






CHARACTERIZATION OF CHILDREN ACCIDENTAL DEATH CASES BY ASPIRATION OF FOREIGN BODIES IN MINAS GERAIS

CARACTERIZAÇÃO DOS CASOS DE ÓBITO ACIDENTAL DE CRIANÇAS POR ASPIRAÇÃO DE CORPOS ESTRANHOS EM MINAS GERAIS

CARACTERIZACIÓN DE LOS CASOS DE MUERTE ACCIDENTAL INFANTIL POR ASPIRACIÓN DE CUERPOS EXTRAÑOS EN MINAS GERAIS

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ABSTRACT

Objective: to characterize the cases of deaths due to accidental asphyxia by suffocation in children. **Method:** a descriptive and retrospective study of secondary data of death certificates of children, from 2005 to 2015, including those under one year old and those from one to four years old, in the state of *Minas Gerais*, that were reported in the Unified Health System database. The study identified 233 cases of death from asphyxia. Among the victims, the male sex (131, 56.2%), white race/skin color (118, 50.6%), and children under one year (175, 75.1%) were the most common. The most frequent diagnoses were inhalation and food intake, causing respiratory obstruction (155, 66.5%) in children under one year and from one to four years old. **Results:** an average of 14.6 cases per year were reported, with great variation, during the study period. The year 2002 had the highest number of deaths (21, 9.0%) and 2006, the lowest (7, 3%). **Conclusion:** the importance of the implementation of preventive and educational measures to reduce this occurrences, its injuries and sequelae, is highlighted.

Keywords: Airway Obstruction; Respiratory Aspiration; Foreign Bodies; Child; Mortality; Nursing.

RESUMO

Objetivo: caracterizar os casos de óbitos decorrentes de asfixia acidental por sufocação em crianças. **Método:** estudo descritivo e retrospectivo de dados secundários no qual procedeu-se à análise dos dados dos óbitos de crianças menores de um ano e de um a quatro anos ocorridos no estado de Minas Gerais e notificados no banco de dados do Sistema Único de Saúde, no período de 2005 a 2015. Foram identificados 233 casos de óbitos por asfixia. Entre as vítimas prevaleceram o sexo masculino (131, 56,2%), a raça/cor branca (118, 50,6%), sendo em maior proporção nas crianças menores de um ano (175, 75,1%). Os diagnósticos mais frequentes foram inalação e ingestão de alimentos, causando obstrução do trato respiratório (155, 66,5%), em menores de um ano e de um a quatro anos. **Resultados:** foram notificados, em média, 14,6 casos por ano com grande oscilação no período estudado, sendo que no ano de 2002 houve maior número de óbitos (21, 9,0%) e em 2006 apresentou-se o menor número de casos (7, 3%). **Conclusão:** destaca-se a importância da implementação de medidas preventivas e educativas, com vistas a reduzir o evento, as lesões e as sequelas decorrentes.

Palavras-chave: Obstrução das Vias Respiratórias; Aspiração Respiratória; Corpos Estranhos; Criança; Mortalidade; Enfermagem.

RESUMEN

Objetivo: caracterizar los casos de muerte por asfixia accidental en niños. **Método:** estudio descriptivo y retrospectivo de datos secundarios en el que se analizaron datos de la muerte de niños menores de un año y de uno a cuatro años en el estado de Minas Gerais informados en la base de datos del Sistema Único de Salud de 2005 a 2015. Se identificaron 233 casos de muerte por asfixia. Entre las víctimas

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había más varones (131; 56,2%), de tez blanca (118; 50,6%), y en una proporción mayor entre los niños menores de un año (175; 75,1%). Los diagnósticos más frecuentes fueron inhalación e ingesta de alimentos, causando obstrucción del tracto respiratorio (155; 66,5%) en niños menores de un año y de uno a cuatro años. **Resultados:** en promedio, se informaron 14,6 casos por año con gran oscilación durante el período de estudio; en 2002 hubo más cantidad de muertes (21; 9,0%) y en 2006 menos muertes (7; 3%). **Conclusión:** se realiza la importancia de la implementación de medidas preventivas y educativas para reducir los eventos, lesiones y secuelas. **Palabras clave:** Obstrucción de las Vías Aéreas; Aspiración Respiratoria; Cuerpos Extraños; Niño; Mortalidad; Enfermería.

