

Epidemiological Study of Traumatized Patients Treated in a Tertiary Hospital in the Southern Region of Brazil

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Abstract

Objective: Analyze and correlate data collected on different types of trauma treated in a tertiary hospital in southern Brazil. **Methods:** A cross-sectional and retrospective epidemiological analysis of 424 trauma-related appointments in a tertiary reference hospital in the northern region of the state of Rio Grande do Sul (RS), Brazil. This study analyzed data on patients seen from 2019 to 2020 in an orthopedic medical residency service and aimed at an epidemiological profile of the patients, types of traumas, age groups and lesion patterns. **Results:** The results showed that most traumas were due to falls from standing height (45.24%). Distal radius fractures were the most prevalent (total of 21.98%; 5.6% in children and 16.37% in adults). In general, most of the cases of trauma were adult patients aged between 30 and 40 years (13.91%) and were caused by high-energy accidents. Furthermore, the patients were mostly men, totaling 252 patients and 59.43% of the total number of cases. When it comes to the elderly population, the traumatic injuries commonly affect the hip (trochanteric, subtrochanteric, and femoral neck fractures), and also affect the wrist (distal radius fractures). **Conclusions:** The trauma maintains a similar pattern and characteristics in body injuries according to the type of accidents, age group and the epidemiological profile of a region, which demonstrates the need to develop protocols to better serve trauma patients.

Keywords

Epidemiology, Trauma, Orthopedics and Traumatology

1. Introduction

Trauma is the greatest cause of mortality and morbidity in human history. In addition to causing, often irreversible, damage to victims, it also impacts hospitals. In the financial and administrative sphere, for example, it results in high costs for treatment and leads to hospital overcrowding due to the large number of visits and the long period of hospitalization of patients [1].

By definition, a polytrauma patient is a victim with an injury to more than one organ or system of the body that can be life-threatening. A traumatized patient is one who suffers at least one physical injury resulting from an incident [2]. In this context, understanding the effects that traumatic injuries have on our body is extremely important to optimize patient care, thus improving the treatment outcome and increasing the chances of a good prognosis.

When it comes to the orthopedic specialty, trauma victims can range from minor limb injuries to traumatic amputations and even death. The wide range of possible injuries to trauma patients represents a great challenge for surgeons, nurses, physiotherapists and other healthcare professionals who directly care for these patients [3]. Therefore, recognizing possible injuries and their physiological repercussions is essential for successful treatment of traumatized patients.

Studying and understanding the epidemiology of trauma is extremely important when we think about improving care for traumatized patients. The analysis of the frequency of accidents, the patterns of victims and the mechanisms of traumatic events generates adequate assistance for patients and, consequently, reduces the significant impact that trauma causes throughout the treatment process.

Therefore, the objective of this work was to analyze and correlate data collected from various traumas that were treated in the emergency room of a tertiary hospital in the northern region of Rio Grande do Sul, aiming to develop an epidemiological study of traumatic events. As it is possible to anticipate unfavorable outcomes in the evolution of a trauma patient, there is an advance in the therapeutic approach, making it more effective and optimized.

2. Materials and Methods

The epidemiological study contained in this work is the result of a cross-sectional and retrospective analysis of 424 consultations involving trauma patients in a tertiary and referral hospital in the northern region of Rio Grande do Sul, southern Brazil. The data was collected from consultations that occurred from 2019 to 2020 and covered in an orthopedics medical residency service, which is accredited by the Ministry of Education and Culture (MEC) with approval from the Teaching and Research Council (CEP), with number 39774420.8.0000.5210.

The information analyzed strictly follows the regulations of the General Law for the Protection of Personal Data (LGPD) number 13.709, since no names are mentioned nor images of exams are published in this epidemiological research.

All data analyzed were extracted from emergency care at a tertiary hospital in Rio Grande do Sul and compiled into a table in the 2021 Microsoft Office Excel

software, with the aim of organizing and statistically analyzing the traumatic events that occur in the northern region of Rio. Grande do Sul.

The inclusion criteria for composing this epidemiological study were: blunt trauma to the limbs, closed and open fractures, musculoskeletal injuries resulting from falls from a height (over 1 meter) and falls from a standing height, traffic accidents, physical assaults, work accidents and sports traumas. The exclusion criteria were care that is not listed above, such as atraumatic low back pain and post-operative infections.

