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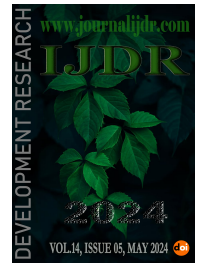
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TRAINING TEACHERS AND CIVIL SERVANTS IN THE BASICS OF FIRST AID AND EXTRICATION MANEUVERS FOR CHILDREN AND ADOLESCENTS

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ABSTRACT

Accidents can happen anywhere and at any time. But within the context of randomness, there is a percentage of possibilities to avoid them through adequate training of the agents involved. On the other hand, in the school environment, due to its specific characteristics, there is a greater probability of occurrence. In Brazil, every year, five hundred children unfortunately suffer a fatal choking accident. Most of these children could be saved with simple measures. There is no time to wait or take the child to the Emergency Medical Service. Simple maneuvers that don't require equipment should be taught to teachers and staff. The age group of the students, together with the physical conditions of the school spaces, are added risk factors. Through a literature review, this article discusses the causes of accidents in schools and the preparation of education professionals through the implementation of the Lucas Law, which aims to ensure that teachers and staff are trained in first aid and emergency assistance.

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INTRODUCTION

Health education is simply the process of developing a critical sense and changing individual opinions in relation to their health problems, which leads them to seek solutions together with other people (OLIVEIRA; GONÇALVES, 2004). However, despite the fact that health education began in the late 19th century, its fragility in operationalization is still notable today. Its implementation in the school environment is of the utmost importance, as it raises awareness

among educators and staff of the risks posed by the physical environment and prevents accidents that commonly occur in the school environment (FIORUC *et al.*, 2008). With regard to first aid, it can be conceptualized as the act of providing immediate care at a given moment, when faced with a victim of a domestic or non-domestic accident, recognizing the risk condition to which the victim is exposed and promoting conditions for subsequent in-hospital care. To do this, the individual needs to be able to carry out basic first-aid procedures through knowledge and procedures through knowledge and training appropriate to the situation (FIORUC *et al.*, 2008). The

lack of health information and knowledge is a risk that can cause casualties, who in some cases die due to a lack of specific training in immediate aid situations. Prevention is of the utmost importance and knowing the physical environment and its risks would result in the absence of countless accidents that could have been avoided (FIORUC *et al.*, 2008; NETO; ALVES; PAES, 2010). Health professionals have the task of enabling principals and teachers to see and understand what is known as the "golden minute", those precious seconds that the education professional will use and which will determine whether the child, in this case the victim, will have sequelae or die (TINOCO; REIS; FREITAS, 2014). Unintentional injuries are the biggest causes of morbidity and mortality in childhood, accounting for around 25% of deaths among children aged between five and nine. Data from the World Health Organization shows that childhood accidents are responsible for approximately 830,000 deaths per year (PEDEN *et al.*, 2023). Several studies have shown a reduction in accident rates following the implementation of educational, legislative and environmental prevention strategies. Since it is an important activity in the initial care of people until specialized help arrives (CHANDRAN *et al.*, 2013; SOAR *et al.*, 2019). Brazil's public schools are made up of old buildings, built at a time when accident risks were not a major concern. In addition, the lack of investment in maintenance exacerbates safety issues and accident prevention becomes more prominent. Characteristics such as physical and mental immaturity, inexperience, curiosity, a tendency to imitate adult behavior, lack of body awareness or motor coordination, plus the existence of inadequate access ramps, exposed wiring, broken tiles, lack of signs and escape routes and alarms, exposed or poorly installed gas cylinders, pipes and sockets distributed within reach of children, promote dangerous situations and are risk factors for accidents (CAMPOS *et al.*, 2021). The simple identification of risk sites, through a more attentive eye, when carried out by the entire school team can be a differential in the statistics that accompany accidents and their consequences (KHAN, 2013). The aim of this study is to investigate the main causes of accidents in the school environment and propose suggestions that can minimize these accidents.

