e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(11); 187-192

Original Research Article

Epidemiological Profile, Associated Factors and Endoscopic Outcome in Patients of Foreign Body Ingestion in a Tertiary Care Centre in Western Rajasthan

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Received: 01-08-2025 / Revised: 15-09-2025 / Accepted: 21-10-2025
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Conflict of interest: Nil

Abstract

Background: Foreign body ingestion (FBI) and esophageal food impaction (EFI) are frequent emergencies that demand rapid triage and skilled endoscopic management. Epidemiologic patterns vary widely by age, object type, and setting, and data from resource-constrained regions of India remain sparse.

Methods: We conducted a single-centre, cross-sectional observational study at the Department of Gastroenterology, MDM Hospital, Dr SN Medical College, Jodhpur (Western Rajasthan). After ethics approval, consecutive patients with suspected or confirmed FBI/EFI requiring endoscopic evaluation were enrolled through December 2024. Demographics, clinical features, radiography, procedural details, and outcomes were collected prospectively. Socioeconomic status (SES) used the Revised Kuppuswamy 2021 scale. Normality was assessed by Kolmogorov–Smirnov. Depending on distribution, we used t-tests or Mann–Whitney U for two-group comparisons; ANOVA or Kruskal–Wallis for ≥3 groups; and chi-square for categorical associations. Significance was set at $p<0.05$.

Results: A total of 134 patients were analyzed. Continuous variables (age, time since ingestion, and procedure time) were non-normal except hemoglobin. Sedation was used predominantly in younger patients (Age: sedation vs no sedation, Mann–Whitney U $p=0.000045$). Procedure time differed by instrument (ANOVA $p=0.019$) and age differed by endoscopic location (ANOVA $p=0.009$). Endoscopic location strongly predicted removal success (χ^2 $p<0.000001$). Foreign body type associated with sedation (χ^2 $p=0.0297$) and with gastric ulcer (χ^2 $p=0.0445$); most other cross-tabs were not significant. Overall removal was high (>90%) with very low complication rates (bleeding rare).

Conclusion: In this Western Rajasthan cohort, children predominated, coins and other blunt objects were common, and endoscopic removal was highly successful with minimal complications. Procedural efficiency varied by instrument choice, and success was strongly linked to endoscopic location. These findings reinforce guideline-concordant practice and provide region-specific epidemiologic and operative insights to guide triage, instrumentation, and counselling.

Keywords: Foreign Body Ingestion; Esophageal Food Impaction; Pediatric Gastroenterology; Emergency Endoscopy; Outcomes; Instrumentation; Rajasthan; India.

Introduction

Foreign body ingestion (FBI) and esophageal food impaction (EFI) are among the commonest gastrointestinal emergencies across age groups, yet their epidemiology, clinical trajectories, and resource implications vary strikingly by geography and health-system context [1–3]. In children—especially those 6 months to 6 years—exploration, mouthing behavior, and limited chewing capacity drive a preponderance of blunt objects (coins, toy parts), while in adults, food bolus impaction and psychiatric or neurologic comorbidity are more prominent [1–4]. Although most blunt objects traverse spontaneously, an estimated 10–20% require endoscopic intervention and <1% surgery, a risk that escalates with sharp objects, long/irregular items, multiple magnets, and button batteries, the last two demanding time-critical management to avert pressure necrosis, perforation, and vascular injury [1,5–7]. International societies emphasize risk-stratified urgency based on object morphology

and location, the interval since ingestion, and symptom burden (drooling, dysphagia, chest pain, respiratory compromise) [1,5]. Radiography remains the first-line modality for radiopaque objects, while non-radiopaque items often require clinical stratification, selective cross-sectional imaging, or prompt diagnostic/therapeutic endoscopy [1,5,6]. Endoscopic success hinges on operator expertise and instrument availability—nets, graspers, rat-tooth forceps, and snares—along with adjuncts such as hoods/caps for sharp objects to minimize mucosal trauma [1,5,8]. Sedation and airway management are particularly salient in pediatric cases, where movement control, comfort, and safety must be balanced against hemodynamic and respiratory risks [2,3,8].