Traumas in different regions of the body treated by the specialty of Orthopedics and Traumatology were analyzed, including lower limbs, upper limbs, pediatric, hip and spine. The age range involved was wide, from children to the elderly. In addition, other variables were also observed, such as sex, race, affected side, surgical or conservative treatment, length of stay in the ward, need for admission to an intensive care unit and whether the patient died during the post-trauma hospital stay.

According to the data compiled in table form, comparisons and correlations were carried out through graphical analyses with the purpose of studying the relationship between the causes and consequences of traumatic events. An example of the model used for data compilation and analysis is shown in **Table 1**. A brief model of the constructed table is shown below.

3. Results

3.1. Traumas Attended to

The results are based on analyses carried out using informative graphics, with the purpose of comparing and quantifying the data collected in the research.

As the various causes of traumatic events treated in the emergency were analyzed, it became clear that the majority of traumas occur due to a fall from height to the ground (45.24%).

Secondly, trauma due to falls from a height—over 1 meter—is observed in 26.22%. Next, sporting accidents (6.22%) are third in frequency. In fourth place are traffic accidents (motorcycle and car—5.9% and 5.24%, respectively), together with work accidents (5.9%). Then, in descending order of events, falls from bicycles (2.62%), physical attacks (1.96%) and, finally, pedestrian collisions (0.65%) are observed (**Figure 1**).

3.2. Age Group Affected

For the purpose of studying the age range of traumatized patients, the patients were separated into an infographic analyzed by decades of life. According to the analysis of consultations, it was observed that the majority of consultations occur among adult patients aged between 30 and 40 years (13.91%). Then, the ages and percentages of trauma were correlated: under 10 years old (9.66%), 10 to 20 years old (10.84%), 20 to 30 years old (13.20%), 30 to 40 years (13.91%), 40 to 50 years (12.5%), 60 to 70 years (12.02%), 50 to 60 years (11.32%), 70 to 80 years (8.72%), 80 to 90 years (5.89%) and 90 to 100 years (1.88%) (**Figure 2**).

Table 1. Example of the model used for data compilation and analysis.