MATERIALS AND METHODS

This descriptive study used a literature review of published studies on the main causes of accidents in the school environment. The National Library of Medicine (NCBI) and the Virtual Health Library (VHL) portals were used to access the following research sources: Cochrane Library, Google Scholar, IBECs, Scientific Electronic Library Online (SciELO) and PubMed. The keywords used for the search were "Accidents in the school environment"; Asphyxia; Choking; Heimlich maneuver; Lucas law. The selected articles were read in their full version and their reference lists were manually searched for additional relevant publications. One of 28 articles were considered for this review study. The type of study was based on a descriptive method. After reviewing the literature and searching for relevant works that were consistent with the theme proposed in this article, textual analysis, thematic analysis and interpretative analysis were carried out.

LITERATURE REVIEW

Law No. 13.722, of October 4, 2018 - Lucas Begalli: This law arose as a result of a fatality that occurred in 2017 with a 10-year-old boy, known as Lucas Begalli, a student at a private school in Campinas/SP-Brazil, where, during a school outing, he choked on the food served, dying two days later. The child died of mechanical asphyxiation when he choked on a piece of sausage from the hot dog served as a snack. Unfortunately, Lucas did not receive first aid quickly enough. After choking, Lucas was transferred to hospital in a mobile ICU, but unfortunately he didn't survive. The law known as the Lucas Law (Law No. 13.722, of October 4, 2018), "makes it compulsory for public and private establishments dedicated to children's and elementary education or recreation to train their teaching staff and employees in basic first aid notions". This law

came into being after the teacher present was not trained in first aid (BRASIL, 2018). After tragic events, it is more necessary than ever for education professionals to know and understand the importance of the Lucas Law, a federal law that requires teachers and school staff to be trained in first aid (RODRIGUES *et al.*, 2022). According to Vito *et al.* (2023), the objectives should be to guide, through actions established by the Lucas Law, training teachers and employees of educational institutions and volunteers who exercise learning functions with children and adolescents to act with first aid in the prevention of deaths during the school routine. According to Moreno *et al.* (2021), the Lucas Law obliges schools, both public and private, for early childhood and basic education and children's playgrounds, to prepare for first aid in order to provide a quick and efficient response in emergency situations. Training and certification is monitored by the Department of Education. The law itself lays down the consequences of failing to comply with its provisions. Schools that fail to train their employees may face three types of penalties: (i) notification of non-compliance; (ii) a fine after a repeat offense; and (iii) revocation of their operating license after a second repeat offense (MARTINS *et al.*, 2020). According to Mantovani *et al.* (2023), children's playgrounds will also have to comply with the law. The matter, known as the Lucas Law, was processed with an urgent request. The text stipulates that first aid courses must be offered annually, both for training and for retraining already trained professionals. First aid can be performed by anyone, as long as they are properly trained and know how to perform the appropriate techniques to provide emergency care (Fernandes *et al.*, 2021).

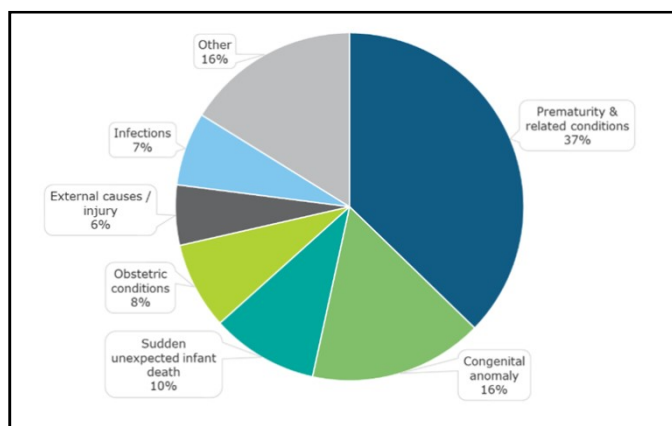
Safety in the school environment: Safety in the school environment involves both the adequate physical structure of the school and the preparation of the agents who work within its environment. Thus, it is speculated that knowledge of first aid is necessary for individuals of different age groups and from different social and professional classes, as the use of these procedures may be necessary for the most diverse populations. According to Godoy & Silva (2009), first aid is carried out through simple procedures, the aim of which is not to aggravate the victim's condition, and is characterized by certain urgent and emergency situations, such as serious injuries and heavy bleeding. First aid is provided by anyone with a basic knowledge of first aid, until a qualified ambulance team takes the victim to hospital. For this to happen, the school environment needs basic materials (splints, scissors, a roll of absorbent cotton, a thermometer, rolls of bandages, a roll of crepe tape, a roll of adhesive plaster, gas packs, saline solution, disposable gloves, soap or coconut stones) along with a professional who has a good posture when attending to children, because first aid actions are usually carried out immediately on the victim with improvised materials such as cardboard splints, gauze improvised with any fabric found at the time of the incident, and often some inappropriate products and medicines are used in an attempt to maintain the victim's vital functions until they receive qualified assistance (IERVOLINO; PELICI ONE, 2005).

