104] I Yildiz et al. "Tendency To Ingest Foreign Bodies In Mentally Retarded Patients: A Case With Ileal Perforation Caused By The Ingestion Of A Teaspoon". In: *Case Reports In Surgery* (2016). DOI: 10.1155/2016/8075432.
- [105] Fj Buils. "Repeated Behavior Of Deliberate Foreign Body Ingestion In A Patient With Psychiatric Disorder". In: *A Case Report. Clin Surg* (2024). DOI: 10.52916/jmrs244144.
- [106] Bert T. te Wildt et al. "Swallowing Foreign Bodies as an Example of Impulse Control Disorder in a Patient With Intellectual Disabilities". In: *Psychiatry (Edgmont)* 7.9 (Sept. 2010), pp. 34–37. ISSN: 1550-5952. (Visited on 04/14/2025).
- [107] Mohamed amine Elghali et al. "The Management of Voluntary Ingestion of Razor Blades by Inmates". In: *International Surgery* 105.1-3 (Nov. 2016), pp. 129–133. ISSN: 0020-8868. DOI: 10.9738/INTSURG-D-16-00204.1. (Visited on 04/14/2025).
- [108] J. G. Karp, L. Whitman, and A. Convit. "Intentional ingestion of foreign objects by male prison inmates". In: *Hospital & Community Psychiatry* 42.5 (May 1991), pp. 533–535. ISSN: 0022-1597. DOI: 10.1176/ps.42.5.533.
- [109] Tae Hee Lee et al. "Foreign Objects in Korean Prisoners". In: *The Korean Journal of Internal Medicine* 22.4 (Dec. 2007), pp. 275–278. ISSN: 1226-3303, 2005-6648. DOI: 10.3904/kjim.2007.22.4.275. (Visited on 04/14/2025).
- [110] Python Software Foundation. *Python*. May 2025.
- [111] The Pandas Development Team. *pandas-dev/pandas: Pandas*. Zenodo. Mar. 2020. DOI: 10.5281/zenodo.13819579. (Visited on 04/03/2025).
- [112] Fabian Pedregosa et al. "Scikit-learn: Machine Learning in Python". In: *Journal of Machine Learning Research* 12.85 (2011), pp. 2825–2830. ISSN: 1533-7928. (Visited on 04/04/2025).
- [113] American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (5th ed.)* 2013.
- [114] UN General Assembly. *Protocol Relating to the Status of Refugees*. Jan. 1967. (Visited on 05/27/2025).
- [115] Francis Mading Deng, UN Representative of the Secretary-General on Internally Displaced Persons, and UN Office for the Coordination of Humanitarian Affairs. *Guiding Principles on Internal Displacement*. Tech. rep. UN Doc E/CN.4/1998/53/Add.2. United Nations Commission on Human Rights, Feb. 1998. (Visited on 03/31/2025).

- [116] United Nations High Commissioner for Refugees. *Asylum-seekers*. <https://www.unhcr.org/us/about-unhcr/who-we-protect/asylum-seekers>. 2025. (Visited on 05/27/2025).

APPENDIX A ELIGIBILITY CRITERIA

A. Inclusion Criteria

Category	Details
Population	Any human. Any age group.
Interventions or exposures	Humans that have: – Non-accidental – Ingestion of a true foreign body (non-nutritive items)
Comparators / Control group	Motivation/reason for ingestion: – Protest – Suicidal intent – Self-harm – Psychiatric and other documented motivations Intervention details: – Number of ingestions – Management strategies (Conservative, Endoscopic, Surgical) Object characteristics: – Multiple objects – Blunt objects – Sharp-pointed objects – Long objects (>6 cm) – Short objects (≤6 cm)
Outcomes of interest	Setting/location – Endoscopic intervention – Surgical intervention – Conservative management – Complication rates – Mortality rates
Setting	Any setting.
Study designs	– Observational studies (cohort, case-control, cross-sectional) – Case series – Clinical trials – Case reports

B. Exclusion Criteria

#	Exclusion Criterion
1	Full text not available in English.
2	Studies not focusing on intentional self-ingestion (into the gastrointestinal tract) of foreign object via the oral cavity (mouth) or where unclear if ingested.
3	Studies focussing solely on accidental ingestion.
4	Non-human or animal studies.
5	Reviews, editorials, commentaries, and opinion pieces without original empirical data.
6	Duplicate publications or studies with overlapping data sets (the most comprehensive or recent study will be included).
7	Studies focusing on ingestion or co-ingestion of substances (e.g. poisons, medications) rather than physical foreign objects.
8	Ingestions undertaken in controlled environments as part of a voluntary study.
9	Ingestions not explicitly stated to be intentional and history not suggestive of deliberate ingestion (i.e. Age < 8, no history of previous ingestions, no psychiatric co-morbidities, not a prisoner/detainee/vulnerable group).
10	Does not meet inclusion criteria.
11	Ingestions where death resulted from other means (i.e. suicide).
12	Studies before the advent of endoscopy (1906).

