

Causes of Infant Choking (Children up to 1 Year of Age) and Strategies for Prevention: Systematic Review

Cristianne Confessor Castilho Lopes¹, Larissa Silva Guimarães², Eduardo Barbosa Lopes³, Fabio Herget Pitanga³, Lucas Castilho Lopes³, Maria Eduarda Castilho Lopes³, Joacir Ferreira Júnior³, Marilda Moraes da Costa⁴, Joely Athina Martins Rocha⁵, Sandra Maria Alves de Sousa Lima⁶, Kennedy Ferreira Lales⁷, Rayssa Figueiredo Magalhães Santiago⁸

¹University of Joinville Region - Joinville – SC – Brazil

²Belo Horizonte University Center – Belo Horizonte – MG – Brazil

³Alto Vale do Rio do Peixe University - Caçador - SC – Brazil

⁴Lutheran Educational Association - Faculty IELUSC - Joinville – SC – Brazil

⁵São Lucas University Center - Porto Velho – RO – Brazil

⁶Amazonian University of Pando – Cobija – Bolívia

⁷Federal University of Maranhão - Imperatriz – MA – Brazil

⁸Nilton Lins University - Manaus – AM – Brazil

ABSTRACT

Introduction: Choking in babies is not only a health issue, but also a source of anxiety for parents and caregivers, as it can lead to serious consequences, including serious injuries and, in extreme cases, death.

Objective: Offer a thorough analysis of the existing literature on this critical topic.

Methods: This study constitutes a systematic review, classified as exploratory and descriptive. The preparation of the research was a bibliographical search in electronic databases on methods associated with RSL (Systematic Literature Review) and the applications of SMARTER (Simple Multi-Attribute Rating Technique using Exploiting Rankings).

Results: A comprehensive systematically search of the literature yielded a total of 423 articles referring I'm the main causes of choking in children under 1 year of age, of which 11 articles were eligible I'm be included in this systematic review.

Conclusion: Continued research and public education efforts are important in mitigating the risks associated with choking in infants. Implementing evidence-based prevention strategies is crucial to ensuring the safety and well-being of newborns and young infants.

KEYWORDS: Causes of Choking; Choking; children Under 1 Year

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INTRODUCTION

Choking in babies, children up to one year of age, is an extremely relevant concern in pediatric medicine. The vulnerability of these young patients to choking incidents requires an in-depth understanding of the underlying causes and the implementation of evidence-based prevention strategies (LOVRENSKI; VILOTIJEVIĆ DAUTOVIĆ; LOVRENSKI, 2019).

The first years of a baby's life are characterized by rapid development, both physical and cognitive (MUELLER; TRONICK, 2020) . During this period, exploring the world

around them is essential for healthy development. However, this inherent curiosity can also expose babies to a series of risks, choking being one of the most serious (DALY; BELOGLOVSKY, 2020; MCKISSACK, 2020; PARIS; MCKOWN, 2023a).

Choking in babies is not only a health issue, but also a source of anxiety for parents and caregivers, as it can lead to serious consequences, including serious injuries and, in extreme cases, death. (MOON et al., 2022). Understanding the specific causes of this problem and implementing

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effective preventive measures therefore becomes an indisputable priority.

In the United States, suffocation is a leading cause of injury and death in children, causing the death of one child every five days and occurs when objects block the airway. The most common objects are coins, toys and food which are the most common causes of choking in children. What increases the likelihood of suffocation is the shape, consistency and size of the object. Young children aged 3 years and under are at greater risk of suffocation as they are still learning to chew and swallow and are always putting objects in their mouths (AMERICAN ACADEMY OF PEDIATRICS, 2021).

By understanding the complexities of choking in infants and promoting education and awareness among parents and caregivers, we can take important steps in reducing choking incidents and thus ensure a safer environment for these little patients.

This systematic review study aimed to provide a thorough analysis of the existing literature on this critical topic and sought to highlight the continued importance of research and public education efforts to protect this vulnerable population by ensuring that every baby has the opportunity to explore and grow safely in your environment.