Statistics on child accidents in Brazil: Falls, suffocations, burns, drowning and poisoning that occur accidentally in the home are the main causes of child deaths in Brazil in the 0-14 age group. According to data from the Ministry of Health recorded by the Child Mortality Information System, which is part of DataSUS, in Brazil there were 1,616 deaths from domestic accidents involving children aged 0 to 14 in the period 2020 and 2021, with 792 deaths in 2020 and 824 in 2023 (MINISTÉRIO DA SAÚDE, BRASIL, 2023). It can be seen that the highest number of child deaths from domestic accidents occurred in the 0-4 age group, with 621 deaths in 2020 and 671 in 2023. The federative unit with the highest number of records in the same age group is São Paulo, with 113 occurrences in 2020 and 136 records in 2023 (MINISTÉRIO DA SAÚDE, BRASIL, 2023). According to Amaral and Paixão (2023), in 2023, 21,040 deaths of individuals up to the age of 19 in Brazil were caused by accidents and violence. Of these, 1,762 (8.4%) occurred in the North, 5,437 (25.8%) in the Northeast, 8,783 (41.7%) in the Southeast, 3,229 (15.3%) in the South and 1,984 (9.4%) in the Midwest. According to Sena, Ricas and Viana (2018), among the intrapersonal factors, the characteristics of the child that could contribute to the occurrence of the accident are:

Stage of motor development; Stage of social and cognitive development; Biological constitution and psychic structure.

Statistics on child accidents around the world: Infant mortality generally refers to the death of children under the age of one. Infant mortality, which is often used synonymously with child mortality, is the death of children under the age of five. The main causes include pneumonia, diarrhea - which causes dehydration - and infections in newborns, while malnutrition is also a serious problem (ALVES, 2021).

GRAPH 1 shows the relationship between the main causes of neonatal death and the later neonatal phase observed by the World Health Organization in 2023. The majority of countries with a high infant mortality rate are developing or emerging countries, most of which are located in Africa. Good health care and hygiene are crucial to reducing infant mortality. The countries with the lowest infant mortality rates are exclusively developed countries, whose inhabitants generally have access to clean water and comprehensive health care. Access to vaccines, antibiotics and a balanced diet also help to reduce infant mortality in these regions (PARKS, 2023).



Graph 1. Causes of infant death in 2023. Source: World Health Organization

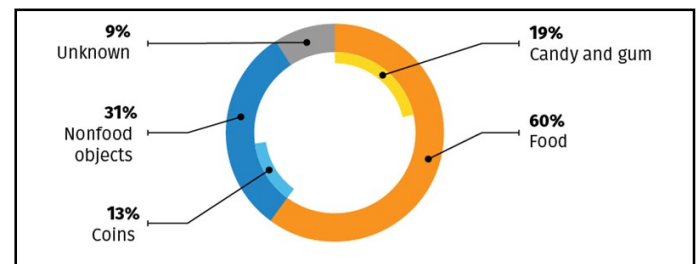
Causes of Asphyxial Deaths in Children: Choking is the difficulty or interruption of breathing that leads to a lack of oxygen in the body. Choking usually occurs when a child puts an object in their mouth or nose that restricts the passage of air. The greatest risk lies in the possibility of the object being aspirated into the lungs (SCHEIMBERG, 2023). According to the Brazilian Society of Pediatrics, foreign body aspiration is seen mainly in male children between the ages of 1 and 3. More than 50% of aspirations occur in children under the age of 4 and more than 94% before the age of 7. Up to the age of three, children do not have control over chewing and swallowing food due to the lack of molar teeth, an important structure for crushing solid food. Offering some foods to children in this age group, such as peanuts, beans, popcorn and corn, poses a risk of aspiration because they swallow without chewing. Any distraction, laughter, play or fright can cause an accident. In addition, children of this age have a habit of bringing objects to their mouths (OBEAGU, 2023). According to Park (2023), any material can become a foreign body in the respiratory system. The greatest suspicion that an accident has occurred is choking. As soon as an object is aspirated, there is a coughing fit, followed by choking. Aspiration should also be considered when there is a sudden onset of wheezing in children with no allergies in the family.