Despite an expanding global literature, region-specific data from South Asia remain comparatively limited and heterogenous, and frequently under-report social determinants, pre-hospital delays, and operational barriers (e.g., after-hours access, anesthesia support, and equipment pools) [2,4]. Indian cohorts generally describe a pediatric predominance, coin ingestion as the modal event, and high endoscopic success rates (>90%) in experienced units, but also signal variability in time-to-presentation and instrumentation that may influence mucosal injury, procedure duration, and complication profiles [2,4,9–11]. In Western Rajasthan—a vast, mixed urban-rural catchment—care pathways can be further shaped by distance, health-seeking behaviors, and socioeconomic context, including household literacy, occupation, and disposable income, all of which may modulate both exposure (access to coins/batteries, small household items) and delay to definitive care [9–12]. Yet, standardized appraisal of these socioeconomic gradients alongside endoscopic outcomes is rare.

Against this backdrop, we undertook a single-centre, cross-sectional study at a government tertiary hospital in Jodhpur, Western Rajasthan, with four objectives: (i) delineate the epidemiological profile (demographics, presentation, radiographic and endoscopic localization, object characteristics) of FBI/EFI; (ii) evaluate associated factors (sedation use, need for pushing into stomach, procedure time, ulceration, instrumentation); (iii) quantify endoscopic outcomes (removal success and complications); and (iv) profile family socioeconomic status using the Revised Kuppuswamy 2021 scale. We prespecified rigorous statistical handling—testing normality and applying parametric or non-parametric methods as appropriate—to maximize inferential clarity for clinical decision-making. We hypothesized that endoscopic location would be a key determinant of removal success, instrument choice would influence procedure time, and younger age would associate with sedation—patterns consistent with international guidance but requiring local validation in a resource-constrained, high-volume Indian setting [1–8,11,12].

Materials and Methods

Study design and setting: Single-centre, cross-sectional observational study at the Department of Gastroenterology, MDM Hospital, Dr SN Medical College, Jodhpur (Western Rajasthan), enrolling consecutive patients with FBI/EFI requiring endoscopic evaluation and/or intervention through December 2024 after institutional ethics approval.

Participants: Inclusion: patients (all ages) with suspected/confirmed FBI or EFI needing endoscopic intervention, presenting to or referred into our department. Exclusion: none beyond the absence of an endoscopic indication. In pediatric cases, evaluation incorporated guardian history and examination.

Pre-procedure assessment: Presenting symptoms and ingestion circumstances were recorded. Plain X-ray was performed (or prior external films reviewed) to localize radiopaque objects. Patients/guardians received counselling regarding management strategy, endoscopy, and complications; informed consent was obtained. Selected children underwent endoscopy despite passable objects at guardian insistence.

Endoscopy and techniques: Emergency upper GI endoscopy (Olympus flexible endoscopes) was performed via mouth-gag. Device choice was tailored to object morphology: biopsy forceps, rat-tooth forceps, snares, Roth-net basket; a hood/cap for sharp objects where appropriate. Where necessary, safe pushing into stomach was used. Post-procedure observation lasted ≥2 hours; patients with psychiatric comorbidity were referred for follow-up counselling.

Variables: We captured demographics, clinical presentation, elapsed hours since ingestion, radiographic orientation, endoscopic location, sedation use, device(s) used, procedure time (minutes), need to push into stomach, mucosal ulcers, complications, and SES (Revised Kuppuswamy 2021 class).

Outcomes: Primary outcome: endoscopic removal success (operationalized by instrumented removal documentation). Secondary outcomes: procedure time, complications.

