

The Hidden Dangers: Superabsorbent Polymer Beads as a Cause of Bowel Obstruction in Children

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Background

- Superabsorbent polymer (SAP) beads, commonly known as water beads, have raised significant concerns due to ingestion by children.
- Commonly utilized in children's toys, home decorations, and gardening supplies. Their soft texture and often vibrant colors make them very enticing to young children and unfortunately, easy to swallow.
- Their ability to expand in liquids puts children at risk for bowel obstruction after ingestion.
- Despite Consumer Product Safety Reports and the recall of some water bead products numerous SAP bead products continue to remain accessible.

Methods

Part 1 – Literature Review

- Google Scholar and PubMed databases (1950-2023)
- Keywords: ("superabsorbent" OR "polymer" OR "hydrogel" OR "crystal" OR "jelly" OR "Orbeez" OR "beads") AND ("ingestion" OR "obstruction" OR "perforation") AND ("intestinal" OR "bowel")
- Patient characteristics, imaging findings, treatment modalities, and outcomes were extracted.

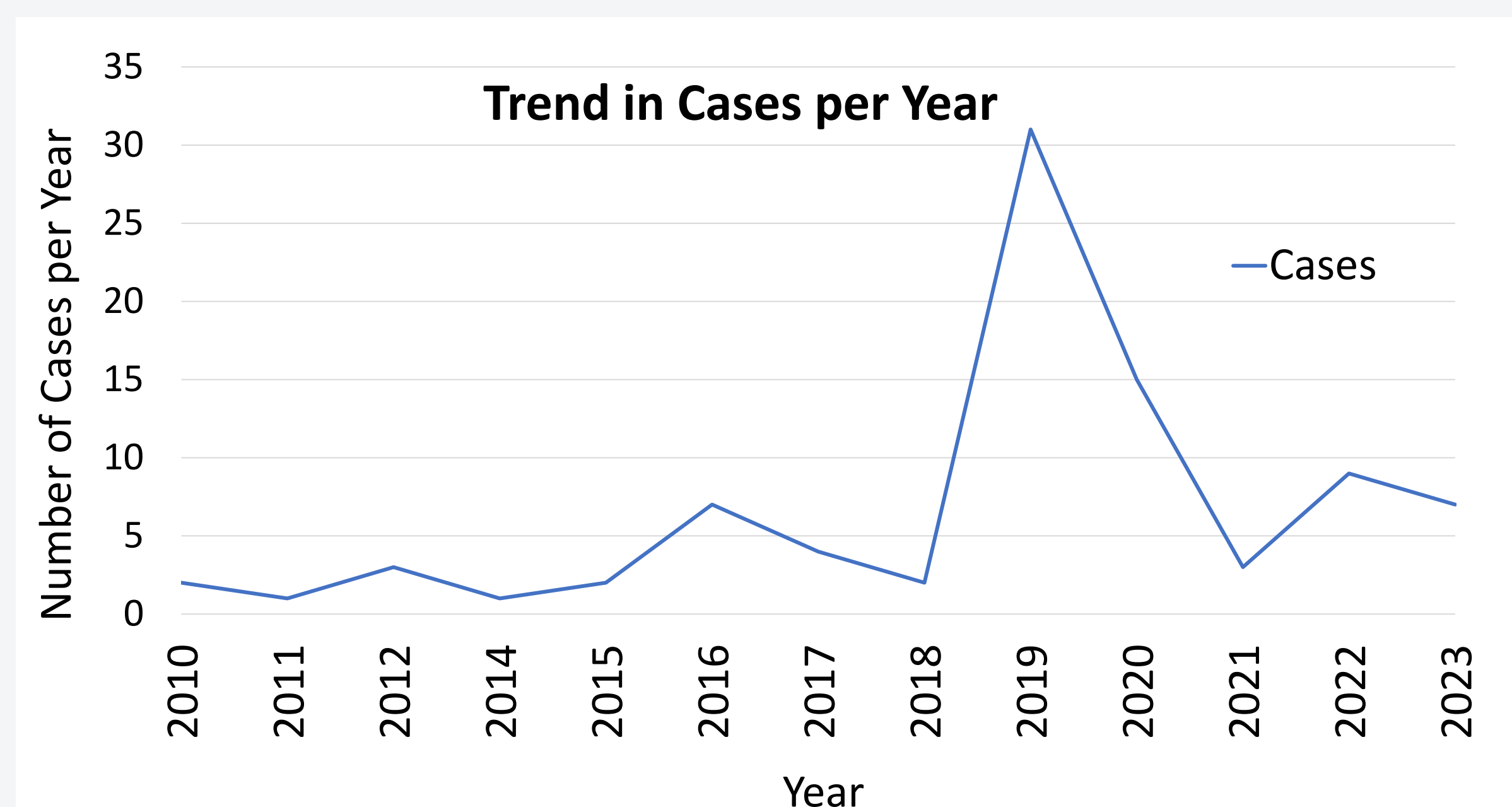
Part 2 – In-Vitro Experiment

- Small, medium, and large SAP beads were grown in simulated small bowel fluid (0.9% sodium chloride, 37°C).
- The expanded beads were transferred to various solutions of different osmolarities.
- Diameters were measured before exposure and at varying time points after exposure.