PATIENT ID	INIT SEX	SERVICE	DATE OF ADN AGE	RACE	REASON FOR MAIN AFFECTED SITE OF TRAU	AFFECTED SI	HOSPITALIZA	CONSERVATIVE	TRISURGICAL	TR TYPE OF SUR LENGTH OF T	MATERIAL U	DO YOU NEE	ICU TIME	DEATH?	CAUSE OF DEATH
IMFM															
BBB		2713143		64 White	Fall from own Knee	Knee	0	Yes	No		Conservative No			0	
VL	VL	2654338	14/10/2020	13 White	Blunt trauma Foot	Hallux	0	Yes	No		Conservative No			0	
TSN	VL	2654338	14/10/2020	53 White	Fall from heig Hip	Trochanteric fracture	5	No	Yes	RAFI	3 Synthesis ma No			0	No
SMV	VL	2654338	14/10/2020	53 White	Fall from heig Fish	Distal radius fracture	5	No	Yes	RAFI	3 Synthesis ma No			0	No
JS	SMV	2642642	04/10/2020	70 White	Fall from own Hip	Trochanteric fracture	42	No	Yes	RAFI	3 Synthesis ma No			0	No
LAC	JS	2639583	01/10/2020	82 White	Fall from own Hip	Trochanteric fracture	5	No	Yes	RAFI	2 Synthesis ma No			0	No
LCS	LAC	2626505	22/09/2020	64 White	Fall from own Hip	Subtrochanteric fractu	8	No	Yes	RAFI	3 Synthesis ma No			0	No
OXB	LCS	2623504	18/09/2020	85 White	Car-accident Hip	Trochanteric fracture	16	No	Yes	RAFI	0 Synthesis ma Yes			14	Yes
PMGS	OXB	2618562	15/09/2020	62 White	Fall from own Hip	actabular fracture	1	No	Yes	RAFI	1 Synthesis ma No			0	No
ESM	PMGS	2751261	27/12/2020	53 White	Fall from own Hip	Trochanteric fracture	30	No	Yes	RAFI	20 Synthesis ma No			0	No
RS	ESM	2751267	27/12/2020	83 White	Fall from own Hip	Trochanteric fracture	6	No	Yes	RAFI	3 Synthesis ma No			0	No
EJFD	RS	2729192	10/12/2020	80 White	Fall from own Hip	Femoral neck fracture	7	No	Yes	PTQ	3 Synthesis ma No			0	No
DBR	EJFD	2714730	11/12/2020	35 White	Trauma Free Hip	Distal radius fracture	7	No	Yes	RAFI	3 Synthesis ma No			0	No
CI	DBR	2723658	08/12/2020	43 White	Blunt trauma Hip	Femoral pseudarthro: Left	7	No	Yes	RAFI	3 Synthesis ma No			0	No
INB	CI	2717210	04/11/2020	32 White	Blunt trauma Shoulder	Shoulder	0	Yes	No					0	No
RVF	INB	2727180	06/12/2020	9 White	Blunt trauma Elbow	Elbow	0	Yes	No					0	No
V8FS	RVF	2738013	15/12/2020	77 White	Fall from own Elbow	Supracondylar fracture	4	No	Yes	RAFI	3 Synthesis ma No			0	No
OPS	V8FS	2750966	26/12/2020	60 White	Fall from heig Shoulder	Proximal humerus frac	3	No	Yes	RAFI	1 Synthesis material			0	No
PMC	OPS	2331011	01/01/2020	75 White	Blunt trauma Shoulder	Shoulder	Yes							0	No
GFS	PMC	2531164	01/01/2020	28 White	Fall from own Elbow	Elbow	Yes							0	No
RUD	GFS	2572707	06/08/2020	26 White	Pull on the ar Shoulder	Anterior glenohumeral	Yes							0	No
DWSM	RUD	2656537	09/08/2020	40 White	Fall from own Arm	Proximal humerus frac	3	No	Yes	RAFI	1 Synthesis material			0	No
LOL	DWSM	2585937	18/08/2020	22 White	Motorcycle at Clavicle	Distal third fracture	2	No	Yes	RAFI	1 Synthesis material			0	No
EFM	LOL	2751136	28/12/2020	9 White	Fall from own Elbow	Supracondylar fracture	2	No	Yes	RFFP	1 Synthesis material			0	No
SMPN	EFM	2727221	26/12/2020	5 White	Fall from heig Elbow	Elbow	0	Yes	No					0	No
SMR	SMPN	2735289	23/12/2020	16 White	Fall from own Elbow	Fracture chapter	1	Yes	No					0	No
FC	SMR	2735401	11/12/2020	61 White	Fall from heig Elbow	Olecranon fracture	2	Yes	Yes	RAFI	1 Synthesis material			0	No
YMP5	FC	2616134	10/12/2020	9 White	Fall from own Arm	Arm	0	Yes						0	No
OSA	YMP5	2626485	21/09/2020	45 White	Fall from heig Shoulder	Anterior glenohumeral	0	Yes	No					0	No
FC	OSA	2629853	23/09/2020	26 White	Fall from heig Shoulder	Anterior glenohumeral	0	Yes	No					0	No
SPC	FC	2632716	25/09/2020	5 White	Fall from heig Clavicle	Clavicle fracture	0	Yes	No					0	No
ACE	SPC	2633472	27/09/2020	17 White	Bicycle fall	Clavicle fracture	0	Yes	No					0	No
ODR	ACE	2648839	08/10/2020	9 White	Bicycle fall	Supracondylar fracture	2	No	Yes	RFFP	1 Synthesis material			0	No
AHT	ODR	2653880	14/10/2020	17 White	Bicycle fall	Chapter fracture	2	No	Yes	RAFI	1 Synthesis material			0	No
JAA	AHT	2665003	21/10/2020	61 White	Fall from own Shoulder	Shoulder contusion	0	Yes	No					0	No
MBSK	JAA	2669287	26/10/2020	6 White	Bicycle fall	Supracondylar fracture	0	Yes	No					0	No
IBCT	MBSK	2673777	28/10/2020	33 White	TO READ	Elbow	0	Yes	No					0	No
GR	IBCT	2599070	28/08/2020	25 White	Blunt trauma Shoulder	Anterior glenohumeral	0	Yes	No					0	No
IRT	GR	2600200	30/08/2020	13 White	Fall from own Elbow	Supracondylar fracture	0	Yes	No					0	No
LTPP	IRT	2752524	28/12/2020	54 White	Fall from own Knee	Tibial plateau fracture	4	No	Yes	RAFI	1 Synthesis material			0	No
MFM	LTPP	2713143	28/12/2020	64 White	Fall from own Knee	Sprain	0	Yes	No					0	No
EL	MFM	2717066	29/11/2020	47 White	Bicycle fall	Patella fracture	15	No	Yes	RAFI	7 Synthesis material			0	No