Some signs should alert you to a suspicion of aspiration:

- Persistent cough;
- Chest wheezing;
- Sudden shortness of breath;
- Hoarseness;
- Purplish lips and nails.

When the foreign body is partially aspirated, the child may cough and make sounds. In this situation, the best course of action is not to intervene in the home environment and to refer the child to a health service for definitive treatment (PARK, 2023).

CHART 2 shows the types of objects or foods that cause choking in children.



Graph 2. Objects or foods that cause choking in children. Source: World Health Organization (2023)

Environmental characteristics of babies who died from different types of unintentional asphyxia: A study by Ely et.al (2023) found that babies whose deaths were attributed to choking had some noteworthy characteristics. Half (50.8%) of the cases of asphyxia occurred in winter and only 7.8% in summer. Overlapping was the most frequently reported circumstance, contributing to 88.6% of cases; 10.4% of babies were overlapped by the adult's body, and 1.0% of cases were due to other causes. Of the 193 infant deaths due to asphyxia, 93.8% occurred when co-sleeping/bed-sharing with parents, and 72.8% of babies who co-slept/bed-shared with parents were covered with the same quilt as the parents. It was also found that breast milk was the main cause of inhalation asphyxia in infant deaths (54.5%), followed by a liquid substance (33.8%) and another semi-solid or solid substance (11.7%). In our study, 80.5% of infant deaths from inhalation asphyxia occurred after feeding; in 28.2% of these cases, the infants were held upright and stroked by their caregivers, while 57.2% were put to sleep immediately after feeding (ELY et.al, 2023).

Accident prevention: Therefore, teachers and school staff, in addition to their educational and pedagogical commitment, are also responsible for ensuring the safety of children, dedicating themselves to their education and well-being. It is considered necessary that approaches and studies of preventive behaviors should begin in the family and be extended to the school environment, with the participation of children and their guardians in discussions regarding the safety of all (MINOZZO and ÁVILA, 2006; BESSA and VIEIRA, 2001). This responsibility is in line with Article 196 of the Brazilian Federal Constitution, which reads: "Health is everyone's right and the duty of the state, guaranteed through social and economic policies aimed at reducing the risk of disease and other illnesses and universal and equal access to actions and services for its promotion, protection and recovery". The Convention on the Rights of the Child and Adolescent states that all sectors of society, especially parents and children, should be ensured of knowledge of basic health principles and accident prevention actions. They should receive support to apply this knowledge (FILÓCOMO *et al.* 2002). According to the Ministry of Health (2022), while children and adolescents remain at school, it is important to seek health promotion, with the development of actions to prevent diseases and strengthen protective factors. Given the importance of this problem, in 2001 the Ministry of Health adopted the "National Policy for Reducing Mortality from Accidents and Violence" based on the following guidelines: Promoting the adoption of safe and healthy behaviours and environments, monitoring the occurrence of accidents and violence, systematizing, expanding and consolidating pre-hospital care, interdisciplinary and intersectoral care for victims of accidents and violence, structuring and consolidating care aimed at recovery and rehabilitation, training human resources and supporting the development of studies and research (AMARAL and PAIXÃO, 2007).

