CLINICAL SCIENCE

Fall-related traumas in urgent care centers

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OBJECTIVE: To identify the scope and the characteristics of fall-related traumas in urgent care centers in Sergipe, Brazil and to verify potential associations among the following variables: gender, age, and where the event occurred.

METHOD: This descriptive, cross-sectional study with a quantitative approach was conducted in the urgent care centers of two public referral hospitals in the state of Sergipe, Brazil. The data collection was conducted in November 2010, after approval was obtained from the Human Research Ethics Committee, through a structured interview with a sample of 509 fall victims.

RESULTS: Most of the participants were male, between 0 and 19 years old, single, with no impairments or preexisting diseases, nor regular use of medication or alcohol. The victims were brought to the hospital by ambulance and were accompanied. Most events occurred at home, were same-level falls, and most frequently resulted from slipping and tripping during recreational activities with a subsequent fracture, contusion or sprain. Most victims were discharged from the hospital after care delivery. Statistically significant associations were found between place of fall and age and gender.

CONCLUSION: There is a high incidence of seeking out care in urgent care centers due to falls, which constitutes a severe public health problem that affects both genders in different age groups. The adoption of preventive measures aimed to reduce such events is urgently required.

KEYWORDS: External Causes; Accidental Falls; Epidemiology; Wounds and Injuries.

INTRODUCTION

Trauma is considered to be a severe public health problem worldwide and an important determinant of impairment and disability in victims (1). It is the second most frequent cause of mortality in Brazil and the most frequent among individuals between five and 49 years old (2). Trauma is also one of the main causes of morbidity, work leave, low work efficiency, mental disorders, inability to resume work, and physical and psychological limitations (3,4).

The Surveillance System for Violence and Accidents (SSVA) was implemented in Brazil by the Ministry of Health in 2006 to establish a more sensitive diagnosis of the situation, especially in non-recognized cases not incorporated into the Mortality and Hospitalization Information Systems. Data from the SSVA reveal that falls appeared in a plurality of cases (36%) and were most frequent among children, adolescents and young adults. These results emphasize the need to continue investigations because the literature typically focuses on a specific population group, such as the elderly or children, rather than encompassing all age groups (5).

The fall is an unexpected and unintentional change in position, which causes the individual to pass from a higher to a lower level and is usually a consequence of a cause extrinsic to the victim (6). Falls are the leading cause of hospitalization in the Brazilian public health system (7), with a further negative effect when falls occur among elderly individuals due to potential permanent incapacitation and a high level of mortality (8,9). Acquiring knowledge concerning the epidemiological characteristics of falls in all age groups is essential in this context to better evaluate the magnitude of the phenomenon and support the planning of preventive actions designed to reduce the frequency of falls in society.

This study was designed to identify the scope and characteristics of fall-related traumas in urgent care centers in Sergipe, Brazil and to verify potential associations among the variables of gender, age, and place of fall. We expect to establish a more accurate portrait of fall-related injuries, which in most cases do not result in death or hospitalization but do account for a large demand on emergency care services.

MATERIALS AND METHODS

This descriptive, cross-sectional, quantitative study was conducted in urgent care centers providing services to trauma victims in two public referral hospitals in Aracaju, Sergipe, in northeastern Brazil.

The first hospital provides highly complex care and has an average of 15 appointments per month. This hospital follows a Risk Classification model, giving priority to victims according to risk and severity and dividing the urgent care department into color-coded areas: the blue area (low priority), green area (medium priority), yellow area (care provided to critical victims requiring semi-intensive care) and red area (high priority – intensive care).

The second is a low-complexity care hospital with an average of 750 appointments. This facility is also organized according to priority of care using a Risk Classification model.

Data were collected through structured interviews held during the 12-hour day shift (from 7 am to 7 pm) over 30 consecutive days in November 2010. An interview script was developed based on the SSVA and was composed of three parts: the first section to characterize the victim, the second to collect information concerning the fall and the third to collect information concerning how the victim's condition progressed.

The non-probabilistic convenience sample was composed of 509 fall victims who met the following inclusion criteria: being a fall victim cared for in an urgent care center and providing written and oral informed consent. Fall victims were included in the study regardless of age and gender.

The study was approved by the Human Research Ethics Committee at the Federal University of Sergipe (CAAE 4940.0.000.107-10). All of the participants or their legal guardians signed free and informed consent forms in accordance with Resolution 196/96 (October 10, 1996, Brazilian National Council of Health).

The data were stored in a Statistical Package for the Social Sciences (SPSS) version 18.0 database. The 'falls' (W00-W19) were classified according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10) (10).

The definition provided in Decree No. 3.298/99 from the Special Department for Human Rights was used for the variable ''disability'', that is, ''every loss or abnormality of a structure or psychological, physiological or anatomical function causing impairment in the performance of an activity within a standard considered normal for human beings'' (11). ''Preexisting diseases'' were those that affected the victims at the time of the study but were not related to the falls, and ''regular use of medication'' was considered to be any type of medication used by the victim on a regular basis.

