

## HOME ACCIDENTS DUE TO EXPOSURE TO ANIMATE MECHANICAL FORCES AMONGST CHILDREN AND YOUTH POPULATION

### ACIDENTES DOMICILIARES POR FORÇAS MECÂNICAS ANIMADAS NA POPULAÇÃO INFANTOJUVENIL ACCIDENTES DOMICILIARIOS DEBIDO A FUERZAS MECÂNICAS ANIMADAS EN LA POBLACIÓN INFANTO-JUVENIL

Jackeline Gonçalves Brito <sup>1</sup>  
Christine Baccarat de Godoy Martins <sup>2</sup>

<sup>1</sup> RN. PhD student in Nursing. Federal University of Mato Grosso – UFMT, School of Nursing, PhD Postgraduate programme. Cuiabá, MT – Brazil.

<sup>2</sup> RN. PhD in Public Health. Adjunct Professor. UFMT, School of Nursing, Post Graduate Programme. Cuiabá, MT – Brazil.

Corresponding author: Jackeline Gonçalves Brito. E-mail: jackeline\_brito@hotmail.com  
Submitted on: 2014/12/05      Approved on: 2016/06/27

#### ABSTRACT

Human, animal and insect bite accidents in the home are a major cause of hospital attendance amongst children and adolescents (0-24 years). In order to delineate preventive measures and interventions it is necessary to identify the circumstances surrounding such accidents. **Objective:** To assess home accidents due to exposure to animate mechanical forces amongst children and youth population cared for at the emergency care unit of a public reference hospital during 2013. **Method:** Cross-sectional epidemiological study with retrospective data collection and quantitative analysis. The researchers analysed records of home accidents due to exposure to animate mechanical forces in the population aged 0-24 years throughout 2013. The participants had been cared for at the emergency care unit of a public reference hospital. Data were entered in EPI program and analysed through simple and bivariate statistics. **Results:** most participants were male (63.6%), aged 1 to 9 (64.6%). Dog bites were observed in 63.9% of the cases. Head injuries were more common among children aged 1 to 4, whereas injuries to upper limbs were recorded mostly amongst those aged 15 to 24 (62.5%). Hospital discharge happened in 97.0% of the cases. **Conclusion:** the researchers recommend preventive measures addressing this type of accidents in order to reduce the risks and ensure a safe home environment for the development of children and adolescents.

**Keywords:** Accidents, Home; Animals, Domestic; Bites and Stings; Child; Adolescent; Young Adult.

#### RESUMO

Acidentes por mordeduras humanas, de animais e picadas de insetos em ambiente domiciliar são importantes causas de atendimentos hospitalares na população infantojuvenil (0-24 anos). Conhecer as circunstâncias que envolvem esses acidentes é essencial para traçar as medidas preventivas e intervenções. **Objetivo:** analisar o perfil de acidentes domiciliares causados por forças mecânicas animadas na população infantojuvenil, atendida por serviço público de referência em urgência e emergência, durante o ano de 2013. **Método:** estudo epidemiológico de corte transversal com coleta retrospectiva de dados e análise quantitativa. Foram analisadas as fichas de pronto-atendimento decorrentes de acidentes domiciliares por forças mecânicas animadas na população de zero a 24 anos durante o ano de 2013, atendidas por um hospital público de referência em urgência e emergência. Os dados foram digitados no programa EPIINFO e para análise foram utilizadas estatísticas simples e bivariadas. **Resultados:** predomínio do sexo masculino (63,6%) e faixa etária de 1-9 anos (64,6%). A mordedura de cão representou 63,9% dos atendimentos. Entre crianças de 1-4 anos as lesões concentraram-se no segmento encefálico (62,5%) e entre 15-24 anos nos membros superiores. Houve alta em 97,0% dos atendimentos. **Conclusão:** evidenciou-se a importância de medidas preventivas para acidentes com forças animadas de forma que eliminem os riscos e torne o ambiente domiciliar seguro para o desenvolvimento de crianças, adolescentes e jovens.