Examples of first aid actions: According to Alves et.al (2023), considering that children are energetic beings who want to play, it is common for small incidents to happen in the school environment. That's why it's so important to know how to act in such cases. Some examples of first aid actions include;

- Sanitizing wounds and cuts properly;
- Apply pressure to bleeding and keep the area elevated;
- Check breathing and heart rate;
- Cool burns with cold running water;
- Immobilize twisted or fractured areas with a splint;
- Do not remove impaled objects;
- Apply ice packs to bruises;
- Correctly administer anti-allergic medication, such as adrenaline injections, if prescribed by a doctor;
- Help the student to use their inhaler during asthma attacks;
- Place the child on their side after an epileptic seizure to prevent aspiration of saliva or vomit;
- Talk to the student and keep them calm while waiting for specialized help.

end of the rib cage; then hold this hand with your non-dominant hand, providing better support (ALVES et.al, 2023).

Choking maneuvers: Choking is a manifestation of the body expelling food or an object that has taken a "wrong turn" during deglutition (the act of swallowing). Choking is considered an emergency and, in serious cases, can lead to death by asphyxiation or render the person unconscious for a time. Therefore, acting quickly avoids complications (ZHU et al, 2023).

Emergency Aid (Baby Choking): Place the baby face down on your arm and perform five compressions between the shoulder blades (in the middle of the back). Turn the baby face-up on your arm and perform five more compressions on the sternum (the bone that divides the chest in half), at the level of the nipples (Figure 1). Try to visualize the foreign body and gently remove it from your mouth. If you can't, repeat the compressions until you reach an emergency service (emergency room or hospital). These procedures are only valid if the choking child or adult is conscious. Unconscious victims need hospital care quickly. First aid for choking or choking should be given until specialized care is available (Britten, 2023).

CHOKING FIRST AID for INFANTS

Coughing is the best way to clear a partially blocked airway, but if your baby is unable to breathe, cough or make a sound, his airway may be totally blocked and he will need your help to clear it.

1. LOOK INSIDE MOUTH

Never put your finger in a choking baby's mouth until you visually check for an obstructing object.

Pull the baby's jaw open to look inside his mouth. If you can see an object, avoid pushing it further back in the throat by sweeping a finger along the inside cheek and back behind the object to pop it out.



2. FIVE BACK BLOWS

If the object is too far back in the throat to see or easily remove with a finger, support your baby's head under his chin and lie him face down along your forearm with his head lower than his bottom.

Using the heel of your hand, give 5 blows between the shoulder blades.

Visually check for an object in the baby's mouth and remove if possible.



3. CHEST THRUSTS

If his airway is still blocked after 5 back blows, turn your baby onto his back on a firm surface and give him up to 5 chest thrusts.

Place two fingers on his breastbone about 1 finger width below the nipple line.

Push downward and upward (towards baby's head).

After each chest thrust, visually check for an object in baby's mouth and remove if possible.



4. REPEAT CYCLE

If baby's airway is still blocked after 5 chest thrusts, repeat 3 cycles of back blows and chest thrusts before calling 911 for an ambulance. Continue the cycles until airway clears or help arrives.

Take your baby to the doctor after a choking episode, even if your baby seems to be fully recovered.

Figure 1. First aid to be given to a child who has choked. Source: <https://letmommysleep.com/blog/2022/05/03/choking-first-aid-infants/>
When a child chokes, you should clench the fist of your dominant hand and position it on the upper abdomen, between the navel and the

Although choking is a common cause of injury and death in children, it doesn't have to be. Parents and caregivers can prevent situations that can cause choking in babies by ensuring that;

- Bottle-fed babies are supervised
- Developmentally appropriate foods are offered, such as soft foods only when solids are introduced
- Small objects that babies or young children can pick up and put in their mouths are never within the child's reach.

How to act in case of foreign body choking: Heimlich maneuver:

Position yourself from behind and wrap your arms around the victim's abdomen (if it's a child, kneel down first), if they are conscious. One hand remains closed over the so-called "mouth of the stomach" (epigastric region). The other hand compresses the first, at the same time pushing the "stomach mouth" inwards and upwards, as if to lift the victim off the ground. Make compression movements inwards and upwards (like a letter "J"), until the victim eliminates the foreign body.