Categorical variables were described using absolute and relative frequency, and the Chi-square test was used to verify potential associations among the variables. The multivariate statistical technique was used in the cluster analysis, which analyzes groups of individuals with the same characteristics. This technique maximizes the homogeneity of objects within the same group while simultaneously maximizing the heterogeneity among groups (12). When the classification is successful, the objects within the clusters are close when represented graphically, and different clusters are distant from each other. A level of significance of $p<0.05$ was established for the entire study.

RESULTS

Most victims were male (53.4%), children and adolescents from 0 to 19 years old (44.5%), single (42.6%), reported to be of mixed race (48.9%), with no impairment (92.5%), preexisting disease (76.6%) or regularly used medication (79.8%); a lack of exercise was reported by 84.1% of the victims as presented in Table 1.

The data in Table 2 show that most victims had a companion when they arrived at the hospital (84.1%), and most were brought by an ambulance (27.1%). Most falls (52.8%) occurred in Aracaju, the capital of Sergipe, in the morning (44.4%). A total of 25.7% were characterized as occupational accidents, and 97.5% of the victims did not use alcohol or illegal drugs; the events occurred most frequently in the victim's household (45.4%).

Falls most frequently occurred during recreational activities (28.9%), were same-level falls (63.9%) and were caused by slipping (24.6%). The most frequent falls from one level to another were on stairs/steps (8.3%), and only 2.6% of people reported loss of consciousness at the time of the event.

Fractures (34.6%) were the most common injury. Most victims were discharged after initial emergency care was provided (89.8%) (Table 2).

A significant association ($p<0.0001$) was observed between the variables 'age' and 'gender' according to data presented in Table 3. Male individuals predominated among those up to 18 years of age, and female individuals were more frequent among those older than 18 years of age.

The Chi-square test showed a statistically significant association ($p<0.0001$) between 'place of fall' and 'gender' (Table 3). Falls among male and female victims most

Table 1 - The distribution of fall victims according to gender, age, marital status, race/ethnicity, type of impairment, preexisting diseases and use of regular medication. Sergipe, Brazil, 2010.

Variables	Categories	(n)	(%)
Gender	Male	272	53.4
	Female	237	46.6
Age (years)	0-13	169	33.9
	13-19	53	10.6
	19-60	200	40.2
	60 or older	76	15.3
Marital status	Single	145	42.6
	Married/stable union	136	40.0
	Separated/divorced	18	5.3
	Widowed	41	12.1
Race/ethnicity	Caucasian	140	27.5
	Afro-Brazilian	111	21.8
	Mixed	249	48.9
	Indigenous	04	0.8
	Asian	05	1.0
Has some type of impairment	Yes	38	7.5
	No	471	92.5
Preexisting diseases	Yes	119	23.4
	No	390	76.6
Use of regular medication	Yes	103	20.2
	No	406	79.8
Exercise	Yes	81	15.9
	No	428	84.1
TOTAL		**509**	**100**

Table 2 - Characterization of fall-related traumas. Sergipe, Brazil, 2010.

Variables	Categories	(n)	(%)
Companion	Yes	428	84.1
	No	81	15.9
Transportation means	Ambulances	138	27.1
	Private car	137	26.9
	Public transportation	108	21.2
	Mobile emergency care	44	8.6
	Taxi	31	6.1
	Motorcycle	20	3.9
	Other	28	5.5
Time of fall	Morning	226	44.4
	Afternoon	195	38.3
	Night	88	17.3
Occupational accident	Yes	71	25.7
	No	205	74.3
Consumption of alcohol/drugs	Yes	07	2.5
	No	269	97.5
Place of the event	Home	231	45.4
	Public roads	98	19.3
	Workplace	53	10.4
	School	41	8.1
	Sporting events/leisure activity	86	16.9
Activity at the time of the fall	Recreation/leisure	147	28.9
	Walking	124	24.4
	Working	65	12.8
	Domestic activities	36	7.1
	Sleeping	14	2.8
	Traveling to work	11	2.2
	Consuming alcohol	03	0.6
	Others	74	14.5
Type of fall	**Same-level falls**		
	Slip	125	24.6
	Trip	110	21.6
	Collision with or pushing by another person	46	9.0
	Caused by a collision with an object	12	2.4
	Missteps	06	1.2
	Others	26	5.1
	Fall from one level to another		
	Bed/sofa/cradle	33	6.5
	Stair	42	8.3
	Hole	17	3.3
	Furniture	27	5.3
	Tree	21	4.1
	Roof	06	1.2
	Scaffolding	12	2.4
	Others	26	5.1
Loss of conscience	Yes	13	2.6
	No	496	97.4
Nature of injury	Fracture	176	34.6
	Contusion	139	27.3
	Sprain	112	22.0
	Dislocation	28	5.5
	Other types of trauma	54	10.6
Outcome	Hospital discharge	457	89.8
	Hospitalization	52	10.2
TOTAL		**509**	**100**