Statistics: Data integrity checks included normality by Kolmogorov–Smirnov. For two groups we used Welch t-tests (or Mann–Whitney U if non-normal). For ≥3 groups we used one-way ANOVA (or Kruskal–Wallis if non-normal). Categorical comparisons used chi-square tests. Two-sided $p<0.05$ was significant. Analyses used standard

statistical software; figures were prepared for journal submission.

Ethics: Approved by the Institutional Ethics Committee. Confidentiality was maintained; abnormalities were conveyed to families with appropriate management.

Results

Cohort profile. We analyzed N = 134 patients. Age, post-ingestion period and procedure. Duration did not follow the Kolmogorov Smirnoff test on duration was non-normally distributed. Hemoglobin was a value of approximation to normality (Table 1). The majority of them were children and blunt objects. Predominantly (especially coins), pediatric patterns were the rule. Most cases were localized to the esophagus or stomach (fundus/body) is what determines the choice of device and method of retrieval. Selective application of sedation- much more selectively applied in young patients (Age: sedation vs no). Reflecting clinical judgment of comfort and safety, sedation, Mann Whitney U=0.000045). In smaller children. Characteristics and outcomes of procedures. The success rate of retrieval was more than 90% and location of greater than 90%. The presence of the foreign body was a prevalent predictor of removal success (0.000001).

The time taken to perform the procedure also differed depending on the instrument (ANOVA p=0.019) in favor of customized device. Selection; age was also a difference by endoscopic location (ANOVA p=0.009). Foreign body type related to sedation (X 2 p=0.0297), and type related to gastric ulcer (X 2 p=0.0445), Most of other cross-tabs (e.g. type x esophageal ulcer) were not significant. Complications had few (bleeding uncommon) events and the post-procedure courses were mostly uneventful. Socioeconomic profile. Kuppuswamy 2021 classes were non-homogeneous; SES class per was heterogeneous. In this dataset type was not significantly linked to see, so the description profiling provides the illustration of the. Environment where exposures and delays of presentation in pediatrics take place (Tables at request).

Table 1: Normality (Kolmogorov–Smirnov), N=134

Variable	N	KS	p
Age (years)	129	0.303052	**<0.000001**
Hours since ingestion	118	0.362971	**<0.000001**
Time to removal (min)	110	0.248264	**0.000002**
Hemoglobin (g/dL)	20	0.192600	0.397574

Table 2: Two-group comparisons (non-parametric where appropriate)

Analysis	Test	n1	mean1	n2	mean2	p
Age (years): M vs F	Mann–Whitney U	96	13.153	33	8.394	0.06491
Age (years): Sedation Yes vs No	Mann–Whitney U	15	3.120	102	10.814	**0.000045**
Age (years): Blunt vs Sharp	Mann–Whitney U	103	9.748	16	11.500	0.71774
Time (min): Blunt vs Sharp	Mann–Whitney U	96	3.745	14	5.571	0.09569
Time (min): Sedation Yes vs No	Mann–Whitney U	14	5.157	96	3.781	0.27793
Hours: Blunt vs Sharp	Mann–Whitney U	94	28.564	14	10.571	0.28585
Hb: Sedation Yes vs No	t-test	4	12.875	16	12.688	0.87326
Hb: Blunt vs Sharp	t-test	17	12.735	3	12.667	0.95486

Table 3: Multi-group comparisons

Analysis	Value	Factor	N	Test	p
Time (min) by Instrument	Time to removal (min)	Instrument used	110	**ANOVA**	**0.019**
Age by Endoscopic location	Age (years)	Endoscopic location	116	**ANOVA**	**0.009**
Hours since ingestion by Presentation	Hours since ingestion	Presentation	118	ANOVA	0.904
Hours since ingestion by Endoscopic location	Hours since ingestion	Endoscopic location	110	ANOVA	0.730
Age by Socioeconomic class	Age (years)	Kuppuswamy class	26	ANOVA	0.069

Table 4: Key categorical associations (Chi-square)