APPENDIX B KEYWORDS AND MESH TERMS

A. PubMed

Concept	Keywords	MeSH Terms
Foreign Bodies	"foreign obj*" "foreign bod*"	Foreign Bodies [MeSH]
Intentional Ingestion / Self-harm	"intent*" "deliberate*" "purpose*" "self-injur*" "selfharm*" "self-harm*"	Self-Injurious Behavior [MeSH]
Ingestion Behavior	"ingest*" "swallow*"	—
Interventions	"surg*" "endoscop*" "EGD" "OGD" "Esophagogastroduodenoscopy" "Oesophagogastroduodenoscopy" "manag*"	Endoscopy [MeSH] Surgical Procedures, Operative [MeSH] Conservative Treatment [MeSH] Drug Therapy [MeSH]

TABLE VI: Concepts with associated keywords and MeSH terms used in PubMed search strategy.

B. Embase

Concept	Keywords	EMTREE Terms
Foreign Bodies	"foreign obj*" "foreign bod*"	"foreign body"/exp
Intentional Ingestion / Self-harm	"intent*" "deliberate*" "purpose*" "self-injur*" "selfharm*" "self-harm*"	"automutilation"/exp
Ingestion Behavior	"ingest*" "swallow*"	"swallowing"/exp
Interventions	"surg*" "endoscop*" "EGD" "OGD" "Esophagogastroduodenoscopy" "Oesophagogastroduodenoscopy" "manag*"	"endoscopy"/exp "surgery"/exp "conservative treatment"/exp "drug therapy"/exp

TABLE VII: Concepts with associated keywords and EMTREE terms used in Embase search strategy.

C. Cochrane (CENTRAL)

Concept	Keywords	Cochrane MeSH Terms
Foreign Bodies	"foreign obj*" "foreign bod*" (foreign NEXT obj*) (foreign NEXT bod*) intent* deliberate*	[mh foreign bodies]
Intentional Ingestion / Self-harm	purpose* (self NEXT injur*) (self NEXT harm*)	[mh self-injurious behavior]
Ingestion Behavior	ingest* swallow* surg* endoscop*	—
Interventions	EGD Esophagogastroduodenoscopy Oesophagogastroduodenoscopy manag*	[mh endoscopy] [mh surgical procedures, operative] [mh conservative treatment] [mh drug therapy]

TABLE VIII: Concepts with associated keywords and Cochrane MeSH terms used in CENTRAL search strategy.

D. Web of Science

Concept	Keywords	Search Field
Foreign Bodies	foreign obj* foreign bod* automutilation intent* deliberate*	ALL=
Intentional Ingestion / Self-harm	purpose* self-injur* selfharm* self-harm* swallowing	ALL=
Ingestion Behavior	ingest* swallow* endoscopy surgery conservative treatment drug therapy	ALL=
Interventions	surg* endoscop* EGD Esophagogastroduodenoscopy Oesophagogastroduodenoscopy manag*	ALL=

TABLE IX: Concepts with associated keywords and Web of Science fields used in the search strategy.

E. Scopus

Concept	Keywords	Search Field / Syntax
Foreign Bodies	foreign PRE/0 obj* foreign PRE/0 bod* intent* deliberate*	ALL()
Intentional Ingestion / Self-harm	purpose* self PRE/0 injur* self PRE/0 harm*	ALL()
Ingestion Behavior	ingest* swallow* endoscopy surgery 'conservative' 'treatment' 'drug' 'therapy'	ALL()
Interventions	surg* endoscop* egd esophagogastroduodenoscopy oesophagogastroduodenoscopy manag*	ALL()

TABLE X: Concepts with associated keywords and Scopus syntax used in the search strategy.