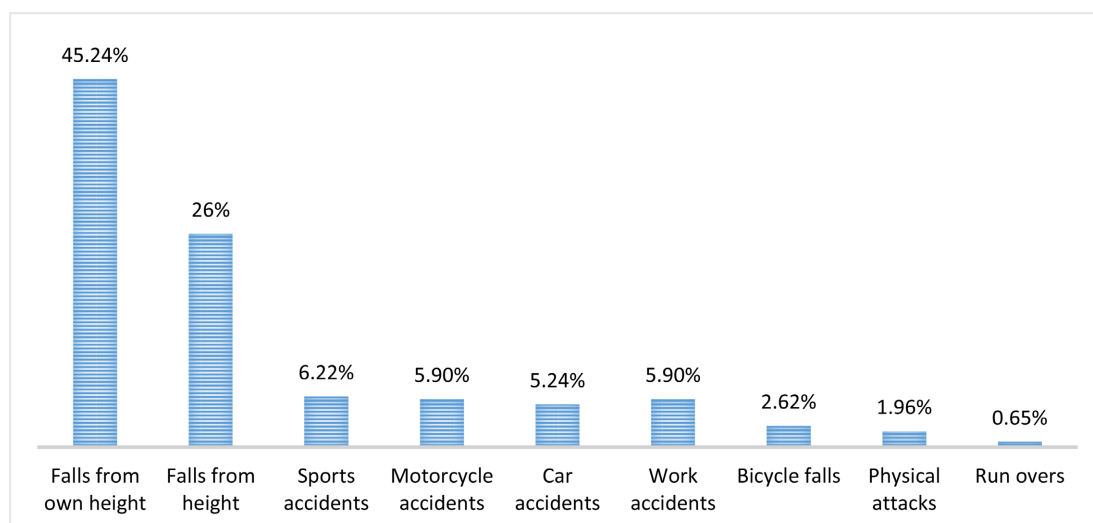


Figure 1. Traumas attended to.

