ORIGINAL ARTICLE

Profile of patients with traumatic injuries of the upper limb treated in a tertiary hospital

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ABSTRACT

The incidence of traumatic injuries of the upper limbs in a tertiary hospital has a wide variety. This is why the creation of a unified database becomes important-to know the patients' profile. **Objective:** This study sought to determine the profile of patients with traumatic injuries of the upper limbs, treated by Physical Therapy in Rehabilitation Center of the Clinics Hospital of Ribeirão Preto. **Method:** Two hundred and twenty-three patient records were evaluated (58 women and 116 men). They had an average age of 34.54 (± 19.05) years and were referred by the orthopedic clinic of this hospital. **Results:** Of the cases studied, wrist and hand injuries had the highest incidence (60.99%), followed by injuries of the shoulder (20.63%), elbow (12.55%), arm (3.59%) and forearm (2.24%). In injuries of wrist and hand, the trauma mechanism with the highest percentage was the motorcycle accident, associated with multiple handbone fractures. Falling down, motorcycle accidents, and falling off a ladder were the mechanisms of injury correlated with proximal humerus fractures, shoulder dislocations, and broken scapulas, respectively. **Conclusion:** The incidence of injury, trauma mechanism, and characteristics of the population was verified and further improvements in protocols for specific disorders and prevention can be made.

Keywords: Hand Injuries, Forearm Injuries, Arm Injuries, Rehabilitation Centers, Health Profile

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Financial Support: Foundation for Administrative Development of the State of São Paulo - PUNDAP.

Received on February 6, 2013.
Accepted on April 19, 2013.

DOI: 10.5935/0104-7795.20130003

INTRODUCTION

The upper limb is rich in details and functions and it can be divided into its main articulations: shoulder complex, elbow, forearm, wrist, and hand.[1] Due to the richness of components and functions of the upper limbs, many pathologies can interfere in its correct functioning. Among them we have rheumatic and neurological diseases, and orthopedic and traumatic dysfunctions.[2] The main and most numerous impairments are the traumatic, for in addition to interfering with the normal functioning, these alterations may cause pain, reduce mobility, induce muscle weakness, instability, and compensations,[2] and may cause permanent sequelae.

Databases are important allies in epidemiological studies.[3,4] According to Goldbaum,[5] databases are used in health studies, in epidemiological vigilance, in "causal" studies, and in the evaluation of services, programs, and technologies. But despite the modern and practical techniques for analysis, especially in computers and information technology, there is great disparity in their incorporation to health services.

This is why it is important to create a unified database, easily and quickly accessible, to know the patients' profiles in the service, the most common injuries, the trauma mechanisms, and the most impaired structures and articulations of the upper limb. This is necessary because, based on this data, specific protocols for prevalent dysfunctions may be improved, the physical space and work equipment may be better organized, the right number of necessary professionals can be present, in addition to investment in campaigns to prevent accidents.

OBJECTIVE

To trace the profile of patients with traumatic lesions in the upper limbs, treated by the Physiotherapy department at the *Centro de Reabilitação do Hospital das Clínicas de Ribeirão Preto (CER*) (Ribeirão Preto Clinics Hospital Rehabilitation Center).

METHOD

This was a transversal and descriptive study made through data survey. A specific physiotherapeutic evaluation sheet from the upper limb sector of the CER was used for the survey. Patients treated between April 2010 and April 2011 were selected, totaling 223 evaluation sheets. All the patients were referred by the Hand and Upper Limb Surgery Outpatient Clinic of the mentioned hospital and the evaluation sheets were filled in during the first visit.

Inclusion Criteria

The evaluation sheets of patients were included in the study if they had suffered traumatic injuries, of a physical nature, through external force to their organism and who were treated and had received a clean bill of health by April 2011. The evaluation sheets of patients who did not have the patient data, cause of trauma, and/or diagnostic hypothesis were excluded.

Thus, after establishing the criteria, we evaluated the histories of 223 patients with traumatic injuries(58 females and 116 males) and an average age of 34.54 (± 19.05) years. The variables analyzed in the traumatic injuries were: name, register, date of trauma, gender, age at the time of evaluation, profession, diagnostic hypothesis, treatment (conservative and/or surgical), dominant side, impaired side, nerve damage and impaired nerve, tendinous injury, impaired tendon and area of injury, arterial injury, and reason for trauma. A database was made in the Excel® program using this data.

RESULTS

From the total of cases included in the analysis (Table 1), 82.06% were submitted to surgical treatments, 16.14% received conservative treatments, and 1.8% received both types of treatment-that is, conservative at the beginning and surgical afterwards. The dominant side was injured in 47.98% of the individuals.