Analysis	Row	Column	N	p
Age group × Type	Child_Group	Type Of Foreign Body	119	0.95874
Age group × Endoscopic location	Child_Group	Location Of Foreign Body	117	0.58734
Age group × Sedation	Child_Group	Use Of Sedation	118	0.45837
Type × Endoscopic location	Type Of Foreign Body	Location Of Foreign Body	117	0.23167
Type × Sedation	Type Of Foreign Body	Use Of Sedation	119	**0.02971**
Type × Gastric ulcer	Type Of Foreign Body	Gastric Ulcer	118	**0.04452**
Endoscopic location × Removal	Location Of Foreign Body	Removal_Done	117	**<0.000001**

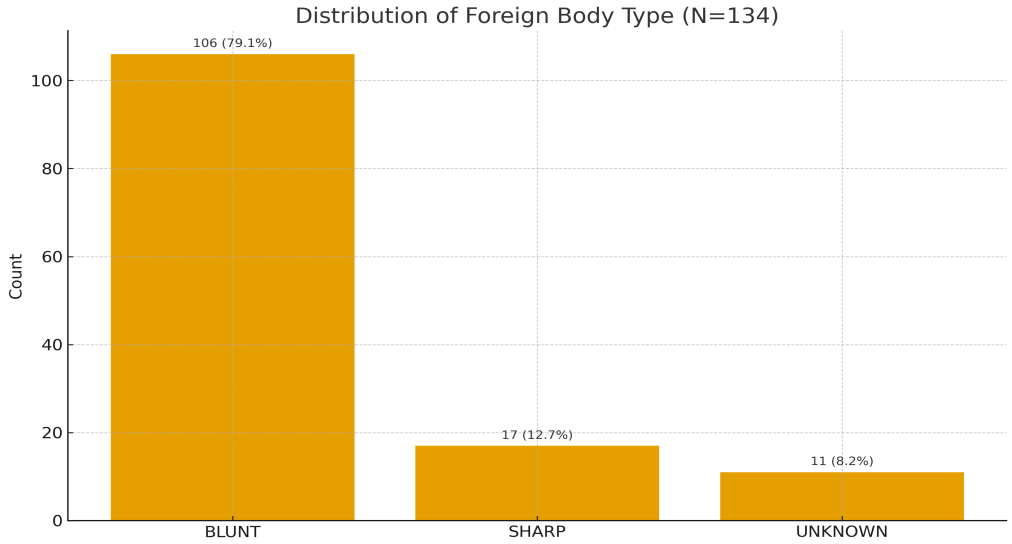

Figure 1: Distribution of Foreign Body Types and Top Named Objects.

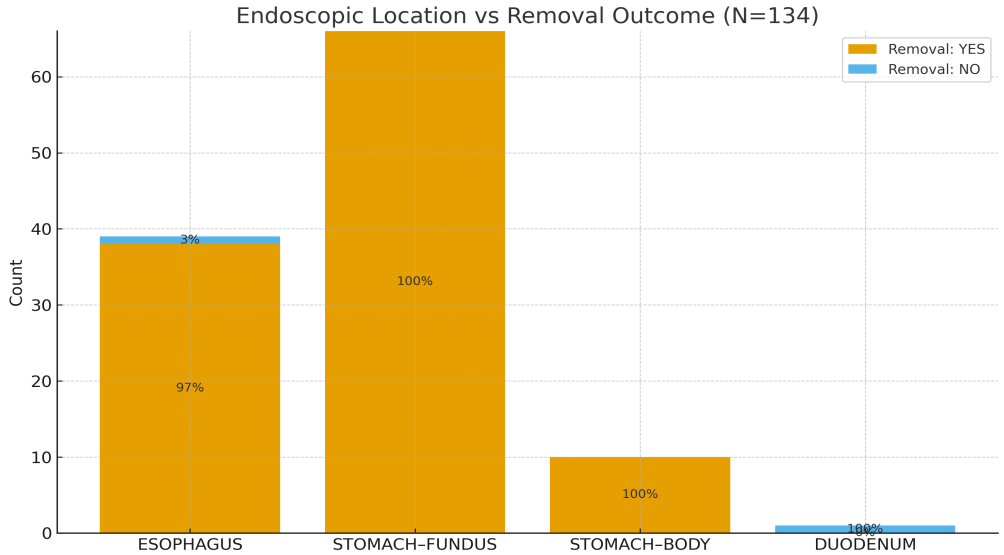

Figure 2: Endoscopic Location Vs Removal Success.