METHODS

This study constitutes a systematic review, classified as exploratory and descriptive. The preparation of the research was a bibliographical search in electronic databases on methods associated with RSL (Systematic Literature Review) and the applications of SMARTER (*Simple Multi-Attribute Rating Technique using Exploiting Rankings*). The work carried out is of a qualitative and quantitative nature. Qualitative data analysis was carried out intuitively and inductively during the survey of the theoretical framework. It is also quantitative through the use of the multi-criteria method. In addition, there is also a numerical experimental study in order to simulate an article selection situation based on the observed criteria.

The bibliographical research was carried out in the following databases: *Web of Science; ScienceDirect; Wiley; SpringerLink; Taylor and Francis; PubMed and EBSCO*. In addition, searches were carried out using bibliographical references of studies that relevantly addressed the topic on the *Google Scholar search platform*.

The search in the databases was carried out using the terminologies registered in the Health Sciences Descriptors created by the Virtual Health Library developed from the

Medical Subject Headings from the US National Library of Medicine, which allows the use of common terminology in Portuguese, English and Spanish. The present study sought to investigate the literature on the main causes of choking in children under 1 year of age. To this end, the descriptors “causes of choking”, “choking”, “children under 1 year old” were used, initially in English, and in a complementary way in Spanish and Portuguese.

As a tool to support decision-making in the selection and prioritization of articles, a set of criteria were considered essential to represent the state of the art of the topic under study. This method has the following characteristics: (i) rigorous logic allows the method to be accepted as a decision support tool; (ii) simple to understand and apply with easy-to-interpret results.

References from selected works were also searched for other documents of potential interest. Once qualified for full text in the evaluation, articles were included in the qualitative review if they met the following inclusion criteria: a) contained causes of choking; b) children under 1 year old. Articles were excluded if they were reports, banners or conference abstracts. There was no review of confidential health information and the study was non-interventional. Therefore, ethics committee approval was not necessary. In the end, the result obtained totaled 11 articles that covered the desired characteristics for the study.

Three independent researchers extracted data from articles that met the inclusion criteria and recorded them in a “Data Extraction Form” generated in Microsoft Excel on the main causes of choking in babies under 1 year of age. From this form, the authors and year of publication, objective, type of study (design), study title, sample size (n) and conclusion of the studies were included, which will be demonstrated in the results through table 1.

RESULTS

A comprehensive systematic search of the literature yielded a total of 423 articles referring to the main causes of choking in children under 1 year of age. Of these, 15 studies were excluded due to data overlap. From this, the SMARTER method (*Simple Multi-Attribute Rating Technique using Exploiting Rankings*) was chosen and 90 articles were selected that were suitable for full-text screening, and 52 articles were included for data extraction, of which 41 were excluded by the exclusion criteria, making 11 articles eligible that were included for systematic review. In Figure 1, we describe the strategy for selecting articles on the topic in question.