**Palavras-chave:** Acidentes Domésticos; Animais Domésticos; Mordeduras e Picadas; Criança; Adolescente; Adulto Jovem.

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#### How to cite this article:

Brito JG, Martins CBG. Home accidents due to exposure to animate mechanical forces amongst children and youth population. REME - Rev Min Enferm. 2016; [cited \_\_\_\_ - \_\_\_\_]; 20: e955. Available from: \_\_\_\_\_. DOI: 10.5935/1415-2762.20160024

## RESUMEN

Las mordeduras humanas accidentales, de animales y las picaduras de insectos en el ambiente domiciliario son importantes causas de atención hospitalaria entre niños y adolescentes (0-24 años). Es esencial conocer las circunstancias en las cuales suceden tales accidentes para poder adoptar medidas preventivas y trazar las intervenciones necesarias. Este estudio busca evaluar el perfil de los accidentes domiciliarios causados por fuerzas mecánicas animadas en la población infantojuvenil, atendidos por servicios públicos de referencia en emergencias durante 2013. Estudio epidemiológico de corte transversal con recogida de datos retrospectiva y análisis cuantitativa. Se consideraron las anotaciones del 2013 de un servicio público de emergencias referentes a dichos accidentes en la población mencionada. Los datos fueron introducidos en el programa EPIINFO y para su análisis se emplearon las estadísticas simples y bivariadas. Los resultados indicaron predominio masculino (63,6%) y de edad entre 1-9 años (64,6%). Las mordeduras de perros representaron un 63,9% de los casos. Entre los niños de 1 y 4 años las lesiones se concentraron en el segmento encefálico (el 62,5%) y entre los 15 y 24 años en los miembros superiores. En el 97,0% de los casos los pacientes tuvieron alta hospitalaria. Es evidente la importancia de las medidas preventivas para accidentes de fuerzas animadas con miras a eliminar los riesgos y a que el hogar sea un ambiente seguro para el desarrollo de niños y adolescentes.

**Palabras clave:** Accidentes Domésticos; Animales Domésticos; Mordeduras y Picaduras; Niño; Adolescente; Adulto Joven.

## INTRODUCTION

Home accidents due to exposure to animate mechanical forces (AMF) are accidents caused by a living force - animals or people.<sup>1,2</sup> According to studies, children and youth populations are the most vulnerable to this type of accidents which have a physical, psycho-emotional, financial and social impact on the victims, their families and society as a whole.<sup>3,4</sup>

In Brazil, from September 2013 to September 2014, a total 2,820 hospital admissions were registered amongst population from 0 to 24 years due exposure to animated mechanical forces (W50-W65 codes ICD-10). These admissions cost R\$ 1,451,354.03 of public money and the accidents accounted for 14 deaths.<sup>5</sup>

Studies demonstrate that dog bites are the most common AMF accident.<sup>3,6,7</sup> Human, rodents, cats, bats and insect bites are other accidents that need emergency treatment for they can have serious physical (bacterial infection, transmission of communicable diseases such as rabies and fever rat bite, and the tissue damage with associated functional loss) and emotional consequences.<sup>8</sup>

Given the diversity of AMF accidents and considering their most vulnerable victims (children, adolescents and young adults), it is important to study the context in which they happen in order to adopt preventive policies and organize services especially targeted to help the victims.

Therefore, the present study aimed at analysing profile of home accidents due to exposure to animate mechanical forces amongst children and youth populations that received treatment in a public emergency care throughout 2013.

## METHODOLOGY

This is a cross-sectional descriptive study with retrospective data collection and quantitative analysis. Data were collected in the first quarter of 2013, at a public reference emergency care unit in the region of Cuiabá.

Data sources were emergency care records related to household accidents occurred from January 1 to December 31, 2013. The researchers used a previously tested form with 25 closed questions and one open question for reporting the accident. The variables were: victim profile (sex, age group, origin), accident profile (AMF type of accident; type of household in which the accident occurred; day of the week/month in which accident occurred; care profile (site of immediate care and time elapsed between the accident and care in the health care unit); consequent injuries (type of injury, part of the body affected and immediate physical sequelae); and clinical evolution (discharge, referral, hospitalization and immediate death).