INTRODUCTION

The mortality rate of children under five years had a significant reduction from 1990 to 2015, going from 52.5/1.000 to 17.0/1.000 live births (LB), which represents a 67.6% decrease.¹ However, deaths and hospitalizations associated with external causes did not follow this reduction. In 2015, this cause of death was still in the top 20 and among the top 15 causes of death in children under five years, making it a major public health problem for families and society.¹

“External causes of morbidity and mortality” represent a variety of accidents, including trauma, injury and violence, as well as accidental causes related to transportation, work, falls, poisoning, drowning, burns, landslide injuries, floods, or other environmental conditions.¹

Home accidents are among the most frequent emergency cases in the child and adolescent population,² and these accidents are responsible for the great demand of care for children, adolescents and young people in emergency services. And among the most frequent cases are those where foreign objects are introduced into natural body holes.³

Accidents of foreign body or food content aspiration in children may cause partial or total airway obstruction (OVACE)⁴ and, depending on the severity of the obstruction, may lead to asphyxia and cause hypoxia in the child.^{5,6}

Small objects offer more aspiration risks, such as ballpoint pen caps, buttons, empty balloons, plastic, rings, coins, earrings, and spherically small foods such as peanuts, walnuts, popcorn, chestnuts, beans, peas, corn, fruits with cores and seeds and toys with small pieces.^{6,7}

The material most closely related to immediate death from asphyxiation is synthetic, such as rubber balloons, spherical structures, solid or not, such as glass balls and toys.⁸

Temporary airway obstruction poses a risk of hypoxia close to 30%, and the OVACE is associated with a mortality rate around 45%.⁹ Child OVACE accidents, also known as choking, involve a high risk of sequelae and death.^{10,11}

The problem of children injury is universal, but in some countries it is significantly lower than in others.¹² In countries such as Algeria, for example, foreign body aspiration is a real public health problem.¹³ Serious complications occur in both high-income and low-middle income countries, with death being common in both.⁷

However, few countries have good systematic data collection. International surveillance systems capable of collecting information in a standardized way need to be implemented.⁷

According to data from the DATASUS, Informatic Department of the Unified Health System (*Departamento de Informática do Sistema Único de Saúde-SUS*) in Brazil, the main cause of accidental deaths in children under one year is asphyxia.⁸

In Brazil, in 2015, there were 2.358 deaths of children due to foreign body aspiration, traffic accidents, drowning, and homicides. The aspiration of foreign bodies was the 10th most common cause of death.¹

In Brazil, the death rates of children from zero to four years old due to asphyxiation, choking, and airway obstruction are high, and these deaths are potentially preventable through educational, prevention and early intervention actions.¹⁴

Child accident prevention, early identification and immediate intervention are important measures in foreign body aspiration accidents.^{5,14,15}

Studies show that most accidents related to airway obstruction or choking in children happen at home.^{10,11} Therefore, mothers and caregivers, the ones who stay the closest and the longest with the children, must be aware of the risks, signs and symptoms of choking or airway obstruction in children, as well as first aid knowledge and training.¹¹

Empowering those most likely to encounter a newborn with airway obstruction increases the likelihood of the survival of these children.¹⁶

Early intervention is possible by identifying total airway obstruction. It consists in performing a maneuver that induces artificial coughing to help expel the foreign body, object, or food that is blocking the victim's breathing and the passage of air into the lungs. This technique is called the Heimlich maneuver.^{14,17}

Considering the educational role of nursing professionals, studies recommend that they use health education with pregnant women and caregivers in order for them to acquire skills and knowledge that prepare them for the preventive aspects of foreign body aspiration.¹⁸

