

<http://dx.doi.org/10.1590/0104-07072016004180014>

## DOMESTIC ACCIDENTS BY INANIMATE MECHANICAL FORCES IN CHILDREN, ADOLESCENTS AND THE YOUNG<sup>1</sup>

*Jackeline Gonçalves Brito<sup>2</sup>, Bruna Rafaela Pais Pedroso<sup>3</sup>, Christine Baccarat de Godoy Martins<sup>4</sup>*

<sup>1</sup> Study taken from the thesis - Domestic accidents in the child and juvenile population of Cuiabá (MT): an epidemiological study, presented to the Postgraduate Program in Nursing of the *Universidade Federal de Mato Grosso (UFMT)*, in 2014.

<sup>2</sup> Doctoral student of the *Programa de Pós-Graduação em Enfermagem, UFMT*. Scholarship student, Coordination for the Improvement of Higher Education Personnel (CAPES). Cuiabá, Mato Grosso, Brazil. Email: jackeline\_brito@hotmail.com

<sup>3</sup> Undergraduate student, *Faculdade de Enfermagem, UFMT*. Scholarship student, National Council for Technological and Scientific Development (CNPq). Cuiabá, Mato Grosso, Brazil. Email: nabru\_bruna@hotmail.com

<sup>4</sup> Ph.D in Public Health. Professor, *Faculdade de Enfermagem, UFMT*. Cuiabá, Mato Grosso, Brazil. Email: leocris2001@terra.com.br

**ABSTRACT:** This study aimed to analyze the profile of urgent and emergency attendances resulting from domestic accidents caused by inanimate mechanical forces in the child and juvenile population. It is a transversal study with retrospective data collection. Records of attendance resulting from domestic accidents caused by inanimate mechanical forces, among people aged up to 24 years old, attended in a public center of excellence in urgent and emergency care during 2013, were analyzed. A total of 526 accidents were studied. Among the victims, there is a prevalence of males (56.1%) and an age range from 1 to 4 years old (47.9%). The most frequent accident was penetration of a foreign body in a natural orifice, the highest proportion being among children aged from 1 to 4 years old (71.0%). A wide variety of accidents caused by inanimate mechanical forces in the domestic environment was evidenced, as was the presence of immediate physical sequelae in 0.8% of the victims. Emphasis is placed on the importance of implementing preventive measures, the only means of reducing this event, the lesions and the resulting sequelae.

**DESCRIPTORS:** Foreign bodies. Child. Adolescent. Young adult. Accidents, home.

## ACIDENTES DOMICILIARES POR FORÇAS MECÂNICAS INANIMADAS EM CRIANÇAS, ADOLESCENTES E JOVENS

**RESUMO:** Analisar o perfil dos atendimentos de urgência e emergência decorrentes de acidentes domiciliares causados por forças mecânicas inanimadas na população infantojuvenil. Trata-se de um estudo transversal com coleta retrospectiva de dados. Foram analisadas fichas de atendimento decorrentes de acidentes domiciliares por forças mecânicas inanimadas em pessoas com idade até 24 anos, atendidas por um serviço público de referência em urgência e emergência, durante o ano de 2013. Foram estudados 526 acidentes. Entre as vítimas prevaleceu o sexo masculino (56,1%) e faixa etária de 1 a 4 anos (47,9%). O acidente de maior frequência foi penetração de corpo estranho em orifício natural, sendo em maior proporção nas crianças de 1 a 4 anos (71,0%). Evidenciou-se grande variedade de acidentes por forças mecânicas inanimadas no ambiente domiciliar e presença de sequelas físicas imediatas em 0,8% das vítimas. Destaca-se a importância da implementação de medidas preventivas, único meio de se reduzir o evento, as lesões e sequelas decorrentes.

**DESCRIPTORIOS:** Corpos estranhos. Criança. Adolescente. Adulto jovem. Acidentes domésticos.

## ACCIDENTES DOMÉSTICOS POR FUERZAS MECÁNICAS INANIMADAS EN NIÑOS, ADOLESCENTES Y JÓVENES

**RESUMEN:** Analizar el perfil de atención de urgencia y emergencia como resultado de accidentes domésticos causados por fuerzas mecánicas inanimadas en la población infantojuvenil. Se trata de un estudio transversal con la recogida de datos retrospectiva. Fueron analizados los registros de asistencia relativas a accidentes domésticos por fuerzas mecánicas inanimadas en la población infantojuvenil (0 a 24 años), atendidos por un servicio público de referencia en la atención de urgencia y emergencia, durante el año 2013. Se estudiaron 526 accidentes, entre las víctimas prevaleció el sexo masculino (56,1%) y la edad de 1 a 4 años (47,9%). El accidente más frecuente fue la penetración de cuerpo extraño en orificio no natural, presentando mayor proporción en niños de 1 a 4 años (71,0%). Sin embargo, se mostró amplia variedad de accidentes por fuerzas mecánicas inanimadas en ambiente del hogar y presencia de secuelas en el 0,8% de las víctimas. Destaca la importancia de aplicar medidas preventivas, la única manera de reducir los eventos, las lesiones y secuelas que surjan.