F. PsycINFO

Concept	Keywords	PsycINFO Descriptors
Foreign Bodies	foreign obj* foreign bod* automutilation intent* deliberate*	—
Intentional Ingestion / Self-harm	purpose* self injur* self harm*	DE "Nonsuicidal Self-Injury"
Ingestion Behavior	ingest* swallow* endoscop* conservative treatment drug therapy	DE "Ingestion"
Interventions	surg* egd esophagogastroduodenoscopy oesophagogastroduodenoscopy manag*	DE "Surgery"

TABLE XI: Concepts with associated keywords and controlled vocabulary (Descriptors) used in PsycINFO search strategy.

G. Google Scholar

Concept	Keywords	Search Field
Foreign Bodies	"foreign obj*" "foreign bod*" "intent*" "deliberate*"	—
Intentional Ingestion / Self-harm	"purpose*" "self-injur*" "selfharm*" "self-harm*"	—
Ingestion Behavior	"ingest*" "swallow*"	—

TABLE XII: Concepts with associated keywords used in Google Scholar search strategy.

APPENDIX C

VARIABLE DEFINITIONS

Used for case report data extraction. Aggregates of which were used to create Variable_Rate and Variable_Cases.

Variable	Definition
Is_Prisoner	Documented in prison, police custody, or detained (including immigration detention) at the time of the encounter; 'N' if not detained; 'UK' if unknown.
Psych_Hx	Documented DSM-V mental disorder (including substance-related disorders) [113]; 'N' if no diagnosis; 'UK' if data unavailable.
Is_Displaced_Person	'Y' if: meets the UN General Assembly [114] definition of 'Refugee'; or meets UNHCR [115] definition of an 'internally displaced person'; or meets the UNHCR [116] definition for 'asylum seeker'; 'N' if not displaced; 'UK' if unknown.
Under_Influence_Alcohol	Evidence, suspicion, or self-report of alcohol influence at presentation; 'N' if no indication; 'UK' if unknown.
Is_Psych_Inpat	Admitted (voluntarily or involuntarily) to a psychiatric facility/ward at encounter; 'N' if not admitted; 'UK' if unknown.
Severe_Disability_Hx	History of severe learning disability or impaired consciousness; 'N' if absent; 'UK' if unknown.
Previous_Ingestions	Prior episode of foreign-body ingestion documented; 'N' if first ingestion; 'UK' if history unknown.
Motivation_Intent_To_Harm	Ingestion intended for self-harm, self-injury, or suicide; 'N' if other motive; 'UK' if unclear.
Motivation_Protest	Ingestion as protest, demonstration, or manipulation (e.g., objection to detention conditions); 'N' if not protest-related; 'UK' if unclear.
Motivation_Psychiatric	Ingestion driven primarily by an underlying psychiatric condition (psychosis, impulsivity, etc.); 'N' if not psychiatric; 'UK' if unclear.
Motivation_Psychosocial	Ingestion motivated by social or interpersonal factors (imitative acts, shock value, body-image, safekeeping, etc.); 'N' if not psychosocial; 'UK' if unclear.
Motivation_Unknown	No clear motivation identified in documentation; 'N' if specific motive recorded; 'UK' if ambiguous.
Object_Button_Battery	Button battery ingested; 'N' if not; 'UK' if object type not recorded.
Object_Magnet	Magnet ingested; 'N' if none; 'UK' if unknown.
Object_Long	Ingested object length > 5 cm; 'N' if ≤ 5 cm; 'UK' if dimensions unknown.
Object_Sharp	Object described as sharp or pointed (e.g., blades, nails, needles); 'N' if not sharp; 'UK' if unclear.
Object_Multiple	More than one object ingested in same episode; 'N' for single object; 'UK' if number unspecified.
Object_Unknown	Where object characteristics are unknown. 'N' if known; 'UK' if Unknown.
Outcome_Endoscopy	Endoscopic intervention performed during episode; 'N' if not; 'UK' if unavailable.
Outcome_Surgery	Surgical intervention performed (operative procedure under anaesthesia); 'N' if not; 'UK' if not documented.
Outcome_Conservative	'Y' if managed without endoscopy or surgery; 'N' if either procedure performed.
Outcome_Death	Death causally related to ingestion complications; 'N' if survived; 'UK' if outcome unknown.
Outcome_Complication	'Y' if any complication directly related to ingestion or resulting from management strategy; 'N' if no complication; 'UK' if unknown.
Outcome_Unknown	Where no outcome identified; 'N' if outcome identified; 'UK' if Unknown.