The researchers included all home accidents caused by animate forces (W50 to W64) according to the International Classification of Diseases ICD-10: (W50) hit, struck, kicked, twisted, bitten or scratched by another person; (W51) Striking against or bumped into by another person; (W52) Crushed, pushed or stepped on by crowd or human stampede; (W53) Bitten by rat; (W54) Bitten or struck by dog; (W55) bitten or struck by other mammals; (W56) contact with marine animals; (W57) Bitten or stung by nonvenomous insect and other nonvenomous arthropods; (W58) bitten or struck by crocodile or alligator; (W59) bitten or crushed by other reptiles; (W60) Contact with plant thorns and spines and sharp leaves; (W64) Exposure to other and unspecified animate mechanical forces.

Data was processed into Epi Info 3.4.3 Data analysis used simple bivariate statistics and considering the chi-square statistical test, being significant p value when equal to or less than 0.05.

This study was submitted to the Ethics Committee of the Júlio Müller University Hospital and approved on 25 September 2013 under Protocol No 405.578. Ethical principles of the National Health Council Resolution No 466/2012 on research with human beings were observed.

## RESULTS

A total of 99 AMF accidents that took place throughout 2013 amongst children and youth populations cared for in reference emergency care service in the region of Cuiabá were considered: 63.6% were male; 64.6% were aged between one to nine years; 81.8% lived in Cuiabá (Table 1).

Table 1 - Distribution of accidents due to exposure to animate mechanical forces amongst the population aged 0 to 24 years old cared for at an emergency unit of a public reference health facility in Cuiabá and nearby areas according to victims' profile – Cuiabá, 2013

Gender	n°	%
Female	36	36.4
Male	63	63.6
<b>Total</b>	<b>99</b>	<b>100.0</b>
Age at time of accident	n°	%
Less than 1year	4	4.0
1 to 4 years	32	32.3
5 to 9 years	32	32.3
10 to 14 years	18	18.2
15 to 19 years	5	5.1
20 to 24 years	8	8.1
<b>Total</b>	<b>99</b>	<b>100.0</b>
Residing in Cuiabá	n°	%
No	18	18.2
Yes	81	81.8
<b>Total</b>	<b>99</b>	<b>100.0</b>

Table 2 shows that being bitten or struck by a dog was the most frequent accident (63.6%). Regarding the type of domicile, 95.0% happened at home; three accidents (3.0%) occurred on a farm; and two (2.0%) in collective housing facilities, such as an orphanage, nursing home or prison. Regarding the distribution of accidents, there was a slight increase of incidence on Saturdays and the month of January.

There was no statistical significance between the type of accident and the victim's age ( $p = 0.0698$ ). Bites and stings by nonvenomous insect and other nonvenomous arthropods were more prevalent (50.0%) among children under one year old; bites or strikes by dogs happened more frequently (63.9%) amongst 1 to 24 years old, occurring mainly in the age group 15-19 (80.0%) and 5-9 years old (71.9%); bites by rats was the second most prevalent accident between ages 1-24 years (Table 3).

In almost all accidents, immediate care was provided in a health institution (96.0%); three victims (3.0%) received first aid in the home; and in one case (1.0%) the information was missing in the emergency care record.

Table 2 - Distribution of accidents due to exposure to animate mechanical forces amongst population aged 0 to 24 years old, cared for at a public reference emergency care facility in Cuiabá and nearby region, according to accidents profile – Cuiabá, 2013