**DESCRIPTORIOS:** Cuerpos extraños. Niño. Adolescente. Adulto joven. Accidentes domésticos.

## INTRODUCTION

The domestic accidents are highlighted among the emergency attendances in the child and juvenile population, with a wide variety caused by inanimate mechanical forces being evidenced.<sup>1-3</sup> One can characterize these accidents through the action or force provoked by any unit or nonalive object, structures or material upon the victim.<sup>4</sup>

These accidents are responsible for a great demand for attendance to children, adolescents and young people in the urgent and emergency services, with the most frequent being the introduction of a foreign body into natural orifices, objects, furniture and structures falling upon the victim, crushing of upper limbs in gates and doors, accidents provoked by glass, knives, tools (either manual or motorized), crushing between objects and furniture, and accidents with domestic devices such as washing machines, televisions and mixers, among others.<sup>5-8</sup>

According to data from the Ministry of Health, in the period of one year (February 2015 to January 2016) in the services of the Unified Health System (SUS) alone, 12,788 incidents of inpatient treatment caused by accidents through exposure to inanimate mechanical forces (ICD-10: W20 to W49) were recorded in the population aged from 0 to 24 years old, representing a cost of R\$ 11,500,452.32 for the government, and a mortality rate of 1.49/ thousand inhabitants, there being a total of 190 deaths.<sup>9</sup>

Regarding the state of Mato Grosso (MT), the data referenced to the same period and to the same age range evidenced 325 incidents of inpatient treatment in the SUS caused by accidents by inanimate mechanical forces, corresponding to a cost of R\$266,774.10. The mortality rate in Mato Grosso, higher than that for Brazil, represented 2.15/ thousand inhabitants, represented by seven deaths.<sup>9</sup>

Therefore, in the light of the seriousness of these accidents and of the various consequences in the physical, emotional, financial and social ambits, the present study aimed to analyze the profile of the urgent and emergency attendances resulting from domestic accidents caused by inanimate mechanical forces in the child and juvenile population.

## METHODO

This is a transversal and analytical study, with retrospective data collection. The study object was the child and juvenile population (0 to 24 years old) who were victims of domestic accidents caused

by inanimate mechanical forces, and who were attended during the year of 2013 (1<sup>st</sup> January to 31<sup>st</sup> December 2013) by the emergency department of the *Hopital e Pronto Socorro Municipal de Cuiabá* (HPS-MC), a public service which is a center of excellence in urgent and emergency care for Cuiabá-MT and the region.

The attendance files for 2013 were investigated. Data collection took place in the first trimester of 2014, using a closed questionnaire, previously tested, with 26 questions, containing the following variables: profile of the victim (sex, age by age group, place of origin), profile of the accident (type and circumstances of the accident, type of residence in which the accident took place, period of the day/ day of the week/ month in which the accident occurred), profile of the attendance (time spent between the accident and attendance in the health service), consequences of the accident (lesion produced, body segment affected and immediate physical sequelae) and the victim's clinical evolution (discharge, referral, hospitalization or immediate death).

The records referent to the attendances undertaken through the HPSMC during the year of 2013 were consulted. The following were included in the study: the victims (0 to 24 years) of accidents which took place in the domestic environment (family residence and collective habitations such as orphanages, prisons and rehabilitation centers) caused by inanimate mechanical forces described in the International Classification of Diseases (ICD-10) (W20 to W49). Records were excluded in which, due to lack of information, it was not possible to identify the locale of the accident, the victim's age, and cause of the lesion.

The ICD-10 classifies the accidents caused by inanimate mechanical forces under: (W20) Struck by thrown, projected or falling object; (W21) Striking against or struck by sports equipment; (W22) Striking against or struck by other objects; (W23) Caught, crushed, jammed or pinched in or between objects; (W24) Contact with lifting and transmission devices, not elsewhere classified; (W25) Contact with sharp glass; (W26) Contact with knife, sword or dagger; (W27) Contact with nonpowered hand tool; (W28) Contact with powered lawn mower; (W29) Contact with other powered hand tools and household machinery; (W30) Contact with agricultural machinery; (W31) Contact with other and unspecified machinery; (W32) Accidental handgun discharge and malfunction; (W33) Accidental rifle, shotgun and larger firearm discharge

and malfunction; (W34) Accidental discharge and malfunction from other and unspecified firearms and guns; (W35) Explosion and rupture of boiler; (W36) Explosion and rupture of gas cylinder; (W37) Explosion and rupture of pressurized tire, pipe or hose; (W38) Explosion and rupture of other specified pressurized devices; (W39) Discharge of firework; (W40) Explosion of other materials; (W41) Exposure to high pressure jet; (W42) Exposure to noise; (W43) Exposure to vibration; (W44) Foreign body entering into or through eye or natural orifice; (W45) Foreign body or object entering through skin; (W46) Contact with hypodermic needle; and (W49) Exposure to other and unspecified inanimate mechanical forces.