In this context, it is important to develop educational programs directed at parents and caregivers, with the objective of training them regarding the risks of accidents in children. They must be able to observe the signs and symptoms indicating the airways are obstructed and the interventions needed, by learning basic techniques of upper airway clearance.¹⁹ This

is because the observer, when able, can detect the signs of asphyxiation, and intervene effectively.²⁰

The prevention of childhood accidents will result in reduced demand for health services, hospital costs and, above all, the suffering of parents, caregivers and the child itself.¹⁸

Studies aiming at an approach about the epidemiological analysis of infant morbidity and mortality and the circumstances of deaths provide visibility to the real situation of states and municipalities, providing managers and health professionals and nurses with data to plan strategies for prevention and caring for children, aiming at diminishing sequelae and deaths.²¹

Thus, a question arises regarding the panorama of children deaths due to accidents related to aspiration of foreign bodies, bronchial aspiration, and suffocation in *Minas Gerais*, since its answer will instigate and justify the need for the prevention and educational programs mentioned above.

This study aims to characterize the cases of deaths due to accidental choking by suffocation in children under one year and from one to four years old, occurred in the state of *Minas Gerais*.

METHOD

This is a quantitative, descriptive and retrospective study using data from the records of deaths of children under one year and from one to four years old, in the state of *Minas Gerais*, Brazil.

Data collection investigated information on deaths that were reported in the *Sistema Único de Saúde* (DATASUS) database from 2000 to 2015. The period analyzed was chosen considering that the available data referred to the years from 2000 to 2015, in addition to the fact this is a more recent period.

Data from the database from the *Sistema Único de Saúde* (DATASUS) is recorded in the SUS Hospital Information System (*Sistema de Informações Hospitalares-SIH/SUS*). This system is the responsibility of the *Ministério da Saúde* (MS), *Secretaria de Atenção à Saúde* (SAS), *Departamento de Regulação, Avaliação e Controle* (DRAC), and is called *Guia de Internação Hospitalar* (GIH). Its purpose is describing all care provided by the hospital that was paid by the SUS.

The database allows searches for the number of deaths from each cause through the ICD of the disease and is available at: <http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sim/cnv/ext10mg.def>.

The study included cases of death of children under one year and from one to four years old, occurred in *Minas Gerais*, registered and available in the DATASUS database.

To obtain the data, a search was made in the database considering the recorded cases of death by accidental asphyxia. Diagnoses of causes of death according to the International Statistical Classification Review of Diseases and Related

Health Problems (ICD 10) were used, namely: suffocation and accidental strangulation in bed – W75, other hanging and accidental strangulation – W76, inhalation and food ingestion causing respiratory obstruction – W79, inhalation and ingestion of other objects causing respiratory obstruction – W80.

The available variables investigated were gender, color, age, place of death, and ICD classification.

STATISTICAL ANALYSIS

The data identified was stored in an Excel® spreadsheet, after double entry input, for later validation. The data was imported into the software Statistical Package for Social Sciences (SPSS) version 21, for processing and analysis. The qualitative variables were analyzed according to descriptive statistics, absolute and relative frequency distribution, while for quantitative variables descriptive measures of centrality (mean) and dispersion (minimum and maximum value) were used.

ETHICAL ASPECTS

The study was registered in the *Plataforma Brasil* under the Certificate of Submission for Ethical Assessment (CAAE) 654301175.0000.5154, and was approved under Protocol number 2.005.525.

RESULTS

233 cases of death from asphyxiation in children under one year and from one to four years old were identified, from 2000 to 2015 in the state of *Minas Gerais* (MG). There was a prevalence of male (131, 56.2%), white (118, 50.6%) and younger than one year old (175, 75.1%) children (Table 1).

Table 1 - Distribution of deaths from asphyxia (n = 233), according to epidemiological profile, from 2000 to 2015 – *Minas Gerais*, 2017

Variable	N°	%
Gender		
Female	102	43.8
Male	131	56.2
Skin color		
White	118	50.6
Black	8	3.4
Brown	86	36.9
Ignored	21	9
Age group		
Under one year	175	75.1
One to 4 years	58	24.9

Source: data from the *Sistema Único de Saúde* (DATASUS).