Type of accident according to ICD 10- animate forces	n°	%
Hit, struck, kicked, twisted, bitten or scratched by another person	3	3.0
Striking against or bumping into by another person	5	5.1
Bitten by rat	9	9.1
Bitten or struck by dog	63	63.6
Bitten or stung by nonvenomous insect and other nonvenomous arthropods	7	7.1
Bitten or crushed by other reptiles	1	1.0
Exposure to other unspecified animate mechanical forces	11	11.1
<b>Total</b>	<b>99</b>	<b>100.0</b>
Type of domicile	n°	%
Farm	3	3.0
Collective housing	2	2.0
Others	–	–
Nursing home	94	95.0
<b>Total</b>	<b>99</b>	<b>100.0</b>
Weekday on which the accident occurred	n°	%
Monday	9	9.1
Tuesday	16	16.2
Wednesday	16	16.2
Thursday	13	13.1
Friday	15	15.2
Saturday	17	17.2
Sunday	13	13.1
<b>Total</b>	<b>99</b>	<b>100.0</b>
Month in which the accident occurred	n°	%
January	15	15.2
February	8	8.1
March	9	9.1
April	8	8.1
May	4	4.0
June	8	8.1
July	6	6.1
August	6	6.1
September	10	10.1
October	8	8.1
November	7	7.1
December	10	10.1
<b>Total</b>	<b>99</b>	<b>100.0</b>

Table 3 - Distribution of accidents due to exposure to animate mechanical forces amongst population aged 0 to 24 years cared for at a public reference emergency care unit in Cuiabá and nearby region according to type of accident and age of the victim – Cuiabá, 2013 (p = 0.0698)

Animate Mechanical Force	Age group (% in years)						
	<1	1-4	5-9	10-14	15-19	20-24	Total
Hit, struck, kicked, twisted, bitten or scratched by another person	25.0	3.1	3.1	–	–	–	3.0
Striking against or bumping into another person	25.0	3.1	6.3	5.6	–	–	5.1
Bitten by rat	–	3.1	9.4	16.7	20.0	12.5	9.1
Bitten or struck by dog	–	59.4	71.9	66.7	80.0	62.5	63.6
Bitten or stung by nonvenomous insect and other nonvenomous arthropods	50.0	15.6	–	–	–	–	7.1
Bitten or crushed by other reptiles	–	–	3.1	–	–	–	1.0
Exposure to other unspecified animate mechanical forces	–	15.6	6.3	11.1	–	25.0	11.1
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

In 82.8% (82) of the cases information on the time elapsed between accident and medical care was unavailable. Records that provided such information displayed the following: one (1.0%) was treated in less than thirty minutes; four (4.0%) between thirty minutes and one hour; one between one hour and less than two hours (1.0%); four (4.0%) between two hours and less than three hours; and seven (7.2%) over three hours after the accident.

Table 4 demonstrate the prevalence of injury to the head (42.4%) followed by injury to upper limbs (27.3%).

Table 4 - Distribution of accidents due to exposure to animate mechanical forces amongst population aged 0 to 24 years old cared for at a public reference emergency care unit in Cuiabá and nearby region, according to the part of the body affected – Cuiabá, 2013

Part of the body affected	n°	%
Injury to the head	42	42.4
Injury to the neck	1	1.0
Injury to thorax	1	1.0
Injuries to abdomen, back, lumbar spine and pelvis	7	7.1
Injury to upper extremity (shoulder, arm, elbow, wrist, hand)	27	27.3
Injury to lower limbs (hip, thigh, knee, leg, ankle, foot)	15	15.2
Multiple injuries	1	1.0
Unspecified injuries	4	4.0
Foreign body on eye, ear and respiratory, digestive and genitourinary tracts	1	1.0
<b>TOTAL</b>	<b>99</b>	<b>100.0</b>

Table 5 shows that in individuals between one and four years the most affected part of the body was the head (62.5%); between 10 and 14 years injuries to lower limbs were more prevalent (50.0%); and between 15 and 24 years, injuries to the upper limbs (80.0% in 15-19 years and 62.5% in those aged 20-24 years). There were no casualties with immediate physical sequelae.

