

ORIGINAL ARTICLE

Gastroenterology

'You can be as vigilant as you can, yet they make their way in': A descriptive study of parent and caregiver perspectives towards keeping children safe from button batteries

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Abstract

Objectives: Button batteries pose a significant threat to young children, and parents and caregivers play an important role in keeping children safe from button batteries, especially in the home environment. However, little is known regarding parent or caregiver perspectives on button battery safety, in particular, the threat they pose to children. The aim of this study was to examine perspectives on button battery safety to enable tailored prevention strategies and to examine parent and caregiver perspectives on button battery safety in the home.

Methods: One hundred and seventy-four parents and caregivers of children aged 0–5 completed a cross-sectional online survey. Distribution occurred via social media. The survey contained multiple-choice questions pertaining to button battery knowledge and attitudes.

Results: Most respondents recognised the dangers of button battery ingestion, yet only 37% knew of button battery ingestion symptoms. While 68% knew of household items containing button batteries, 21% were aware of product-recall information sources. Approximately 64% understood immediate post-ingestion steps, but only 31% were familiar with first-aid procedures. From an attitudinal standpoint, 95% understood the importance of child supervision around button batteries, 78% prioritised battery safety in toy purchases, and 17% found current safety labels unsatisfactory. This study provides a foundation for ongoing investigation of parent and caregiver perspectives on button battery home safety.

Conclusion: Ongoing, comprehensive education and public-safety campaigns are needed to rectify gaps in knowledge regarding button battery safety, and to reduce the risk of button battery ingestion in children.

KEYWORDS

coin battery, ingestion, paediatric

1 | INTRODUCTION

Button batteries pose a significant threat to young children, with button battery ingestion injury most often reported in children aged 6 years and under.¹ Due to

their size, button batteries are commonly used in household and novelty items. For the same reason, button batteries can be accidentally ingested, and if oesophageal lodgement occurs, cause significant damage within hours.¹ Injury occurs through generation

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of hydroxide through hydrolysis, which causes liquefactive tissue necrosis¹ and can result in diffuse mucosal injury to the alimentary tract, causing prolonged issues with swallowing and oral intake.² Potential sequelae of ingestion include oesophageal perforation, strictures, vocal cord paralysis, spinal erosion, tracheoesophageal or aortoesophageal fistula formation and death.^{3,4}

Button battery exposures are a significant problem in Australia. Poisons Information Centre data from four Australian states reported 506 calls for paediatric exposure (or potential exposure) in a 19-month period.⁵ Further, it is estimated one child per month in this age group is seriously injured after swallowing a button battery⁶ while three Australian children have died from button battery ingestion injury since 2013. Consequently, coronial findings have called for increased public awareness, as well as change in manufacturer and consumer attitudes. In Australia, four mandatory button battery standards aim to reduce the risk of button battery injury. These standards pertain to design and construction of consumer goods, and compliance and testing requirements. They also specify the markings and warnings that must be displayed on button batteries, and products containing them. Similarly, in the United States, there are guidelines for manufacturers regarding warning labels, child-resistant packaging, and disposal of button batteries. However, there remains an ongoing risk of injury, as many products do not comply with mandatory standards.⁷

Consumer vigilance remains paramount in reducing the incidence of button battery ingestion; however, studies investigating consumer perspectives on this issue are limited. In a recent study,⁸ researchers surveyed 930 people from Australia, Canada, United States and United Kingdom to obtain data about awareness and risks of button battery ingestion. Questions pertained to symptoms, management, and button battery disposal. Identified knowledge gaps included the presentation of the injury, management strategies and disposal methods.⁸ However, only 1.8% of respondents were from Australia. Similarly, Carr et al.⁹ conducted a survey of 557 parents in the United States, and reported parents are likely to keep devices with button batteries out of reach of children and keep devices with button battery compartments secure. While international data exists, there is value in obtaining targeted insight into the perspectives of Australian parents to guide ongoing education and safety advice in this domain.

2 | AIM

The aim of this study was to increase our knowledge of parent and caregiver perspectives on button battery safety in the home and add to the limited knowledge base in this area.

What is Known

- Button batteries pose a significant threat to young children, resulting in damage to the aerodigestive tract if they become stuck and are undetected.
- Reducing the risk of button battery ingestion in children requires ongoing evidence-informed public education, as well as change in manufacturer and consumer attitudes.

What is New

- While many parents and caregivers recognise the inherent dangers of button batteries, knowledge gaps exist regarding symptom recognition, recall sources and postingestion management.
- Most respondents understand the importance of child supervision and safe button battery purchasing choices, yet there is noticeable dissatisfaction with current safety labels and warnings.
- This study underscores that enhanced knowledge directly fosters more proactive attitudes towards button battery safety, emphasising the need for ongoing prevention and education efforts.