Regarding the place of death, the children's house was identified as the most common (100, 42.9%), followed by the hospital (82, 35.2%) (Table 2).

Table 2 - Distribution of deaths due to asphyxia, according to place of death, from 2000 to 2015 – *Minas Gerais*, 2017

Variable	N°	%
Local		
Hospital	82	35.2
Other health institution	32	13.7
Home/residence	100	42.9
In the street	8	3.4
Others	9	3.9
Ignored	2	0.9
Total	233	100

Source: data from the *Sistema Único de Saúde* (DATASUS).

Among the diagnoses, according to ICD, the most frequent was W79 – inhalation and food intake causing respiratory tract obstruction, 155 (66.5%), both in children under one year old and from one to four years old (Table 3).

By analyzing the frequency of deaths per year, it was found that during the study period, the minimum value was seven and the maximum 21, which means, on average, 14.6 deaths per year. The number of deaths from 2000 to 2015 varied widely. 2002 had the highest number of deaths (21, 9.0%) and 2006, the lowest (7.3%) (Figure 1).

DISCUSSION

In the present study, 233 cases of accidental asphyxia deaths were identified in children under one year and from one to four years. Over a period of 15 years, it was found that the high incidence of deaths in children due to accidents caused by foreign body aspiration is present in other states, as in a study conducted in the city of Recife (PE) through data collection at the *Instituto de Medicina Legal* (IML). It was found that in 2012,

106 deaths were recorded in children from zero to nine years of age and there was a predominance of airway obstruction accidents in children under four years of age and drowning in those aged from two to nine years.²¹

In the city of *Cuiabá*, a survey conducted in 2013 identified that, from the 526 healthcare cases due to home accidents, the most frequent type of accident in children under four years old was due to foreign body ingestions causing choking and airway and tracheal obstructions and asphyxia.²²

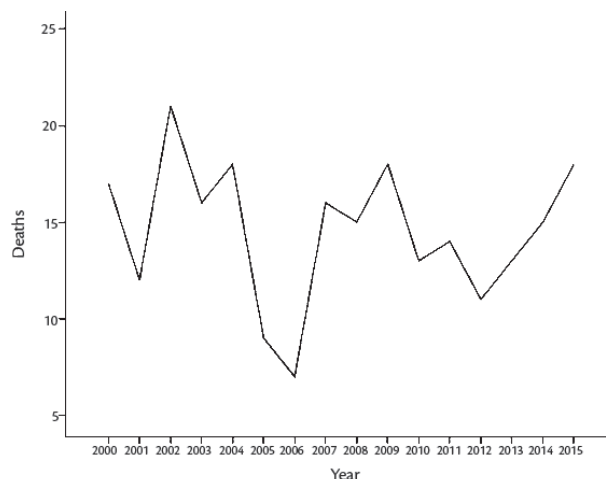


Figure 1 - Distribution of deaths due to asphyxia in the period from 2000 to 2015, *Minas Gerais*, 2017.

Injuries caused by foreign body accidents represent a preventable cause of mortality and morbidity, but actions to prevent these accidents are still neglected around the world. Upon analysis of mortality and morbidity, it was found that from 37,997 children were suspected of having aspired a foreign body, almost two thirds come from low- and middle-income countries.⁸

It was found that there was a predominance of male children in the present study. These results corroborate other researches that found that the highest number of deaths was among male children.^{14,15,21}

Table 3 - Distribution of deaths due to asphyxia according to ICD, from 2000 to 2015, *Minas Gerais*, 2017

Variable ICD	Age		Total	%
	< One year	One to 4 years	< One year One to 4 years	
W75- Accidental choking and strangulation in bed	25	0	25	10.7
W76- Other accidental hanging and strangulation	0	3	3	1.3
W79- Inhalation and ingestion of food causing respiratory obstruction	124	31	155	66.5
W80- Inhalation and ingestion of other objects causing respiratory obstruction	26	24	50	21.5
Total	175	58	233	100

Source: data from the *Sistema Único de Saúde* (DATASUS)