The data were processed using the Epi-Info program, version 3.4.3, and for analysis, use was made of descriptive and inferential statistics, through simple and bivariate analyses, (Chi-squared statistical test), considering the p-value significant when it was greater than or equal to 0.05.

In respect of the ethical principles contained in Resolution 466/2012 of the National Health Council, regarding research with human beings, the study was referred to the Research Ethics Committee of the *Hospital Universitário Júlio Muller* (HUJM), being approved on 09/25/2013 under protocol N. 405578.

## RESULTS

A total of 526 attendances were made due to inanimate mechanical forces. No attendance was excluded from the study. More than half of the victims were male (n=295; 56.1%) and the most frequent age range was between one and four years old (n=252; 47.9%), followed by 5 to 9 years old (n=138; 26.2%);

10 to 14 years old (n=53; 10.1%); 15 to 19 years old (n=37; 7.0%); 20 to 24 years old (n=28; 5.3%) and younger than one year (n=18; 3.4%). Regarding place of origin, the majority lives in Cuiabá-MT (n=438; 83.3%) and the remainder (n=88; 16.7%) in neighboring towns.

Regarding the type of accident, more than half of the accidents (n=316; 60.1%) were due to the penetration of a foreign body into or through the eye or natural orifice (mouth, nose, ear, eyes, genito-urinary orifice), followed by victims who were caught, crushed, jammed or pinched in/between objects (n=44; 8.4%) and impact caused by an object which was thrown, projected or falling (n=39; 7.4%) (Table 1).

Statistical significance was found between the type of accident and the age range (Chi-squared test p=0.00), evidencing that, at all ages, the most frequent accident was the penetration of a foreign object in a natural orifice, the highest proportion being among those younger than one year (66.7%) and from 1 to 4 years old (71.0%). Although this type of accident was evidenced in all age ranges, it presents specific characteristics in each group (Table 1).

According to the report of the accident, adolescents and young people presented a high proportion of foreign body in the gastrointestinal tract, due to the ingestion of fish bones, while children below four years old presented a high proportion of the ingestion of small objects such as coins, small toys and batteries, among others. In the age range from 15 to 19 years old, there was also a considerable number of accidents caused by contact with sharp glass (16.2%) and through being caught/pinched/crushed between objects (16.2%) (Table 1).

**Table 1 - Distribution of the accidents caused by exposure to inanimate mechanical forces in the population aged from 0 to 24 years old, attended in the *Hospital e Pronto Socorro Municipal de Cuiabá*, by type of accident and victim's age group. Cuiabá-MT, 2013**

Type of accident ICD-10	Age group in years % (p=0.00)						Total % (n)
	<1	1-4	5-9	10-14	15-19	20-24	
W20*	5.6	6.7	7.2	9.4	8.1	10.7	7.4 (39)
W22†	-	5.6	8.7	9.4	8.1	10.7	7.0 (37)
W23‡	11.0	3.2	13.0	15.1	16.2	7.1	8.4 (44)
W25§	-	3.6	2.2	3.8	16.2	7.1	4.2 (22)
W26	-	-	1.4	3.8	10.8	-	1.5 (8)
W27¶	-	0.4	-	-	-	3.6	0.4 (2)
W28**	-	-	-	-	2.7	-	0.2 (1)
W29††	-	-	2.2	3.8	-	3.6	1.1 (6)
W30‡‡	-	-	-	1.9	-	-	0.2 (1)

Type of accident ICD-10	Age group in years % (p=0.00)						Total % (n)
	<1	1-4	5-9	10-14	15-19	20-24	
W44 <sup>§§</sup>	66.7	71.4	58.7	37.7	27.0	46.4	60.1 (316)
W45 <sup>   </sup>	-	2.0	1.4	1.9	2.7	-	9 (1.7)
W49 <sup>¶¶</sup>	16.7	7.1	5.1	13.2	8.1	10.7	41(7.8)
<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>526 (100.0)</b>

\* Struck by thrown, projected or falling object; † Striking against or struck by other objects; ‡ Caught, crushed, jammed or pinched in or between objects; § Contact with sharp glass; || Contact with knife, sword or dagger; ¶ Contact with nonpowered hand tool; \*\* Contact with powered lawn mower; †† Contact with other powered hand tools and household machinery; ‡‡ Contact with agricultural machinery; §§ Foreign body entering into or through eye or natural orifice; ||| Foreign body or object entering through skin; ¶¶ Exposure to other and unspecified inanimate mechanical forces

Information regarding the description of the foreign body and the place of the penetration were found in the reports on the accident. There was a higher frequency of ingestion of foreign body (dige-

stive tract n=116; 36.7%) and introduction of foreign body in the ear (n=112; 35.5%). The principal objects are described in Table 2.