3 | METHODS

Approval from the University of Southern Queensland Human Ethics Committee was granted on the 18th of April 2023 (Approval Number ETH2023-0117). A survey that contained 20 questions (19 multiple-choice questions, and one open-ended question) was developed for this research. The multiple-choice questions had three options: 'No', 'Uncertain' and 'Yes'. The survey was piloted and revised before dissemination. The items were presented in random order, with the open-ended question always appearing last. Parents and caregivers (defined as those who care for a child at least once per week) of children aged 0–5 years were invited to complete an anonymous online survey via the UniSQ Survey Tool. The survey was available from June to August 2023. Recruitment was via social media and online forums. The invitation to participate included the participant information sheet and a survey link. Respondents indicated their informed consent before commencing the survey. A total of 231 respondents started the survey; of these, 174 completed all questions, and were included in the analysis.

4 | RESULTS

4.1 | Demographic characteristics

Responses were collected from all Australian states and territories. Respondents were predominantly located in Queensland ($n=88$, 51%), followed by Western Australia ($n=24$, 14%), Victoria ($n=24$, 14%) and New South Wales ($n=19$, 11%). They mainly lived in major/metropolitan areas ($n=116$, 67%). Most respondents were female ($n=147$, 88%). A wide range of ages was represented (range = 21–66 years, $M=37.2$, standard deviation [SD] = 6.3). Equal numbers of respondents worked full-time and part-time, with both groups containing 65 individuals (38%). Most respondents had completed a bachelor's degree ($n=67$, 39%) or postgraduate qualification ($n=67$, 39%), had a family income of \$150,000AUD per year or over ($n=96$, 55%) and had either one child ($n=76$, 44%) or two children ($n=84$, 48%).

Most respondents knew that a 'dead' or 'flat' battery can cause damage if swallowed ($n=172$, 99%), and that 'swallowing a button battery can be fatal' ($n=170$, 98%). While only 37% ($n=65$) of respondents were familiar with the symptoms of button battery ingestion, two-thirds reported knowing that difficulty eating is a symptom ($n=118$, 68%), while approximately half knew that coughing ($n=95$, 55%) and drooling ($n=92$, 53%) are symptoms. Sixty-eight percent of respondents knew which household products contain button batteries ($n=118$); however, only 21% ($n=37$) reported knowing where to access information about product recalls. Figure 1 depicts the questions and responses.

Over two-thirds of respondents reported knowing what to do if they suspected their child had swallowed a button battery ($n=111$, 64%); however, a smaller proportion were familiar with first-aid management ($n=54$, 31%). Over half of respondents knew how to dispose of batteries safely ($n=98$, 56%). Nearly all respondents were of the view that button battery ingestion requires urgent medical attention ($n=172$, 99%), and that supervision is vital when children are playing with toys containing button batteries ($n=166$, 95%). A large proportion of respondents considered battery safety when they purchased toys ($n=135$, 78%). Just over half of respondents reported that a child in their care could not access a button battery ($n=100$, 57%). When asked if button batteries should be banned in Australia, 55% ($n=95$) answered 'yes'. Similarly, just over half ($n=93$, 53%) felt that items containing button batteries should not be purchased by caregivers of children aged 5 years and below. Almost one in five respondents felt that there is adequate safety labelling on items containing button batteries ($n=30$, 17%), while 11% ($n=20$) believed that retailers are doing all they can to prevent children accessing button batteries.

5 | DISCUSSION

Overall, respondents had a high level of awareness regarding the potential dangers of button batteries, as indicated by their knowledge of the potential symptomatology and outcomes post-ingestion. These positive findings are likely a product of effective Australian awareness campaigns, and media coverage of severe cases. Responses to the four main themes of the survey are discussed below.

5.1 | Symptoms and signs

Respondents demonstrated moderate knowledge of button battery ingestion symptoms. A challenge associated with ingestion identification is the ubiquitous nature of symptoms, and the similarity of symptoms to those of common aerodigestive conditions.¹⁰ This presents a clinical challenge and makes it difficult for parents and caregivers to identify potential button battery ingestion in their children.

5.2 | Product disposal

Most respondents were aware that a 'dead' or 'flat' battery could cause damage, which aligns with prior research.⁸ A smaller proportion knew how to dispose of one safely. This is also similar to existing data.⁸ Safe disposal is vital, given that a flat battery can still have sufficient residual charge to generate hydroxide ions and cause severe tissue damage.¹¹ Research has reported that ingestion of loose or discarded batteries accounts for approximately 30% of button battery ingestion cases.¹ Taping of button batteries before disposal has been found to be an effective preventative measure.¹² In Australia, the Battery Stewardship Council,¹³ an industry-led initiative that focuses on responsible battery recycling, seeks to increase battery collections and recycling, which is an important factor in button battery safety.