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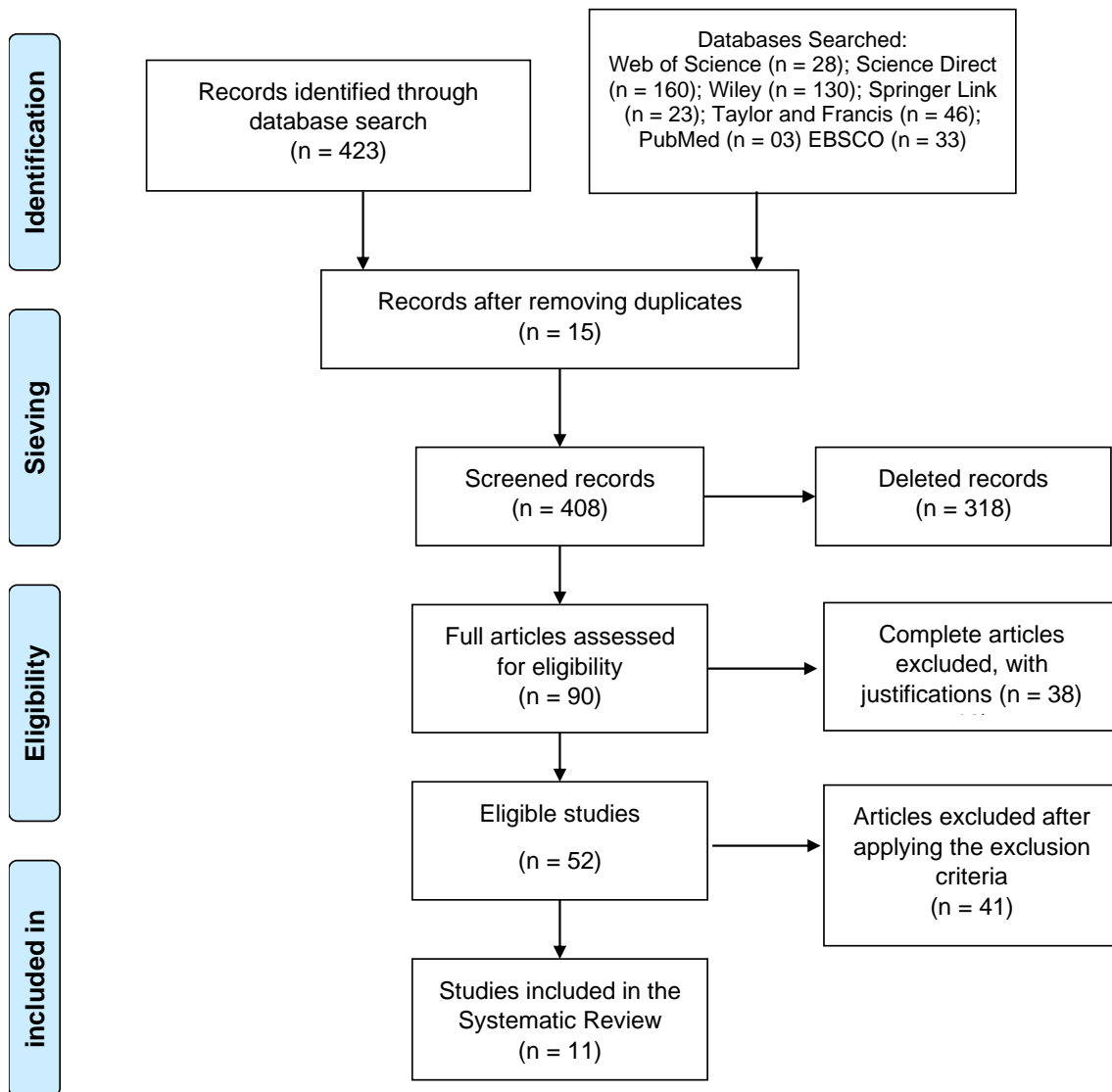


Figure 1. Article search strategy

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AUTHORS/YEAR	OBJECTIVE	KIND OF STUDY	TITLE OF THE STUDY	n	CONCLUSION
MOLLA et al. (2023)	Analyze the clinical and radiological profile, management methods and results of foreign body aspiration in hospitalized children and identify possible interventions for appropriate management	Retrospective Study	Foreign body aspiration in children at University of Gondar Comprehensive Specialized Hospital, two-year retrospective study	73	Any unusual bronchopulmonary infection should be suspected as resulting from foreign body aspiration.
MAYORATHAN; MANIKKAVASAKAR; PRANAVAN (2022)	Raising awareness and educating parents about the important strategy for preventing the incidence of choking.	Case study	Accidental Choking in Children: An Area to Be Focused on	02	Establishing a national surveillance and reporting system for the incidence of food-related choking could be helpful in developing prevention methods in the future.
WANG et al. (2023)	Determine the utility of computed tomography as a method to accurately confirm pediatric airway foreign bodies	Retrospective Cohort Study	The Role of CT Scan in Pediatric Airway Foreign Bodies	226	Chest computed tomography with airway reconstruction can detect foreign bodies in the airway accurately and quickly and reduce unnecessary bronchoscopy.
Feng et al. (2023)	Describe current clinical practice and outcomes in type D esophageal atresia	Retrospective Study	Diagnosis and management of congenital type D esophageal atresia	10	Misdiagnosis of type C esophageal atresia is the main cause of unplanned reoperation. Patients without serious malformations have a good prognosis.
BERGMANN et al. (2022)	Identify the quality of life related to swallowing in preterm ex-very low birth weight and extremely low weight children with repaired esophageal atresia, using the <i>pedSWAL-QOL</i>	Prospective Cross-Sectional Study	Swallowing-related quality of life in children with oesophageal atresia: a national cohort study	44	The quality of life related to swallowing is good, especially regardless of the initial surgery.
WALLACE; HONKALAMPI; KORHONEN (2022)	Investigate parental experiences of feeding a child born with	Qualitative Study	Fear, isolation and the importance of support: A qualitative study of parents' experiences of feeding a child born with esophageal atresia	176	The study highlighted the importance of supporting parents of children born with esophageal atresia and suggested the need for better guidance for feeding and swallowing difficulties.