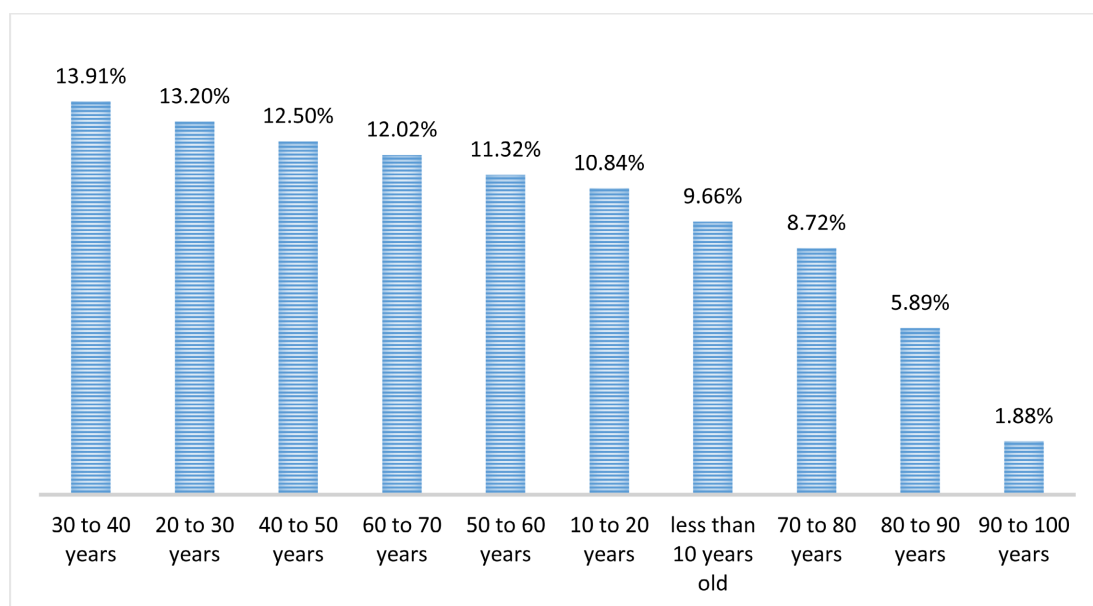


Figure 2. Age group affected.

3.3. Gender of Patients

The present study demonstrated that the majority of trauma victims attended were male, more specifically 252 patients, making up 59.43% of the total number of victims. Among the female victims, the total was 172 patients, reaching 40.56% of the total number of visits (**Figure 3**).

3.4. Affected Body Regions

Among the most affected body regions, the following prevalence rates were observed: trauma to the hand in first place (16.58%), to the wrist, hip and pelvis in second place (all making up 13.65%), to the ankle in third place with 12.19% occurrence. Then, respectively, foot (10.48%), shoulder (7.07%), forearm (6.82%),

elbow (6.09%), knee (4.63%), thigh (2.92%), spine (0.97%), arm (0.97%) and clavicle (0.48%) (Figure 4).

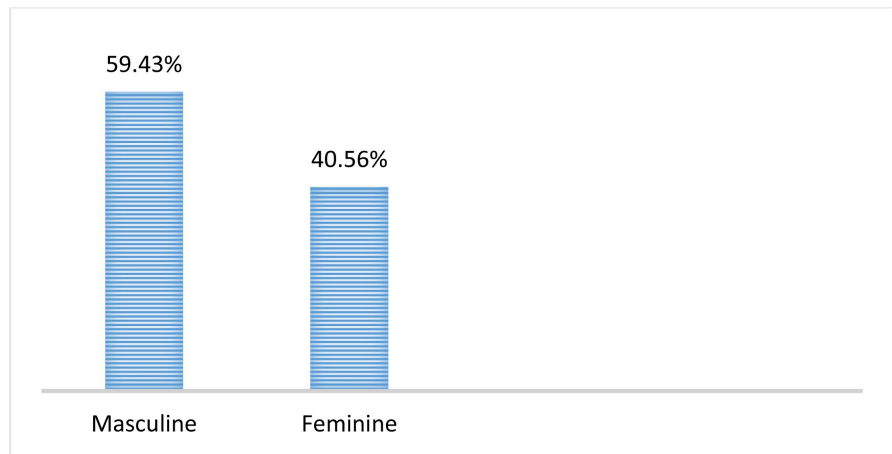


Figure 3. Gender.