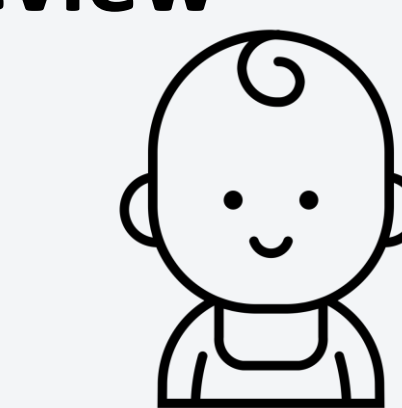
Hypothesis

We hypothesized that hypertonic solutions would exhibit the greatest reduction in diameter of the SAP beads compared to other conditions.

Part I: Literature Review



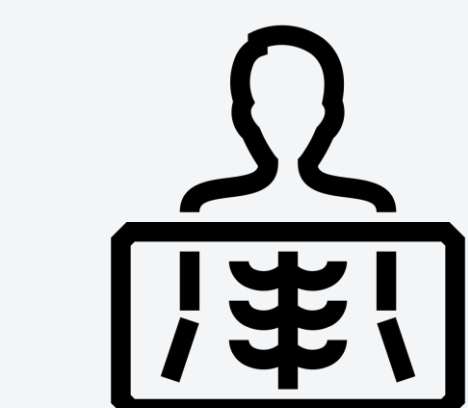
We identified 87 cases from 45 reports. The number of cases has significantly increased over the last decade.



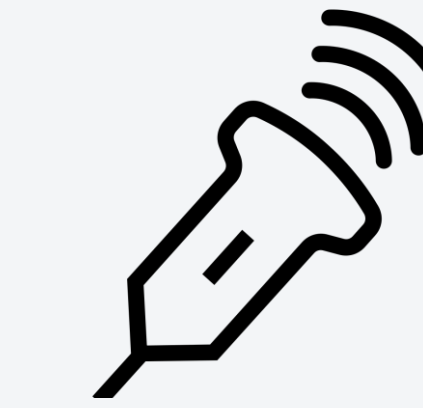
Average age → 14 months



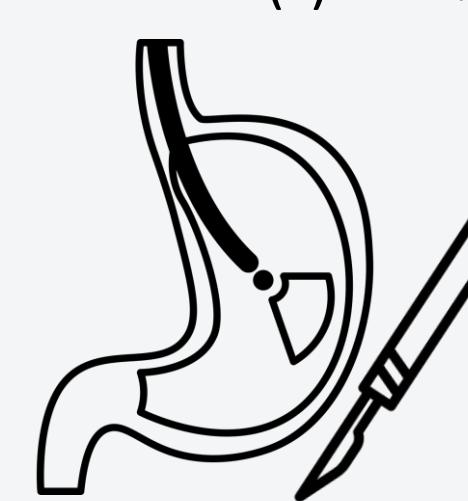
Witnessed ingestion → 16%



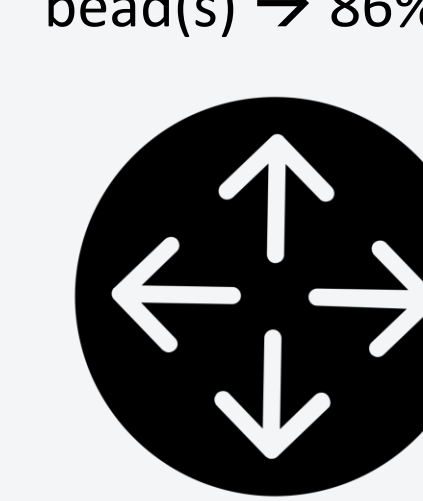
KUB visualization of bead(s) → 6%



Ultrasound visualization of bead(s) → 86%



Surgery or Endoscopy → 92%



Mean bead size 33.7 (±8.3) mm

Postoperative complications (19%)



Reoperation for additional beads → 16%



Anastomotic leak requiring ileostomy → 4%



Median LOS 6 (IQR 5-8) days

One mortality

Discussion

- Despite recalls of some SAP bead products, the number of cases of obstruction in children following ingestion of SAP beads has significantly increased over the last decade.
- Timely diagnosis and intervention are critical.
- During surgery, a thorough examination of the entire bowel and a high index of suspicion for multiple beads is essential since almost 40% of cases involved removal of more than one bead and 4 children required return to the OR for additional bead removal.
- The most significant reduction in SAP bead diameter occurred with the osmotic laxative GoLYTELY, with a reduction rate of 30.3% after 12 hours and 35.2% reduction after 24 hours.

Conclusions

- Increasing incidence of children with bowel obstruction following SAP bead ingestion is a public health concern.
- Heightened education and awareness are needed to ensure timely diagnosis and intervention for the removal of ingested SAP beads.
- Hypertonic solutions and osmotic laxatives may have potential to reduce the size of SAP beads if ingested by children.

References

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Part II: In Vitro Experiment