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NGAMSANGA et al. (2023)	Evaluate the literature and update current knowledge about pediatric respiratory tract foreign bodies in children, clearly considering the aspect of complications and related factors	Systematic review	Pediatric respiratory tract foreign bodies in children: A systematic review	7 articles	Obstructive FB conditions in the respiratory tract of children are serious and potentially fatal conditions. The probability of death depends on the location of the obstruction, the nature of the foreign body, the time of removal and initial resuscitation.
AUTHORS/YEAR	OBJECTIVE	KIND OF STUDY	TITLE OF THE STUDY	n	CONCLUSION
ULAS; AYDIN; EROGLU (2022)	To evaluate outcomes in children and adults undergoing rigid bronchoscopy due to a history of foreign body aspiration.	Unicentric Study	Foreign body aspirations in children and adults	822	Foreign body aspiration is greater in children and direct radiological findings are fewer than in adults. Current findings show that foreign body aspirations in children are more difficult to diagnose and more dangerous clinically.
ANZIANI-VENTE; MOREDDU; TSAPIS (2022)	To describe practice regarding suspected foreign body aspiration (FBCA) and assess the relevance of medical transport for children with suspected ACE, regardless of their clinical and/or radiological presentation.	Retrospective, Unicentric Study	Evaluation of the relevance of interhospital transfer medicalization in the suspicion of foreign body aspiration in children	178	Medical care for suspected ACE in children in the western region of PACA, less than 10% of asymptomatic children, but with suspected ACE, presented a foreign body on endoscopy, which questions the relevance of the doctor's presence during the transport of these patients.
EVANS (2022)	ND	ND	Safer children, healthier lives: reducing the burden of serious accidents to children	ND	The ambition to make a difference on the clinical and community frontline; work together to reduce and prevent childhood injuries and deaths and, as with button batteries, gain a better understanding of symptoms that can lead to an earlier diagnosis.

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RANCE et al. (2022)	Evaluate the diagnostic and therapeutic difficulties, as well as the long-term complications of prolonged retention of an endobronchial foreign body	Retrospective Analysis	Delayed diagnosis of foreign body aspiration in children	794	Foreign body aspiration should always be considered in the differential diagnosis of chronic or recurrent respiratory diseases, even in the absence of a previous choking event.
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Table 1. Selected studies and their main findings

*ND – Nothing Described

DISCUSSION

The causes of choking in babies, an age group that includes children up to one year old, are diverse and multifactorial (ASTRUP et al., 2022). One of the main factors identified is related to food. Babies being introduced to solid foods may face significant risks if there is no adequate adaptation of the texture and size of the food to their chewing and swallowing capacity (TOURNIER et al., 2021). This transitional stage in feeding is critical, and caregivers must be instructed on how to choose foods appropriate for the baby's age and how to prepare them safely (ERASMUS; PILLAY; SIWELA, 2023; WAHED et al., 2022). Furthermore, inappropriate bottle feeding practices, such as the use of inappropriate bottle nipples or incorrect positioning during feeding, have also been identified as significant causes of choking (DELACEY et al., 2022; LA ROSA-BALSEIRO et al., 2022).

Children under two years of age are susceptible to food-related choking as they have not developed molar teeth and although they chew and bite food with their incisor teeth, they are unable to grind the food and swallow it properly. Furthermore, children of this age tend to be easily distracted and not pay attention while eating (MAYORATHAN; MANIKKAVASAKAR; PRANAVAN, 2022). For this reason, supervision at feeding time is important, but as more solid foods are introduced there is a need to adapt them to their stage of development and gradually reduce this supervision so that they become safer to eat (EVANS, 2022).