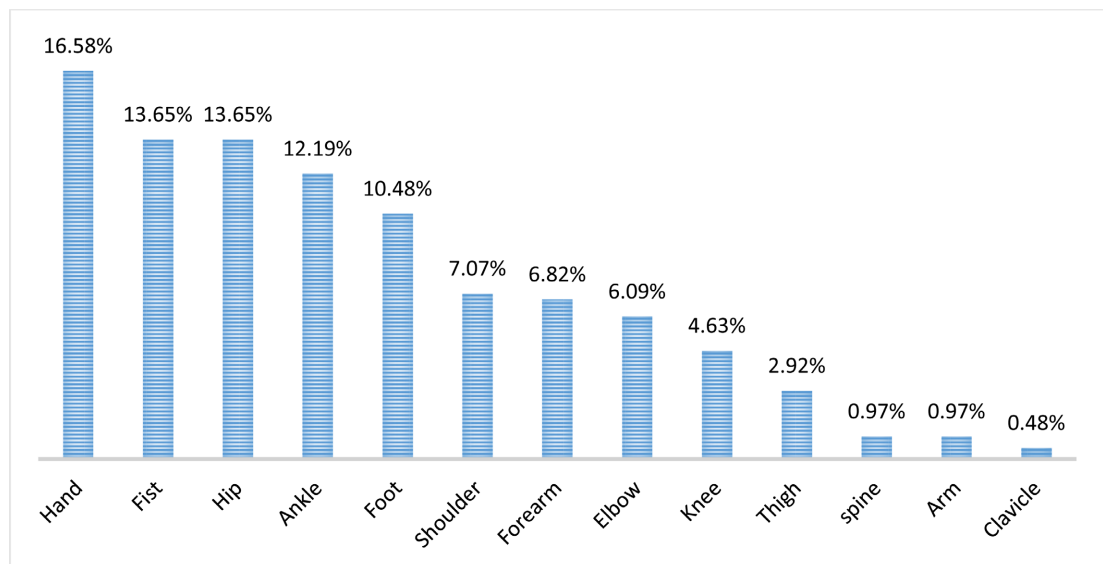


Figure 4. Affected body regions.

3.5. Specific Injuries

Among the specific injuries in each region of the body, the following rates were observed: distal radius fracture being the most prevalent (21.98% in total—5.6% in children and 16.37% in adults). Following: hand phalangeal fractures (11.32%), trochanteric/subtrochanteric fractures (10.77%), femoral neck fractures (8.18%), simple ankle sprains—without fracture (6.89%), toe fractures (5.6%), thumb fractures (2.83%), knee sprains (2.58%), tibial plateau fracture (2.58%), acetabulum/ischiopubic branch fractures (2.58%), blunt injuries to the foot (1.72%), hallux fractures (1.65%), blunt trauma to the knee (1.29%), calcaneal fracture (1.17%) and patella fractures (0.86%) (Figure 5).

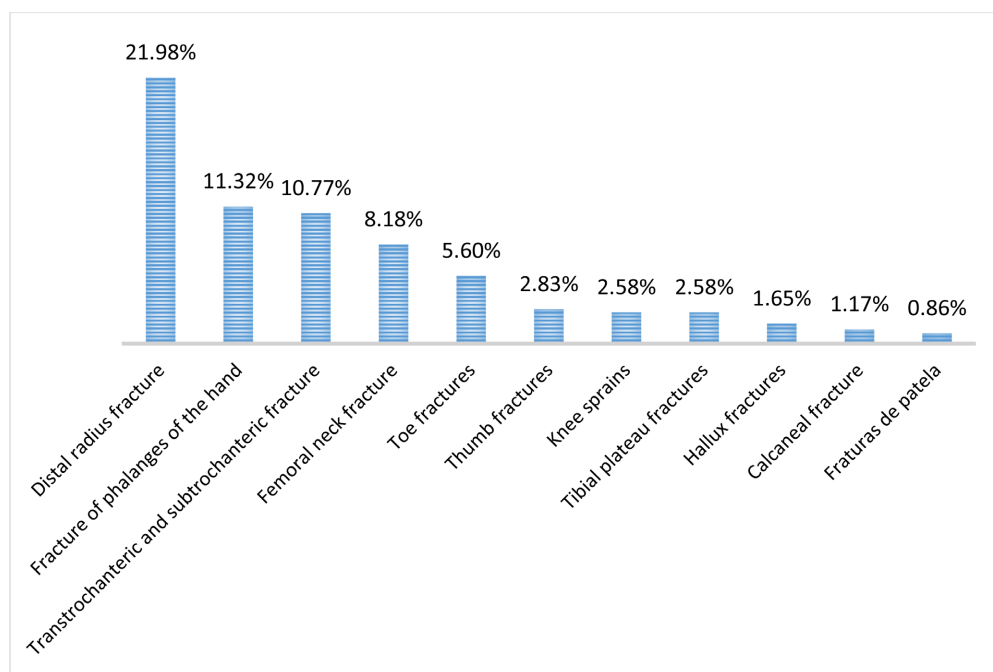


Figure 5. Specific injuries.

3.6. Pattern of Falls from Height

Analyzing in detail the traumas caused by falls from a standing height, which cover the majority of cases, it was observed that 70% were female and 30% were male.

Trauma caused by falling from a height occurs in all age groups, from children to older people. According to the study, falls from height to the ground commonly occur in older people, with the average age of occurrence of these traumas being 59.32 years.

Regarding the treatment of trauma caused by falls from a standing height, the analysis in question demonstrated that 65.21% were treated surgically and 34.78% were treated conservatively.