5.3 | Products containing button batteries

Most respondents reported knowing which household products contain button batteries. This aligns with prior research.^{8,9} Of concern is that only a small proportion of respondents knew where to access information about device recalls. To date, 179 button battery-containing devices have been recalled in Australia, and 40 of these are from 2023.⁶ In December 2020, the Australian Government

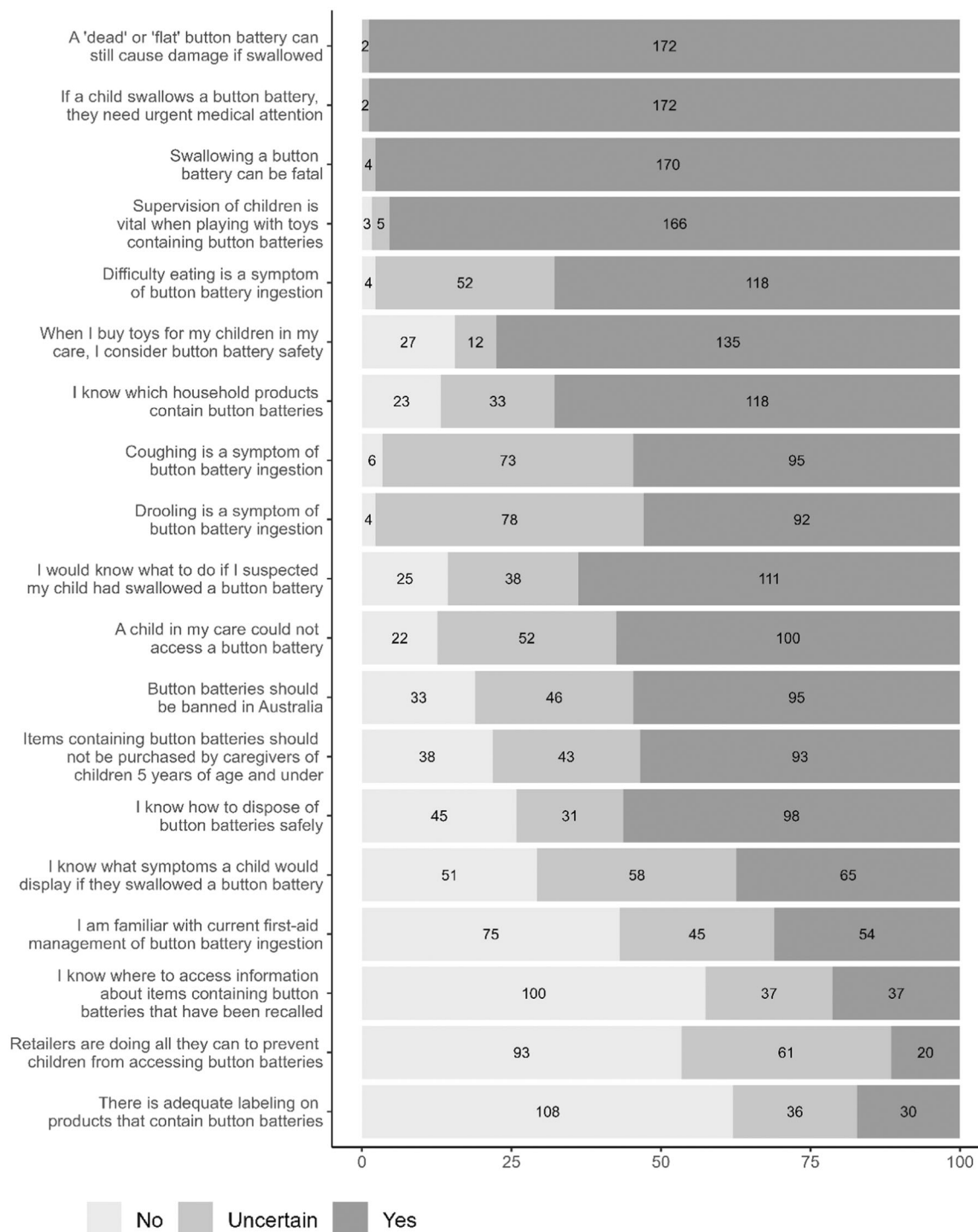


FIGURE 1 Questions relating to parents and caregiver knowledge of button battery safety practices ($N = 174$).

implemented mandatory safety and information standards for button batteries, which dictate that products must have secure battery compartments, undergo compliance testing, have child-resistant packaging, and carry warnings.⁷ However, despite product surveillance and enforcement by regulators, products continue to be sold that pose a danger to young children.