Table 5 - Distribution of accidents due to exposure to animate mechanical forces amongst the population aged 0-24 years at a public reference emergency care unit in Cuiabá and nearby region according to victim's age and the type of injury – Cuiabá, 2013 (p = 0.0001)

Part of body affected*	Age group in years (%)						
	<1	1-4	5-9	10-14	15-19	20-24	Total
S00-S09	25.0	62.5	56.3	5.6	–	25.0	42.4
S10-S19	–	3.1	–	–	–	–	1.0
S20-S29	–	–	–	5.6	–	–	1.0
S30-S39	–	9.4	6.3	5.6	20.0	–	7.1
S40-S69	25.0	15.6	21.9	27.8	80.0	62.5	27.3
S70-S99	–	6.3	9.4	50.0	–	12.5	15.2
T00-T07	–	–	3.1	–	–	–	1.0
T08-T14	25.0	3.1	3.1	5.6	–	–	4.0
T15-T19	25.0	–	–	–	–	–	1.0
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
*S00-S09	Injuries to the head						
S10-S19	Injuries to the neck						
S20-S29	Injuries to the thorax						
S30-S39	Injuries to the abdomen, lower back, lumbar spine and pelvis						
S40-S69	Injuries to the upper limbs (shoulders, arm, elbow, wrist, and hand)						
S70-S99	Injury to the lower limbs (hip, thigh, knee, lower leg, ankle, and foot)						
T00-T07	Injuries involving multiple body regions.						
T08-T14	Unspecified injury						
T15-T19	Foreign body (eye, ear, and respiratory, digestive and genitourinary tracts)						

The abbreviations listed in the above table refer to the injured body part according to the International Classification of Diseases and Related Health Problems ICD-10.

As for the victims' clinical course: 91 (97%) were discharged; one (1.0%) was hospitalized; and two (2.0%) were referred to another institution. There was no hospital drop-out or immediate death or death during medical care.

## DISCUSSION

The authors did not find studies on accidents involving children and youth victims that encompassed animate mechanical forces according to the International Classification of Diseases (ICD-10), which made it difficult to compare results. Therefore, for discussion purposes, the study results were compared with studies on accidents in general or a specific type of accident.

The researchers identified a significant number of emergency care cases resulting from accidents with animals. A similar result was found in an emergency care study in Teresina (PI), which recorded 70 accidents with animals in one year, which stands for 10.3% of unintentional injuries.<sup>9</sup> Other studies recorded medical care delivered to child and youth population due to exposure to animate mechanical force<sup>4,10,11</sup> indicating the need of preventive interventions for this type of accident.

Study on dog attacks revealed the prevalence of male victims which can be explained by gender differences in attitudes and behaviour,<sup>3,12,13</sup> like running from dogs or jumping and yelling to provoke them.<sup>3</sup> In addition, another study shows that boys are less able to identify potential risks of accidents.<sup>14</sup>

Other studies revealed that most victims were aged between one and nine years old.<sup>4,12</sup> Such result may be due to psychomotor development of children of that age who are still unable to predict risk situations or identify animal behaviour patterns (e.g., growling, showing teeth, eye contact etc.) and are physically immature to protect and defend themselves.<sup>15</sup> Children this age should be supervised more closely, which means that parents and caregivers should be given more guidance on risks and ways to reduce them. Human bite is a common characteristic of pre-school children whose egocentric behaviour is unable to foresee the consequences of some games.<sup>8</sup>

Although the majority of victims resided in the state capital, a significant number of victims arrive from other municipalities since this is a reference service for emergency treatment in the city of Cuiabá and its surrounding area.

Dog bite was the prevalent accident, which is corroborated by other national and international studies.<sup>3,6,7,13</sup> This type of accident conveys the possibility of transmission of rabies (severe condition that leads to death in almost all cases), as well as infections caused by the wide variety of bacteria in the mouth of the animal.<sup>6,16</sup>

Preventive measures should be addressed to families, educators and managers of collective dwellings, such as orphanages, shelters, recovery homes and prisons. Health profession-

als are expected to work with such communities and organize activities designed for these environments.