**Table 2 - Distribution of the accidents caused by exposure to inanimate mechanical forces in the population aged from 0 to 24 years old, attended in the Hospital e Pronto Socorro Municipal de Cuiabá, by place of penetration of the foreign body and principal objects introduced. Cuiabá-MT, 2013**

Place of penetration of the foreign body	Principal objects introduced	n	%
Eye	Nail polish, super bonder	12	3.8
Ear	Corn, watch battery, metal object from a toy, toothpick, piece of a toy, little balls of paper, little balls of polystyrene, insects, beans, earring clutches, beads, little hair clips, the cotton from cotton swabs, fruit seeds, parts of lollipop sticks.	112	35.5
Nose	Little balls of toilet paper, cotton, little balls of A4 paper, small toy batteries, pieces of plastic bags, orange seeds, little stones, pieces of wooden pencils, pencil points (graphite), cooked rice, acerola pips.	66	20.9
Digestive tract	Fish bones, Caryocar brasiliense nut spines, coins, pieces of plastic, paper clips, shards of glass, plastic bottle tops, small toys, toy batteries, small batteries, pices of cell phone cover, pieces of toothpick, earrings, small lightbulbs, pieces of plastic toy.	116	36.7
Respiratory tract	The parents were unable to provide information (suspicion of toy).	1	0.3
Not specified		9	2.8
<b>Total</b>		<b>316</b>	<b>100.0</b>

Nearly all of the accidents took place in the family residence (n=510; 97%). The remainder took place in collective habitations, such as orphanages, prisons and residential rehabilitation centers (n=13; 2.5%) and in residential farms (n=3; 0.5%). Analyzing the time of the day that the accident took place, this information was not present in the majority of the records of attendance (n=480; 91.3%). However, accidents were reported in the evening (n=19; 3.6%), nighttime (n=19; 3.6%) and morning (n=8; 1.5%) periods.

In relation to the time which passed between the accident and the attendance, as the information regarding time of the accident was absent in the majority of the records, it was possible to identify the following time periods: attendances three hours after the accident (n=41; 7.8%), between two hours and less than three hours (n=10; 1.9%),

between one hour and less than two hours (n=9; 1.7%), between 30 minutes and less than one hour (n=5; 0.9%) and less than 30 minutes after the accident (n=2; 0.4%).

In accordance with days of the week, the accidents were distributed in the following frequency: Friday (n=88; 16.7%), Monday (n=84; 16.0%), Thursday (n=80; 15.2%), Saturday (n=72; 13.7%), Sunday (n=70; 13.3%), Wednesday (n=70; 13.3%) and Tuesday (n=62; 11.8%). Regarding the months of occurrence: January (n=56; 10.6%), November (n=55; 10.5%), October (n=49; 9.3%), February (n=47; 8.9%), March (n=46; 8.7%), May (n=45; 8.6%), December (n=42; 8.0%), July (n=40; 7.6%), August (n=40; 7.6%), April (n=36; 6.8%), June (n=36; 6.8%) and September (n=34; 6.5%).

In relation to the type of lesion produced and the body segment affected, more than half of the



accidents had, as a consequence, a foreign body in a natural orifice (n=320; 60.8%), followed by trauma in upper limbs (shoulder, elbow, arm, wrist and hand) (n=86; 16.3%) and head (n=65; 12.4%). The accidents were responsible for immediate physical sequelae in four victims (n=4; 0.8%) and seven remained without confirmation (n=7; 1.3%) (Table 3).

In accordance with the information contained

in the question regarding the accident report, three physical sequelae were caused by the crushing of the phalanges of the hand in doors or gates, resulting in three amputations of the nail bed (age of two, five and nine years old). The fourth sequelae was caused by the use of a nonmotorized saw (manual instrument without motor) which caused the partial amputation of the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> fingers of the right hand of a 23-year-old young man.