More deaths in males may be due to behavioral characteristics, since boys exhibit more impulsive behaviors, and also to cultural factors, according to which parents and guardians give boys less restrictions than they do girls.¹⁴

The prevalent skin color was white, in disagreement to the results of other studies, in which there was a higher prevalence of deaths in the brown or non-white race/color.^{5,21}

Regarding the age group, there was a higher frequency of deaths in children under one year. Other studies have also found that breastfeeding-age children are the most affected by this type of accident.^{3,14,18,22}

The most affected population, those under one year old, exhibit factors that favor the aspiration of foreign bodies, the practice of bringing objects directly to the mouth and the immaturity to react to dangers, when facing objects that pose a risk of aspiration.^{3,23}

By analyzing the place of occurrence of these deaths, the most frequent was the child's house, where 100 (42.9%) cases took place. Other authors corroborate these results and indicate the severity and risk of immediate death in these accidents.^{8,10,11}

This research found that 2006 was the year with the lowest number of deaths from obstruction. It is known that in the same year the *Ministério da Saúde*, under the *Sistema Único de Saúde (SUS)*, implemented the *Sistema de Vigilância de Violências e Acidentes (VIVA)* in 27 Brazilian municipalities. The objective was to collect data and generate information on violence and accidents and to describe the profile of violence (interpersonal or self-harm) and accidents (traffic, falls, burns, among others), attended at urgency and emergency units.²⁴

VIVA aims to know the magnitude of these public health problems and to subsidize public health policies directed at these situations, actions to address the determinants and conditioning factors of external causes, seeking to prevent them, encouraging the formation of networks of attention and protection to people who are victims of violence and accidents.²⁴

Even with the implementation of the VIVA system, after 2006 there was a constant number of deaths over the years analyzed, and in some years, the number even grew.

The predominance of deaths of male children under one year of age at their houses, found by this study, was also cited as a social determinant in another investigation.²⁵

The multifactorial characteristic of domestic accidents in childhood is associated with determinants and conditioning factors, such as social and cultural factors of their families, including lack of knowledge of families, non-preventive culture, lifestyle habits that lead to risky situations, poor child surveillance, unsafe home environments with hazardous products and materials, lack of more effective laws, and lack of communication.²⁵

The identification of determinants for childhood accidents reinforces the importance of investing in public policies that

reduce social inequities and risk exposure, considering the different contexts in which children are inserted.^{25,26}

The *Política Nacional de Atenção Integral à Saúde da Criança*, which aims to promote and protect child health and reduce child mortality, includes strategic actions in the integral childcare axis to prevent childhood accidents. Preventive actions for the adoption of attitudes that promote child safety should take into account the risk factors and the vulnerability and stage of development of each child. These actions should be observed in the elaboration of plans, programs, projects and child healthcare actions.²⁶

In addition to the preventive and educational actions, the implementation of the trauma care line at the points of attention of the emergency care network defines the organization of health services for children who suffer accidents, aiming to prevent health issues. The line organizes care according to the specificity and severity of the case to ensure adequate standards of accessibility to technological resources.²⁶

CONCLUSIONS

This study, by characterizing the data of accidental asphyxia deaths due to foreign body aspiration, bronchial aspiration, and suffocation in children under one year and from one to four years, took place from 2000 to 2015 in the state of *Minas Gerais* (MG). The study found that children who were male, white, and under the age of one year of age were the most common victims, and the accidents with death occurred mostly at home.

The most frequent diagnosis was inhalation and food intake, causing respiratory obstruction in the two age groups analyzed, and the lowest number of cases was in 2006.

The data make it possible to understand some characteristics related to risk factors and the causes of accidents with children. It shows the importance of future implementation of preventive and educational measures aimed at preventing, identifying, and managing the aspiration of foreign bodies.

The constant frequency of accidents over the years points to the importance of nurses and other health professionals to act in the prevention of accidents, giving it the same level of priority as other actions for healthy development.

The limits of this study were regarding the period available, which did not allow for the analysis of the last years. Also, the variables considered were limited.

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