Discussion

This paper is a real-life, in-depth picture of FBI/EFI in a tertiary centre in. Western Rajasthan, which is an amalgamation of epidemiology, SES profiling, and extensive endoscopic Outcomes. Three findings stand out. To begin with, this cohort is of pediatric-predominant nature. Load of blunt instruments (at least coins); this is the world experience and that of India. Emphasizes parent/caregiver education and prevention in school [14]. Second, the selection of instruments is associated with the efficiency of the procedures (ANOVA p=0.019), which is. Mechanistically intuitive: there are benefits to snares, Roth-net baskets and forceps.

Based on the geometry and location of objects [1,5]. Third, endoscopic location closely predicts success (χ 2 p=6.091252e -6), an observation that is consistent with schemes of urgency in guidelines putting priority on observations. Esophageal/airway-close dangers and focus on immediate elimination of hazardous substances (batteries, magnets, sharp objects) [1,5,8]. Our data reinforce pediatric sedation practice: sedation was more common in younger patients, with a robust age effect ($p \approx 4.5 \times 10^{-5}$). This aligns with the practical need to optimize tolerance, airway protection, and procedural control in small children [1–3]. We also observed an association between object type and gastric ulcer (p=0.0445), though the event rate was low; biologically, sharp-pointed or irregular objects may abrade mucosa during transit or retrieval. Conversely, type did not significantly influence esophageal ulceration in this dataset, suggesting that contact time and impaction dynamics may be more important than morphology alone—a nuance echoed in prior reports [3,4].

From a systems perspective, our high overall retrieval success with minimal complications is reassuring and consistent with experienced-centre literature [1–3,5]. Importantly, procedure times varied by instrument, highlighting an actionable lever for service optimization—ensuring ready access to nets and specialty forceps, clear selection algorithms, and staff familiarity. The SES profile offers context for risk (e.g., coin exposure, supervision, delayed presentation), though we did not detect significant SES-type associations here; targeted community education and parental counselling remain priorities.

Limitations are that it is cross-sectional, single centred and incomplete in some. Variables (prone to emergency care). We operationalized pragmatically, the removal. Success on the basis of instrumented removal documentation.

The high complication rate is very low- but--is clinically desirable--laws against comparison. Finally, this study was not must have source of power that is rare and high-risk subgroups (e.g., button batteries, multiple magnets); posts this gap could be covered by the multicentre registries.

There are clinical implications: (1) expect pediatric ingestions of blunt objects; (2) adopt. Location-based urgency into a fast-endoscopy; (3) object- nominative instrument choice. Morphology to reduce time; (4) be judicious in using sedation in younger children; and (5) strengthen public health activities on handling of coin and domestic risks. Our results are internally consistent and concordant with international guidance, and provide region specific. Rajasthan benchmarks that can guide triage procedures and purchases.

Conclusion

FBI/EFI was predominated and mainly pediatric in this tertiary-care cohort (Western Rajasthan). Blunt -based, endoscopic success removal, and infrequent complications of >90%. Endoscopic location demonstrated a very strong relationship with removal success as well as tool instruments. Enforced procedure time, endorsing diverse device programs. Sedation was used mainly in safe pediatric practice, safe practice among the younger patients. In line with guideline these findings. Recommendations, give regional epidemiologic, operational information to lead triage, instrumentation, and counselling in resource-constrained environments of this type. Broader work in multicentres should perfect high-risk-item (batteries, magnets) risk stratification pathways. And measure sequelae in the long run.

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