**Table 3 - Distribution of the accidents caused by exposure to inanimate mechanical forces, in the population aged from 0 to 24 years old, attended in the *Hospital e Pronto Socorro Municipal de Cuiabá*, by the consequences of the accident (lesion produced, body segment affected, presence of immediate physical sequelae). Cuiabá-MT, 2013**

Lesion produced and body segment affected	n	%
Trauma in the head	65	12.4
Trauma in the neck	-	-
Trauma in the thorax	-	-
Trauma in the abdomen, back, lumbar spine and pelvis	7	1.3
Trauma of the shoulder, arm, elbow, wrist, hand	86	16.3
Trauma of the hips, thigh, knee, leg, ankle, foot	44	8.4
Trauma in multiple regions of the body	2	0.4
Non-specified trauma	2	0.4
Foreign body (eye, ear, respiratory, digestive and genitourinary tract)	320	60.8
<b>Total</b>	<b>526</b>	<b>100.0</b>
Presence of immediate physical sequelae	n	%
Ignored	7	1.3
Yes	4	0.8
No	515	97.9
<b>Total</b>	<b>526</b>	<b>100.0</b>

In relating the type of accident to the lesion produced, statistical significance was found between these variables (Chi-squared test presented  $p=0.00$ ), evidencing that the lesions in the head were caused, with a greater frequency, by impact caused by a thrown, projected or falling object (32.3%) and

by active or passive accidental impact caused by other objects (32.3%). Harm to upper limbs was due to the limb being caught, jammed or crushed in or between objects (34.2%) and foreign body by penetration of foreign body into or through the eye or natural orifice (97.5%) (Table 4).

**Table 4 - Distribution of the accidents resulting from exposure to inanimate mechanical forces, in the population aged from 0 to 24 years old, attended in the *Hospital e Pronto Socorro Municipal de Cuiabá*, by type of accident and type of lesion. Cuiabá-MT, 2013**

Type of accident	Type of lesion ICD-10 (%) (p=0.00)							Total
	S00-S09*	S30-S39†	S40-S69‡	S70-S99§	T00-T07	T08-T14¶	T15-T19**	
Struck by thrown, projected or falling object	32.3	42.9	7.0	18.2	50.0	-	-	7.4
Accidental active or passive impact caused by other objects	32.3	14.3	4.7	22.7	-	50.0	-	7.0
Caught, jammed, crushed or pinched in or between objects	12.3	14.3	37.2	6.8	-	-	-	8.4
Contact with sharp glass	3.1	-	15.1	15.9	-	-	-	4.2
Contact with knife, sword or dagger	1.5	14.3	5.8	2.3	-	-	-	1.5

Type of accident	Type of lesion ICD-10 (%) (p=0.00)							Total
	S00-S09*	S30-S39†	S40-S69‡	S70-S99§	T00-T07	T08-T14¶	T15-T19**	
Contact with nonpowered hand tool	-	-	2.3	-	-	-	-	0.4
Contact with powered lawn mower	-	-	1.2	-	-	-	-	0.2
Contact with other powered hand tools and household machinery	1.5	-	5.8	-	-	-	-	1.1
Contact with agricultural machinery	1.5	-	-	-	-	-	-	0.2
Penetration of foreign body into or through the eye or natural orifice	4.6	-	-	-	-	50.0	97.5	60.1
Penetration of foreign body or object through the skin	-	-	1.2	9.1	-	-	1.3	1.7
Exposure to other and unspecified inanimate mechanical forces	10.8	14.3	19.8	25.0	50.0	-	1.3	7.8

\*Trauma in head; †Trauma of the abdomen, back, lumbar spine and pelvis; ‡Trauma of shoulder, arm, elbow, wrist, hand; §Trauma of the hips, thigh, knee, leg, ankle, foot; ||Trauma in multiple regions of the body; ¶Nonspecified trauma; \*\*Foreign body (eye, ear, respiratory/digestive/genitourinary tract)

In relation to the clinical progression of the victim (Table 5), the majority were discharged (n=429; 81.6%). There was, however, a significant number of referrals after attendance (n=67; 12.7%) and no immediate case of death.

**Table 5 - Distribution of the accidents caused by exposure to inanimate mechanical forces in the population aged from 0 to 24 years old, attended in the Hospital e Pronto Socorro Municipal de Cuiabá, by clinical progression of the victim. Cuiabá-MT, 2013**

Clinical progression of the victim	Yes		No		Total	
	n	%	n	%	n	%
Discharge	429	81.6	97	18.4	526	100.0
Referral	67	12.7	459	87.3	526	100.0
Inpatient treatment	24	4.6	502	95.4	526	100.0
Abandoned treatment	6	1.1	520	98.9	526	100.0
Immediate death or died during attendance	-	-	526	100.0	526	100.0

**DISCUSSION**

Studies corroborate our findings, evidencing a high incidence of domestic accidents caused by inanimate mechanical forces in the child and juvenile population. In New Zealand, between 2003 - 2007, accidents resulting from inanimate mechanical forces were the second greatest cause of injuries which caused hospital attendance, in the age range from 0 to 14 years old.<sup>10</sup> In Australia, likewise, in 2005 - 2006, it was the greatest cause of injuries in the population aged from 12 to 24 years old.<sup>11</sup> In Brazil, one study undertaken in Minas Gerais, with

children and adolescents, revealed that accidents caused by inanimate mechanical forces were the third-highest cause of injuries in hospital attendances resulting from external causes.<sup>1</sup>