Another group of factors that contribute to choking in babies includes small objects that can be easily reached and placed in the mouth by curious babies (ASTORRI et al., 2022; BIAŁEK-DRATWA et al., 2022). Small toys, coins and household objects represent real threats, and parents and caregivers must be careful to prevent these items from being within the reach of babies (PARIS; MCKOWN, 2023b). Additionally, environmental hazards, such as plastic bags, threads and other non-food objects that can be found in the baby's surroundings, can also become choking hazards (FEDERAL, 2022). Therefore, a safe environment free from small and dangerous objects is essential to prevent choking incidents.

Foreign body aspiration is very common in pediatrics, becoming one of the main causes of morbidity and mortality in children under 3 years of age and being defined

by an aspiration event that combines a coughing fit, choking and cyanosis. Parents often report the event incompletely and confusingly, but clinical examination and chest x-rays can sometimes support the diagnosis (ANZIANI-VENTE; MOREDDU; TSAPIS, 2022).

Every year in France, around 1000 cases of aspiration by foreign bodies are reported, especially in children between 1 and 3 years old, with these foreign bodies being predominantly located in the bronchi (90% of cases) and laryngeal and tracheal locations being relatively rare. Generally after inhalation, children experience an irritating cough, choking and roaring, warning parents and helping with early diagnosis and appropriate treatment (RANCE et al., 2022).

Foreign bodies in the tracheal and bronchial airways are easily missed and for this reason are not quickly diagnosed or misdiagnosed within 24 hours after aspiration. Short periods of time when the foreign body remains in the body only lead to superficial bronchial damage, but more than 5 days can lead to serious damage to the lung parenchyma. Hence the importance of early diagnosis and removal as soon as possible to avoid serious respiratory complications (WANG et al., 2023).

Foreign body aspiration is a medical emergency that can be avoidable, but it has a high morbidity rate that varies between 10% and 20% worldwide. Every year in the United States, foreign body aspiration results in thousands of emergency room visits and is responsible for 5% of accidental deaths in children under 4 years of age (ULAS; AYDIN; EROGLU, 2022).

The study carried out by Molla et al. (2023), demonstrated that a history of foreign body aspiration could be obtained in 93.1% of patients and that in 5.9% of cases, family members were unaware of any type of foreign body aspiration. Of the sample, 89% had an episode of choking.

Esophageal atresia is a congenital disease and can also cause young children to choke and has a reported incidence of 1 in 2,500 births to 1 in 4,500 births. It occurs in the absence of the middle esophagus and is often associated with one or more tracheoesophageal fistulas. The main clinical symptoms are excessive spitting, choking and inability to pass a feeding or suction catheter through the mouth or nose to the stomach (BERGMANN et al., 2022; FENG et al., 2023).

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The study carried out by Bergmann et al. (2022), demonstrated that there is a high level of anxiety during meals in parents of younger children with esophageal atresia, where 60% of parents of babies and young children show significantly more fear of choking compared to 42% of parents of older children. Wallace; Honkalampi; Korhonen (2022), found in their study that parents experienced significant anxiety regarding feeding their children born with esophageal atresia, and that this anxiety was related to swallowing difficulties, choking, and traumatic feeding experiences, and led parents to feel a sense of loss and sadness.

By understanding the specific causes of choking in infants and implementing effective prevention strategies, we can significantly reduce the risk associated with choking incidents in children up to one year of age. Education, supervision, awareness and training in basic life support are fundamental elements to ensure the safety and well-being of this vulnerable population. This study highlights the continued importance of research and public education efforts to protect babies and ensure they can explore and grow safely in their environment.

FINAL CONSIDERATIONS

Choking in babies is a preventable but potentially serious condition. A comprehensive understanding of the causes and implementation of preventive measures can significantly reduce the risk associated with choking incidents in babies up to one year of age. Education, supervision and awareness are essential elements to protect this vulnerable population.

This systematic review highlights the importance of continued research and public education efforts in mitigating the risks associated with choking in infants. Implementing evidence-based prevention strategies is crucial to ensuring the safety and well-being of newborns and young infants.

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