There was no significant difference between frequency of accidents during specific days of the week. The highest incidence of this type of accident occurred in January, period of school holidays, in which children and young people spend most of their time in the home. This result was documented in a study carried out in the United States that revealed that most urgent medical care to stings and animal bites happened during summer.<sup>8</sup>

The highest number of accidents caused by insect bites and non-poisonous arthropods among infant under one year old was also demonstrated in another study.<sup>8</sup> Preventive measures can be implemented at home (such as the use mosquito nets in cribs, screened windows and doors, checking infants clothing, bed linen for insects and arthropods, as well as inspecting place where they sleep and play) and that would reduce the risk of such accidents. It is important also to keep the child clean and in hygienic surroundings to prevent ants and other insects and not to leave clean, stagnant water that could harbour the dengue fever vector.<sup>15</sup>

Dog bite was cited in other studies as a major type of accident amongst children older than one year, adolescents and young adults. Parents and caregivers can teach them simple rules such as: not to disturb the animals that are sleeping or eating; not to approach dogs who are caring for their young; not to run if a dog starts chasing them; to allow dogs to sniff them first and then touch; avoid having at home exotic and aggressive dog breeds; and to keep domestic animals in optimal conditions of hygiene, feeding and vaccination.<sup>18</sup>

In the United States rodent bites accounts for 1.7% of emergency care, representing more than 15,000 victims annually. Victims present rat-bite fever transmitted by the animal's saliva and the cause of severe bacterial infection.<sup>8</sup> Rodents in the home environment may be associated with poor sanitation and with the increasing popularity to keep rats as pets.<sup>19</sup>

Immediate treatment made only in the health care unit may be due to the lack of knowledge of parents and caregivers on how to perform first aid assistance to victims of animate mechanical forces. In the case of animal bite, a simple washing of affected area with water and mild soap removes large amount of bacteria present in the animal's mouth and saliva.<sup>20</sup>

Information on preventive measures and first aid training could reduce the need for emergency care for this type of accident, cutting public expenditure and the burden of care in the emergency services.<sup>8</sup> Based on the clinical evolution of the victims, many of these cases could be directed to secondary emergency care units (UPA) and polyclinics.

The lack of relevant information, such as the time of the accident, was pointed out in a study on animal bites. Data sources were emergency care records that provided limited information about the circumstances of the event, interac-



tion victim/animal, etc.<sup>8</sup> Therefore the multidisciplinary team should be aware of the importance of accurate health records and supervision by the administration.<sup>21</sup>

Another study reported that children under nine years old displayed more trauma to region of the head (head, face, neck) rather than to body extremities; adolescents and young adults presented more injuries to the upper and lower limbs.<sup>3,13,22,23</sup> This is mainly due to the fact that the head of shorter victims are on the same level as some animals'. In addition, they bring their faces closer to the animal that might perceive it as a threat, raising the possibility of an attack; bigger children often try to escape and end up injuring upper and lower extremities.<sup>22,23</sup>

Despite no immediate physical sequelae was recorded, accidents due to exposure to animate forces cause injuries, such as wounds and lacerations that can develop serious infections, tissue loss, dysfunction of limbs, communicable disease and death.<sup>7</sup> Such events may have not been identified as the present research analysed data from emergency care records.

As for the clinical course of the victims, other studies demonstrated that nearly all of them were discharged after treatment.<sup>8,23</sup> However, because many of these accidents demand rabies vaccination and/or serum therapy and a prolonged treatment, public spending on this type of accident is high.<sup>23</sup>

## CONCLUSION

The research revealed that most victims were male and aged between one to nine years. The study recorded accidents like bites inflicted by rats, insects and another person; the most prevalent was dog bite amongst the age group 1- 24 years. The main injuries were trauma to the area of the head (age 1-4 years) and to upper and lower limbs (5-24 years). No physical sequelae or immediate deaths were registered and most victims were discharged soon after treatment.

A limitation to the study is the fact that not all victims of accidents due to exposure to animate mechanical forces seek emergency care services. Therefore, further studies aiming at cases that do not need emergency care or those that result in death on the scene of the accident are needed. Poor quality of information and missing data was another characteristic of the medical records analysed.

The study reveals the importance of preventive interventions, such as conveying information to the public, parents, educators and caregivers. The free supply of vaccines and better health services structure to welcome victims is advisable.

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