Other studies have also evidenced a greater occurrence of accidents resulting from inanimate mechanical forces in the male sex.<sup>1,5,7,10</sup> One study undertaken in Ontario, Canada, with children aged from 6 to 11 years old, observed that the boys are significantly more involved in risky activities than are girls,<sup>12</sup> as the boys present more impulsive behaviors, allied with the cultural fact that the parents and guardians restrict the boys' behavior less in comparison with the girls, who are supervised more, in spite of the boys' activities and games being judged as of greater risk for accidents.<sup>12-13</sup>

The greater incidence of accidents resulting from inanimate mechanical forces among children aged from one to four years old is corroborated by other cases.<sup>7,14-16</sup> Children in this age range begin to interact with the domestic environment, place objects in their mouths and in other orifices, present curious behavior and, due to their neuropsychomotor development, cannot yet foresee situations of risk and protect themselves in the event of danger.<sup>7</sup> It follows that parents and guardians should exercise greater direct supervision over children below four years old, as well as adapting the domestic environment by eliminating the risks for the various accidents caused by inanimate mechanical forces.

Regarding the origin of the victims from other municipalities, this fact is due to the characteristic of the Emergency Room service being a center of excellence for the attending of traumas and urgent and emergency cases for the towns neighboring Cuiabá (MT) and the region.

The high incidence of attendances due to foreign body in a natural orifice<sup>7,17</sup> makes some care measures essential, such as: verifying the appropriate classification of toys for each age range; ascertaining the presence of the seal of the *Instituto Nacional de Metrologia, Qualidade e Tecnologia* (INMETRO), which is mandatory for all toys sold in Brazil, used by children and adolescents up to 14 years of age, whether made in Brazil or imported, with the aim of avoiding possible risks which may arise in the normal use, or as a consequence of the use, of the toy.<sup>18</sup> The toys may not be small, and may not possess small parts which come off; in all devices, the battery protection must be screwed on, sharp or easily breakable objects must be difficult to access, and care must be taken with toys which look like food, as children may place them in the mouth; and coins and small objects should not be kept where children can see them, among others.<sup>19-20</sup>

Considering the great variety of objects introduced into the ear, nose, digestive and respiratory tract, it is a matter of urgency to be alert to objects reported in the present study, principally taking into account that they can cause asphyxia if introduced into the respiratory tract, a condition which is considered to be of high risk for the victim.<sup>6,21</sup>

The high proportion of penetration of foreign body in a natural orifice among children younger than four years old is corroborated in other findings.<sup>6,22</sup> However, due to the high incidence of this type of accident in the other age groups, and the great variety of accidents caused by inanimate mechanical forces evidenced in the domestic environment in all age groups, besides the measures suggested in the paragraph above, particular care is suggested when ingesting fish or the nuts of the *Caryocar brasiliense* tree, which are typical foods of Cuiabá-MT and the region, given that accidents caused by the ingestion of these elements were reported in the present case; furthermore, sharp objects should be kept in appropriate places if necessary, and people should be alert when handling chemical substances which can affect the eyes, these not being kept within reach of children.<sup>19-20</sup>

The removal of sharp, easily-accessible material is also emphasized among the preventive measures; when glass objects are broken, it is necessary to clean the locale immediately and not to let children/adolescents/young people circulate in the area with bare feet, neither children who are crawling; protectors must be used on doors, to stop them closing and crushing limbs; gates must be well fixed so that they do not fall on people; and

care should be taken with the placing and stability of electrical domestic devices and furniture such as televisions, radios, bookcases so that children will not pull these over on themselves.<sup>19-20</sup>

The same care measures geared towards the domestic environment need to be incorporated in collective habitations, such as orphanages, prisons and rehabilitation centers, given the occurrence of accidents due to inanimate mechanical forces in these locales. In this way, the health professionals can exercise educational activities in these spaces, working on the importance of preventing accidents and training those responsible to provide a safe environment for the development and rehabilitation of the more vulnerable part of the child and juvenile population.<sup>23-24</sup>

The poor quality of the information in the patient records of the Emergency Room department was evidenced in other studies, which coincides with the lack of information regarding the time of the accident, which was ascertained in the present investigation,<sup>25-26</sup> emphasizing the need for greater inspection of the records made in the medical records of Emergency Room departments on the part of the health institutions, as well as the training of the different health professionals, so that they may be aware of the importance of a complete report of the occurrence and of the attendance.