Furthermore, among falls from standing height that involved a low-energy trauma mechanism, the most common injuries were those involving the hip (trochanteric, subtrochanteric and femoral neck fractures), which accounted for 34.05%, followed by wrist injuries (distal radius fractures) with 19.56% and ankle traumas (fractures and sprains) with 12.31%.

3.7. Pattern of Traffic Accidents

According to the grouping of motorcycle accidents, car accidents and pedestrian accidents as belonging to traffic accidents, it was observed that 48.64% of traffic accidents were due to motorcycle accidents, 40.54% were due to car accidents and 10.81% were due to being run over.

Among motorcycle accidents, the analysis showed that among the victims, 77.77% were male and 22.23% were female. Furthermore, it was found that the average age of patients involved in motorcycle trauma was 31.5 years old.

When it comes to car accidents, the present study showed that 86.66% were male and 13.34% were female. The average age was 33.13 years.

In relation to pedestrian accidents, an equal division can be seen, with 50% of victims being male and the other half being female. The average age of patients treated due to being run over was 60.5 years.

3.8. Conservative versus Surgical Treatment

According to the data collected in the research, it can be seen that the majority of traumas were treated conservatively. In percentage, non-surgical traumas were 54% and traumas with surgical treatments were 46% (**Figure 6**).

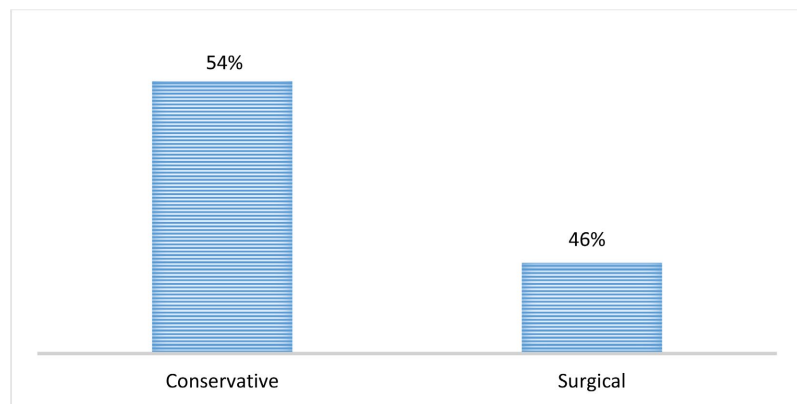


Figure 6. Conservative treatment versus surgical treatment.

3.9. Length of Stay

In relation to the total length of stay, the minimum time was 1 day and the maximum was 42 days. Patients admitted for the hip and knee subspecialty are those who stay in the hospital the longest, on average 8 days. Followed by patients with foot and ankle fractures, who remain hospitalized for an average of 5 days. In third place are patients with fractures in the upper limb (shoulder, elbow and hand), who spend an average of 4 days in hospital.

3.10. Deaths

Among all trauma patients evaluated in this study, six died as a result of injuries, which makes up 1.41% of the total number of patients evaluated.

4. Discussion

Trauma accounts for a large portion of care and hospital admissions, representing a daily challenge for health care teams. It is known that trauma victims are responsible for a large part of the occupancy of hospital beds, representing significant expenses due to the long period of hospitalization and necessary surgical treatments. According to Advanced Trauma Life Support (ATLS) literature, around 9 people die every minute because of trauma or violence. Furthermore, trauma represents 18% of the cost of diseases in the world [4].

The data collected to carry out this work demonstrate the importance of the hospital in the north of the State of Rio Grande do Sul, which receives countless patients for care daily.

The analyses carried out on the information collected support that trauma is present in the daily life of hospital emergency departments, thus deserving a systematized and effective approach, in order to improve patient care and reduce the impacts generated.

As evidenced in this research, the most prevalent trauma was falling from a height (45.24%). This data is also found in the different articles written by the authors Da Silva LAP, Ferreira AC, Paulino RES, *et al.* [5]. In the study by Da Costa AMR, Xavier EM de O and Figueiras MDC, the distal radius fracture is the most prevalent after a fall from height to the ground [6]. However, the study in question diverges from the data found by Da Costa AMR, Xavier EM de O and Figueiras MDC, since it was shown that trochanteric fractures are more common after falls from a standing height, in the case of an isolated low-level trauma. Energy involved. Therefore, one aspect that is shared between these two low-energy traumas is that they are both directly correlated to the age group of the elderly.