frequently occurred at home, 35.3% and 57.0%, respectively. A significant association was also found ($p<0.0001$) when 'place of fall' was related to 'age' through the Chi-square test (Table 4). Most falls among victims younger than 12 years old occurred at home (53.8%), followed by school (14.2%), that is, a ratio of approximately 4:1. In addition to these places, falls among adolescents (13 to 18 years old) occurred during sports (26.4%). The main places of falls among adults were home (36.5%) and public roads (22.0%). Most falls among elderly individuals occurred at home (63.2%).

Cluster analysis related to Euclidian squared distances among subjects with the minimum distance aggregation method identified the presence of four clusters with the following composition: Cluster 1 with 114 victims, Cluster 2 with 113 victims, Cluster 3 with 133 victims and Cluster 4 with 138 victims.

Cluster 1 corresponds to the group of victims with the lowest scores in the different dimensions studied, whereas Clusters 2, 3 and 4 correspond to the highest scores. Clusters 1 and 2 include all (100%) of the falls that occurred at home; more than half occurred among women. The most common

Table 3 - Associations between age and gender of fall victims and between place of the event and gender. Sergipe, Brazil, 2010.

Age group	Gender				
	Male		Female		
	n	%	n	%	*p*-value
0-13	108	40.3	61	26.5	
13-19	40	14.9	13	15.7	
19-60	101	37.7	99	43.0	
60 or older	19	7.1	57	24.8	
TOTAL	**268**	**53.8**	**230**	**46.2**	<0.0001
Place of fall					
Home	96	35.3	135	57.0	
School	32	11.8	09	3.8	
Sporting events/leisure activity	55	20.2	31	13.1	
Public roads	47	17.3	51	21.5	
Workplace	42	15.4	11	4.6	
TOTAL	**272**	**100.0**	**237**	**100.0**	<0.0001

Chi-square test<0.005.

type of fall was 'same-level falls', in which fractures and sprains predominated in Cluster 1 and contusions and other types of injuries predominated in Cluster 2 (Table 5).

In Clusters 3 and 4, there was a prevalence of same-level falls and male victims. Regarding the fall site and nature of the injury, in Cluster 3, there was a prevalence of sports practice locations and fractures, whereas in Cluster 4, public roads and contusion prevailed (Table 5).

DISCUSSION

Effective planning, prevention and treatment are essential given the characteristics of fall-related traumas cared for in urgent care centers. This study was designed to provide relevant data concerning fall-related morbidity in the state of Sergipe, Brazil because it involved the main public hospitals in the city caring for trauma victims.

Most victims were male, in accordance with evidence from other research addressing trauma (13,14). However, in the present study, women over 60 years old demonstrated a higher tendency of falls, corroborating national (9,15,16) and international studies (17,18). These results may be explained by greater fragility, prevalence of chronic

Table 4 - Associations between place of event and age of victims. Sergipe, Brazil, 2010.

Place of event	Age								*p*-value
	0 - 13		13 - 19		19 - 60		60 or older		
	n	%	n	%	n	%	n	%	
Home	91	53.8	15	28.3	73	36.5	48	63.2	
School	24	14.2	11	20.8	06	3.0	-	-	
Sporting event	25	14.8	14	26.4	41	20.5	03	3.9	
Public roads	23	13.6	10	18.9	44	22.0	18	23.7	
Workplace	06	3.6	03	5.7	36	18.0	07	9.2	
TOTAL	**169**	**100.0**	**53**	**100.0**	**200**	**100.0**	**76**	**100.0**	<0.0001

Chi-square test<0.005.

diseases (19) loss of autonomy (20) and menopause. This fragility refers to the smaller amount of muscle mass and strength observed in older women compared with men of the same age (18).

Even though disability is associated with a greater risk of falls, the data in this study show that only 7.5% of the victims had any type of disability. A review study showed that visual disability is a factor that contributes to falls due to individuals' difficulties in maintaining postural control and balance (21).

It is worth noting that only 15.9% of the interviewed victims reported exercising. An Australian study (22) evaluated 1,090 individuals 70 years old or older and revealed that exercise was the isolated intervention that most strongly reduced the number of falls per year.

With regards to the transportation used by victims to reach the hospital, most used ambulances, followed by a private car. These findings are partially similar to those of a study (5) conducted in Brazil in 2007 in which the victims most frequently used a private car (47.4%) and public transportation (23.8%). Victims who are inappropriately transported may aggravate their injuries and experience irreversible sequelae.