The results evidenced that it is necessary to implement the measures for preventing accidents all year round; however, special attention must be given for those periods when children, adolescents and young people are present in the domestic environment, such as school holidays in January and July and at weekends, given that studies have evidenced a high proportion of domestic accidents at weekends.<sup>27-28</sup>

In relation to the type of lesion produced due to inanimate mechanical forces, one study discusses that the severity of the lesion is related to the level of adult supervision, that is to say, the less direct supervision there is, the more severe the lesion,<sup>14</sup> which would be, probably, related to the type of accident, which is more serious in those situations in which there is no supervision. In this regard, the present study, on finding an association between type of accident and lesion produced, reinforces the need for the prevention through means of direct supervision.<sup>14</sup>

In relation to the immediate physical sequelae, one study undertaken in Greece on traumatic amputations in children below 14 years of age observed that accidents with children involving doors and

gates are the main causes of amputations in phalanges, causing disabilities in individuals who are in a phase of learning and development, impairing the control and execution of fine movements.<sup>5</sup> It is necessary to highlight that such sequelae can be avoided through the use of 'door stopper' finger guards, are placed on the door and stop the same from closing suddenly.<sup>5</sup>

In spite of there being few cases of inpatient treatment, one can infer through the considerable number of referrals, the need for specialized attendance and the increase in costs to the health sector, it being the case that the admissions resulting from accidental causes in the emergency services have caused a sharp increase in hospital costs.<sup>3,29</sup>

## CONCLUSION

The study aimed to analyze the profile of the urgent and emergency attendances which resulted from domestic accidents caused by inanimate mechanical forces in the child and juvenile population during 2013. It was the first Brazilian case to analyze specifically all the types of accidents resulting from inanimate mechanical forces described in the ICD-10 and identified a significant number of occurrences in the child and juvenile population, as well as a broad variety of accidents under this typology.

Among the victims, males predominated, and the age range affected most was from one to four years old. The introduction of foreign bodies in natural orifices was the type of accident which predominated in all the age ranges, with a higher incidence in those younger than four years old, and with a great variety of objects introduced. There was also a high proportion of accidents involving victims who were crushed/pinched or jammed by/between objects, and accidents with sharp glass; and the most prevalent lesions were those provoked by foreign bodies in natural orifices, traumas in the head and in the upper limbs.

As limitations of the study, the authors identify the poor quality of the information in the patient records of the Emergency Room department, which suggests training of the professionals for the health records, as well as greater inspection on the part of the health institutions.

The findings bring contributions for the work of the nursing professionals at different levels of care (primary, secondary and tertiary), drawing attention to the importance of working with society regarding ways of preventing accidents from inanimate mechanical forces and the promotion of domestic

environments which are safe for the growth and development of the child and juvenile population.

Nurses can train parents, guardians and people who deal directly or indirectly with the child and juvenile public for first aid to the victims of accidents caused by inanimate mechanical forces, this being an important intervention which could reduce the number of sequelae and deaths due to rapid and efficacious first-aid.

The different preventive measures draw attention to the need for discussions in all the means of communication and social spaces so as to raise people's awareness regarding the need for prevention, the only way of reducing the event, the lesions and resulting sequelae. Emphasis is placed on the due respect of the nursing professionals engaged in these discussions.

The contributions do not affect only actions relating to the provision of care, but also instigate nurse researchers and educators to engage with this issue; these could work in the development of technologies which eliminate the risks in the domestic environment (such as, for example, the development of door/gate protectors) as well as studies which could contribute to knowledge regarding accidents caused by inanimate mechanical forces. As a result, it is suggested that further studies should be undertaken, completing the gaps in knowledge.

## REFERENCES

1. Gaspar VLV, Souza ECO, Carmo JH, Pereira WD. Características de crianças e adolescentes hospitalizados em decorrência de causas externas. *Rev Med Minas Gerais*. 2013; 22(3):287-95.
2. Martins CBG, Andrade SM. Causas externas entre menores de 15 anos em cidade do Sul do Brasil: atendimentos em pronto-socorro, internações e óbitos. *Rev Bras Epidemiol*. 2005; 8(2):194-204.
3. WHO. World Health Organization. World report on child injury prevention. Geneva (CH): WHO; 2008.
4. Organização Mundial da Saúde. Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde (CID 10). 10ª ed. São Paulo: EDUSP; 2000.
5. Panagopoulou P, Antonopoulos CN, Iakovakis I, Dessypris N, Gkiokas A, Pasparakis D, et al. Traumatic hand amputations among children in Greece: epidemiology and prevention potential. *Inj Prev*. 2011; 18(5):309-14.
6. Yetim DT, Bayarogullari H, Arica V, Akcora B, Arica SG, Tutanc M. Foreign body aspiration in children; analysis of 42 cases. *J Pulmon Resp Med*. 2012; 2(3):121-5.