To justify these prevalences, some reasons can be established, such as: senility, osteoporosis, obstacles present on urban mobility routes, motor imbalances and the use of continuous medications or pre-existing diseases that lead to loss of strength or motor coordination. Even though it is a low-energy trauma, fractures caused by falling from a height have an impact on the quality of life of these patients and can lead to prolonged periods of convalescence.

Trauma from falling from a height (above 1 meter) is also common in emergency services and represents a rate of 26.22%. They are generally caused by workplace accidents and tend to be more serious, since the trauma involves greater energy. The implementation of occupational safety measures is, therefore, essential to reduce this statistic.

Regarding the age range of trauma victims, it was observed that the prevalent profile of care is adults, males, between 30 and 40 years old (13.91%). This data is also reported in the study by Padovani, Cauê & Silva, Janete & Tanaka, Clarice [7], in which the authors infer that the majority of trauma victims are young adult men. As seen in the study carried out by Jacqueline Moraes Nogueira, Márcia S. [8], which also concluded that the majority of patients treated were male.

The trauma pattern in adult men is usually associated with traffic accidents, more specifically with multiple traumas associated with motorcycles. This data is corroborated by the analysis by Mascarenhas MDM, Souto RMCV, Malta DC *et al.* [9], which showed that 91% of traumatized patients were men, over 20 years old, involved in automobile accidents, mainly riding motorcycles, which is also observed in the present study. The greater number of motorcyclists on the streets, combined with reckless behavior in traffic and greater speed on the roads, results in greater exposure to the risk of accidents. Since these traumas involve high kinetic energy, these patients commonly suffer severe fractures, requiring surgical

fixation and long periods of rehabilitation [10]. Therefore, more rigorous action by traffic inspection bodies is necessary, as well as constant awareness among drivers to reduce the occurrence of car accidents.

A relevant issue to be discussed is trauma in the elderly, since this age group was repeatedly observed in the rates obtained in the research in question. Trauma is frequently present in the population over 60 years of age [11]. Trochanteric, femoral neck or distal radius fractures, for example, are common in this population after low-energy trauma and are related to osteoporotic conditions [11] [12].

Trampling accidents, on the other hand, fall within the high-energy traumatic mechanisms that also affect the elderly population, as factors such as reduced mobility and loss of vision, inherent to aging, increase the chances of these types of urban accidents occurring in this age group. Furthermore, there are numerous morbidities in orthopedic trauma, both in the adult population, but especially among the elderly, some of these conditions even end up compromising their function in society, such as their social inclusion and economic participation [13].

There are numerous reasons why countries like Brazil, with low per capita income, present deficiencies in the provision of orthopedic trauma services. Most solutions involve a multisectoral approach aimed at existing weaknesses in the current health system.

Therefore, a policy of attention to this population is essential, whether through improvements in urban mobility rules, or through the implementation of measures to better serve the elderly, knowing the vulnerability that this age group has in urban areas or even through promotion of public measures aimed at preventing both high and low energy accidents.

Therefore, this study managed to expose the main points of vulnerability of victims of polytrauma and thus allows the development of protocols and preventive measures that ensure individualized, effective and efficient treatment.

5. Conclusions

After carrying out this epidemiological study, patterns and characteristics related to traumatic events were observed. The majority of trauma care involves young adults, many of whom are victims of traffic accidents, more specifically caused by falls from motorcycles. In the older population, most traumas occur due to falls from height to the ground, with women being the most affected.

In addition to causing damage to the patient's health, trauma generates enormous financial impacts within society. Hospital treatments for trauma patients are costly and time-consuming. And in relation to returning to work activities, traumatized patients are often unable or limited to carrying out specific activities, due to the consequences caused by the traumatic events suffered.

Thus, both the epidemiological study and the statistical analysis of traumatic events have clinical relevance in providing guidance on accident prevention. Furthermore, it serves as an aid tool to optimize medical care for patients, thus reducing trauma-related morbidity and mortality rates.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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