Regarding the outcome, the findings are similar to those of a study (23) in which most victims were discharged after care was provided in an urgent care center. Individuals may have been discharged because the traumas resulted in mild injuries that could be cared for in less complex, specialized services. Hence, overcrowding in a trauma referral center could be avoided.

The variables that allowed us to better differentiate the clusters were fall site, followed by nature of injury, age, gender and type of fall.

We observed in Clusters 1 and 2 that the grouped victims were between 0 and 12 years old, female, and had suffered same-level falls in their residence, which resulted in fracture or contusion. The high occurrence of falls among children and adolescents observed in this study corroborates data from the Brazilian Ministry of Health from 2006 and 2007, in which falls were more frequent in this age group (5). A study (13) that evaluated the occurrence of trauma among individuals up to 18 years old revealed that falls were the most frequent mechanism in 54.6% of cases.

A study (13) addressing orthopedic trauma in children and youth verified that falling was the most frequent mechanism in all places, although 64% of falls occurred at home. The fact that falls occur mainly at home suggests that changing the environment is an effective preventive strategy and emphasizes the need to closely supervise children.

Cluster 3 was composed of subjects who were between 0 and 12 years old, male, and had suffered same-level falls at sports practice locations with consequent fractures. Same-level falls that resulted in fractures were also prevalent in other studies (13,15,24) that indicate this type of fall as the most prevalent in the general population and fractures as the predominant injury (14,25,26). Sports practice should be encouraged from childhood because sports contribute to the adoption of a healthy lifestyle. For this activity to be safe, the environment where these activities take place, such as schools, must be designed in a way to reduce the number of falls during practice.

In the last group, Cluster 4, the subjects were between 19 and 59 years old, male, and had suffered same-level falls on a public road, with contusion. Public roads are the location

Table 5 - Analysis of variables with respect to their ability to differentiate among victim clusters. Sergipe, Brazil, 2010.

Variable	Cluster 1		Cluster 2		Cluster 3		Cluster 4		p-value
n	114		113		133		138		
Age (years)	n	%	n	%	n	%	n	%	<0.0001
0-12	39	34.2	52	46.0	60	45.1	18	13.0	
13-18	7	6.1	8	7.1	27	20.3	11	8.0	
19-59	38	33.3	35	31.0	46	34.6	81	58.7	
60 or older	30	26.3	18	15.9	0	0.0	28	20.3	
Gender									<0.0001
M	46	40.4	50	44.2	93	69.9	79	57.2	
F	68	59.6	63	55.8	40	30.1	59	42.8	
Type of fall									0.02
Fall from another level	49	43.0	47	41.6	35	26.3	48	34.8	
Same-level fall	65	57.0	66	58.4	98	73.7	90	65.2	
Nature of injury									<0.0001
Fracture	68	59.6	0	0.0	82	61.7	22	15.9	
Sprain	40	35.1	0	0.0	31	23.3	38	27.5	
Contusion	0	0.0	80	70.8	7	5.3	49	35.5	
Others	0	0.0	32	28.3	6	4.5	15	10.9	
Place of fall									<0.0001
Home	114	100.0	114	100.0	0	0.0	0	0.0	
School	0	0.0	0	0.0	39	29.3	2	1.4	
Sporting event	0	0.0	0	0.0	58	43.6	25	18.1	
Public roads	0	0.0	0	0.0	32	24.1	63	45.7	
Workplace	0	0.0	0	0.0	4	3.0	48	34.8	

Cluster analysis.

with the second-highest number of falls in adults (5); this observation shows the need for planning safer roads that are well-maintained without holes or irregularities.

The characteristics of falls in the emergency department indicate the relevance of identifying the magnitude of the trauma and the importance of assessing trauma and following up with trauma victims. These data can guide health policies intended to reduce accidents, improve individuals' quality of life, and reduce sequelae.

Falls account for a large and relevant demand on health services. Acquiring knowledge concerning the characteristics of victims and factors that may determine or influence the occurrence of falls enables the implementation of rapid and effective interventions.

The present study had the following limitations. The sample was selected for convenience and was only selected during the daytime shift. However, the interview technique provided better quality data during a period that has the greatest demand for emergency services.

These findings demonstrate that despite the fact that most falls are of low complexity, the search for urgent care services is high and could be avoided through the adoption of preventive measures.

Because these are avoidable events, prevention is the best way to reduce the high occurrence of falls. To achieve this goal, educational programs need to be developed in schools, extended-stay institutions, workplaces and primary health care units, and especially in households where there is a high incidence of such events.

AUTHOR CONTRIBUTIONS

Cartaxo CK was responsible for data collection and redaction. Nunes MS was responsible for data collection and writing the discussion section. Raposo OF conducted the statistical analysis. Fakhouri R reviewed the manuscript. Hora EC served as an advisor and was responsible for the analysis and review of the manuscript.

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