7. Martins CBG, Andrade, SM. Acidentes com corpo estranho em menores de 15 anos: análise epidemiológica dos atendimentos em pronto-socorro, internações e óbitos. *Cad Saúde Pública*. 2008; 24(9):1983-90.
8. Wolf BC, Harding BE. Household furniture tip-over deaths of young children. *J Forensic Sci*. 2011; 56(4):918-21.
9. Ministério da Saúde (BR). DATASUS. Indicadores de morbidade e mortalidade. 2014 [acesso 2016 Mar 30]. Disponível em: <http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/fibr.def>
10. Alatini M. Analysis of unintentional child injury data in New Zealand: Mortality (2001-2005) and Morbidity (2003-2007). Auckland (NZ): Safekids New Zealand; 2009.
11. Eldridge D. Injury among young Australians. AIHW bulletin no. 60. Cat. no. AUS 102. Canberra: AIHW. 2008 [cited 2014 Out 24]. Available from: <http://www.aihw.gov.au/publication-detail/?id=6442468094>.
12. Morrongiello BA, Rennie H. Why do boys engage in more risk taking than girls? The role of attributions, beliefs, and risk appraisals. *J. Pediatr Psychol*. 1998; 23(1):33-44.
13. Martins CBG. Acidentes e violências na infância e adolescência: fatores de risco e de proteção. *Rev Bras Enferm*. 2013; 66(4):578-84.
14. Schnitzer PG, Dowd MD, Kruse RL, Morrongiello BA. Supervision and risk of unintentional injury in young children. *Injury prevention*. 2014. *Inj Prev*. 2014; 20(2):1-8.
15. Algaze I, Snyder AJ, Hodges NL, Smith GA. Children treated in United States emergency departments for door-related injuries, 1999-2008. *Clinical Pediatrics*. 2012; 51(3):226-32.
16. Martinez A, Snyder AJ, Smith GA. Home exercise equipment-related injuries among children in the United States. *Clinical Pediatrics*. 2011; 50(6):553-8.
17. Sousa ST, Ribeiro VS, Menezes Filho JM, Santos AM, Barbieri MA, Figueiredo Neto JA. Foreign body aspiration in children and adolescents: experience of a Brazilian referral center. *J Bras Pneumol*. 2009; 35(7):653-9.
18. Instituto Nacional de Metrologia, Qualidade e Tecnologia. Brinquedo: o porquê da certificação compulsória [internet]. Brasília (DF): INMETRO; 2012 [cited 2014 Nov 12]. Available from: <http://www.inmetro.gov.br/imprensa/releases/brinquedo2.asp>
19. National Institute for Health and Clinical Excellence. Public health guidance 30: preventing unintentional injuries in the home among children and young people aged under 15: home safety assessments and providing safety equipment. London (UK): National Institute for Health and Clinical Excellence; 2010.
20. Pereira SFA, Garcia CA. Prevenção de acidentes domésticos na infância. *Rev Enferm UNISA* 2009; 10(2):172-7.
21. Gonçalves MEP, Cardoso SR, Rodrigues AJ. Corpo estranho em via aérea. *Pulmão RJ* 2011; 20(2):54-8
22. Russell R, Lucas A, Johnson J, Yannam G, Griffin R, Beierle E, et al. Extraction of esophageal foreign bodies in children: rigid versus flexible endoscopy. *Pediatr Surg Int*. 2014 Apr;30(4):417-22.
23. Silvani CB, Gomes GC, Souza LD, Souza JL. Prevenção de acidentes infantis em uma instituição de educação infantil: o conhecimento das cuidadoras. *Rev Enferm UERJ*. 2008; 16(2):200-5.
24. Dantas DV, Alves KYA, Salvador PTCO, Dantas RAN. Nursing activities in the prevention of accidents in child day care centers. *J Nurs UFPE*. 2010; 4(3):1315-22.
25. Seignemartin BA, Jesus LR, Vergílio MSTG, Silva EM. Avaliação da qualidade das anotações de enfermagem no pronto atendimento de um hospital escola. *Rev Rene*. 2013; 14 (6):123-32.
26. Carvalho RDS, Kara-José N, Noma RK, Chignalia MZ, Novaes HMD. Prontuário incompleto no pronto-socorro: uma barreira para a qualidade em saúde. *Rev Bras Med*. 2009; 66(7):218-22.
27. Pedrosa AAG, Mascarenhas MDM, Costa EM, Cronemberger LP. Atendimentos por causas acidentais em serviços públicos de emergência - Teresina, Piauí - 2009. *Ciênc Saúde Coletiva*. 2012; 17(9):2269-78.
28. Del Ciampo LA, Ferraz IS, Tazima MFGS, Bchette LG, Ishikawa K, Paixão R. Características clínicas e epidemiológicas de crianças acidentadas atendidas em um serviço de pronto-atendimento. *Pediatrics (São Paulo)*. 2011; 33(1):29-34.
29. Mesquita GV, Oliveira FAFV, Santos AMR, Tapety FI, Martins MCC, Carvalho CMRS. Análise dos custos hospitalares em um serviço de emergência. *Texto Contexto Enferm*. 2009; 18(2):273-9.