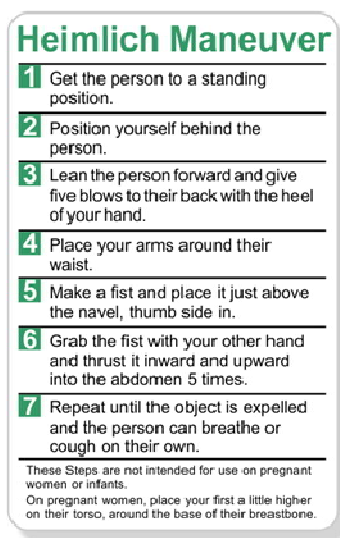


Figure 2 - Step by step of the Heimlich Maneuver. Source: <https://www.corpconnect.com/wallet-reference-card-heimlich-maneuver>

Foreign body asphyxia, known as foreign body airway obstruction (FBOA) or choking, is one of the most common and possibly fatal emergencies. It can be identified as total obstruction of the airways, or partial obstruction with free airways. The faster the individual acts, the greater the chances of preventing complications (LIMA, 2021). A foreign body can be characterized by any object or food that may be able to become lodged in the oral cavity, showing greater risk when aspirated into the lungs (TEIXEIRA, 2017). Children between the ages of one and three tend to explore and get to know the world, and a common attitude is to put objects in their mouths, either because they find them interesting, out of curiosity or even as a way of imitating their parents. They are unable to perceive danger and, as they are still developing, they do not have the ability to chew due to incomplete dentition, which impairs chewing and contributes to accidents such as airway obstructions (PINHEIRO, 2021). The death rate of children from aspiration was one of the biggest causes in the world, reaching 50%. The only treatment was palliative tracheostomy. In 1897, Gustavo Killian performed the first bronchoscopy in order to remove a foreign body from a child's airways and, from that moment on, mortality fell to 1% (LIMA, 2022). The increase in cases of foreign body aspiration is in the one to three year age group. With coughing, large parts of these aspirated foreign bodies are expelled. When residue remains, it settles in the bronchial tree when aspiration occurs (GUAZZO, 2019). Symptoms can be classified into three phases, the first characterized by an initial cough that is usually imperceptible, the second as a foreign body located in the trachea that shows the child signs of dyspnea that is visibly diagnosed and the third which is the foreign body located in the bronchi, which causes a decrease in

respiratory sounds and is usually diagnosed late. The shorter the time it takes to diagnose foreign body aspiration, the fewer complications it can cause (WORNLEY, 2015). Locating the point of obstruction during choking is essential, as this will help define the treatment and minimize possible complications. In children under one year of age, the most affected sites where the obstructions are located are the larynx and trachea, where rupture or complete obstruction occurs. The bronchus is the area most often affected, with occurrences between 80-90% of cases (TAVARES, 2020). The percentage of foreign bodies found in the larynx is 3%, trachea 13%, right lung 60%, left lung 23% and bilateral 2% (WOLNEY, 2015). When the foreign body is easily removed and the patient is asymptomatic after extraction, an assessment and observation will take place within 24-48 hours, and if there are no complications the patient will be discharged from hospital. Complications after extraction can include laryngeal and pulmonary edema, hemoptysis, pneumothorax, tracheoesophageal fistula, pneumonia, atelectasis, including intensive care and mechanical ventilation (GONÇALVES, 2011).

FINAL CONSIDERATIONS

The implementation of "safe schools" should follow a roadmap that starts with the identification of environments at risk of accidents and violence, since accidents in childhood are common and also occur in school environments, where children's interest in exploring new situations, their own potential for new skills and the way they interact with the environment they are in can lead to accidents when exposed to threats that exist in the space they are in, and there is a need for teachers with knowledge and information on first aid. It is concluded that teachers and other members of the teaching team need sufficient technical and scientific knowledge about first aid and the basic materials provided by the educational institution to deal with emergencies in the school environment and their actions should be planned and their lessons taught according to the space, materials and number of children in the classroom. Therefore, promoting partnerships between education and health professionals is essential, as one of their main actions in urgent and emergency care should be assessing the injured student, carefully observing the situation that led to the occurrence, checking the nature of the accident and the severity of the injury, such as fractures, dislocations, sprains or ligament ruptures, as well as helping health professionals to have a positive impact on the knowledge and skill levels of school teachers, helping to establish methods, strategies and ways of thinking.

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