5.4 | Ingestion management

Over two-thirds of respondents reported knowing what to do if they suspected their child had swallowed a battery; however, a smaller proportion reported being familiar with first-aid management of ingestion. This finding aligns with prior research⁸ which reported that most parents' and caregivers would take immediate

action if they suspected button battery ingestion. Given injury can occur within 2 h² prompt identification and management of button battery ingestions is vital.

Most respondents believed that ingestion required urgent medical attention, which is not surprising given that most respondents indicated high levels of knowledge about the dangers of button batteries. Similarly, most respondents reported that supervision is vital when children are playing with toys containing button batteries, and that they consider button battery safety when they buy toys for their children. This is congruent with findings reported by Carr et al.⁹ that two-thirds of parents were aware button batteries pose a high level of danger. Supervision is also highlighted as a major injury prevention strategy used by parents to mitigate the risk of childhood injury.¹⁴ Heightened caregiver vigilance regarding toys is a promising finding, especially as Cairns et al.⁵ reported over a quarter of button battery exposures were from toys. However, button batteries are found in other household items as well. A smaller proportion reported items containing button batteries should not be purchased by parents and caregivers of young children. As button batteries are ubiquitous in the home, caregiver awareness is paramount. Of interest is the small proportion of respondents who believed that safety labelling and retailer efforts for button battery prevention are adequate. Australia has implemented standards to improve product safety in consumer goods containing button batteries, and in button batteries themselves¹⁵; however, it is apparent caregivers want to see further action from retailers and manufacturers with regard to button battery safety.

6 | OPEN-ENDED RESPONSES

The final survey question asked respondents, 'In your opinion, what is the best way to keep children safe from button batteries in the home?'. Respondents' comments included five broad themes: supervision, safe storage of button batteries in the home, ensuring children cannot access button batteries, disposing of button batteries safely and avoiding purchasing items containing button batteries. The comments provided insight into parent experiences of button battery safety. One respondent highlighted the importance of education in preventing ingestions, reporting, 'I do not buy any toys that require button batteries either and we have taught our boys not to put anything in their mouth that isn't food or water'. Some respondents recommended avoiding purchasing products that contain button batteries. For example, one suggested: 'The best approach is to look for products that do not use button batteries, if you have products that use them, they need to be secured well and preferably placed up high out of a child's reach'.

Other respondents called for increased education for consumers about the dangers: 'Increased community education about the health and safety risks button batteries pose to children (and/or individuals across the lifespan with cognitive differences that result in reduced safety awareness)'.

Another respondent remarked on the challenge of having to use products that contain button batteries when alternatives are not available, reporting, 'My husband has hearing aids so we have no choice but to hold button batteries in our household until he can get the new rechargeable hearing aids'. Similarly, a different respondent reported, 'I discovered that a set of weighing scales which sit on the floor had button batteries in them with nothing to stop them being taken out! Equally, my child came home from daycare with some tea lights that turned out to have button batteries in them—so you can be as vigilant as you can be as a parent and yet they make their way in'.

7 | PERSPECTIVES AND LIMITATIONS

This study attempted to understand the perspectives of parents and caregivers towards button battery safety in the home. The risk and severity of injury warrant ongoing research into preventative and medical management. Furthermore, parents and caregivers have a strong mandate for further education and information in this area. This study adds to an area where there is limited published research. Button battery safety is a complex issue, as is the extent to which parent and caregiver perspectives influence safety practices.

This study has clear limitations. First, we did not use a validated questionnaire. The questionnaire was developed to examine parent perspectives, and the authors acknowledge that consideration of the perspectives of other stakeholders around button battery safety would be beneficial to gain further insight into this area. Additionally, recruitment was based on convenience sampling via social media, which limits the representativeness of the data. In the future, focus groups and interviews could be used to conduct more in-depth exploration of this topic. Future research might also utilise diverse recruitment channels and explore additional factors such as specific home-safety practices and button battery information sources.

Although a small contribution based on sample size, the value of this study is in addressing the current paucity of understanding of parents and caregiver perspectives towards button battery safety, and in bringing to light areas that warrant further exploration. While efforts to reduce button battery hazards in the home are likely best targeted at manufacturing and design practices, this study may raise awareness of the parent and caregiver role in button battery safety.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS STATEMENT

Informed consent was obtained from all subjects involved in the study.

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