Nerve damage occurred in 26.46% of the individuals analyzed, while multiple injuries involving the ulnar, median, and radial nerves had greater incidence in 32.2% of the cases, with the remainder having only one nerve injured. Arterial injuries were present in 15.25% of the individuals and tendinous injuries in 26.46%. The most impaired tendons in this population were the wrist and finger flexor muscles with 59.32% incidence. Fractures occurred in 67.26% of the sample.

As for main occupation, the sample of cases treated that showed greater frequency were those classified as of technical level who dealt with tools, with 34.33%, such as cabinet makers, carpenters, mechanics, and stone masons, followed by minors and students with 20.17%. The females were classified as housewives, maids, or cleaning ladies and had a distribution of 19.74%. Other professionals had a lower frequency in the study. Wrist and hand injuries had the greatest incidence (60.99%), followed by shoulder (20.63%), elbow (12.55%), arm (3.59%), and forearm (2.24%).

Wrist and Hand

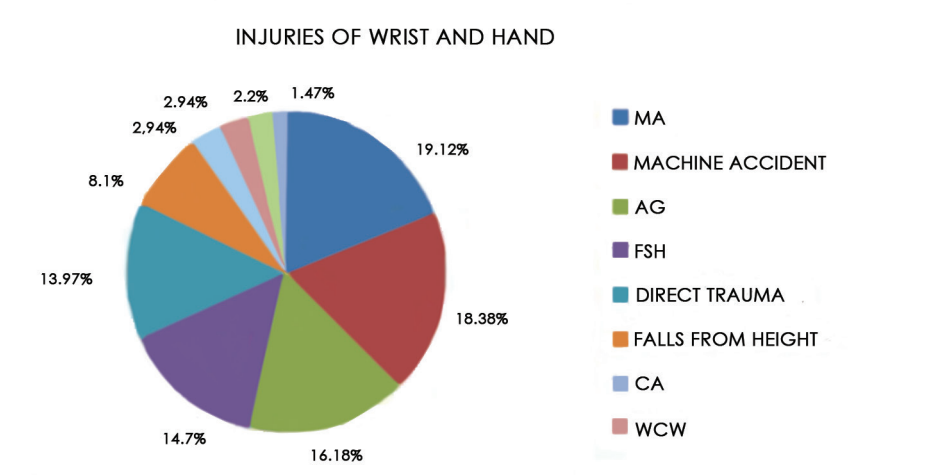
The most frequent causes of wrist and hand injuries were motorcycle accidents (19.12%), accidents with machines (18.2%), glass wounds (16.18%), falls from standing height (14.7%), direct trauma (13.97%), and falls from height (8.1%). Other reasons for trauma such as car accidents, wounds by cutting weapons, and being hit by a car showed a low incidence in this study (Figure 1). Among all the injuries caused by automobile accidents, 57.69% were related to polytraumas of the handbones, followed by distal radius fractures (23.07%), distal radius and ulna fractures (15.39%), and amputations and semi-amputations (3.85%). Injuries prevailing in this group included machine accidents, whose traumas were generated by laminating machines, grinders, sanders, presses, and saws with cut-contusion wounds in the dorsal region (44%), amputations (32%), and fractures of the hand bones (16%). In accidents with glass, the cut-contusion wounds in the volar region were prominent (59.09% of the cases) and related to the flexor tendon injuries. Falls from standing height were directly related to the incidence of radius distal fractures (63.64%) and with a higher average age: 61.45 years. The direct traumas included injuries that were labeled as such in the evaluation sheet as the cause of trauma. The fracture of hand bones had the highest incidence (68.42%). In contrast to motorcycle accidents, fractures caused by direct trauma were isolated, not injuring more than one structure in the hand complex. Finally, we have the falls from height with 63.64% of the distal radius fractures, 18.18% of associated radius and ulna fractures, and with the fractures of hand bones, amputations, and semi-amputations having equal percentages of 9.09%.

Forearm

Diaphysis forearm fractures include the radius and ulna fractures that occur separately (only one bone is afflicted) or associated (both bones are afflicted). Associated radius and ulna fractures correspond to 60% of the total. Playing soccer is responsible for 40% of

Table 1. Characterization of the sample

	Total	223	100%
Gender	Female	58	37.50%
	Male	116	62.50%
Treatment	Surgical	183	82.06%
	Conservative	36	16.14%
	Conservative/surgical	4	1.80%
Impaired side/dominant side	Right-handed/right-handed	100	44.84%
	Left-handed/left-handed	7	3.14%
	Right-handed/left-handed	5	2.24%
	Left-handed/Right-handed	101	45.30%
	Both sides impaired	10	4.48%
Nerve damage	Yes	59	26.46%
	No	164	73.54%
Arterial injury	Yes	34	15.25%
	No	189	84.75%
Tendinous injury	Yes	59	26.46%
	No	164	73.54%
Fractures	Yes	150	67.26%
	No	73	32.74%



MA: Motorcycle accident; machine accident; AG: Accident with glass; FSH: Falls from standing height; Direct trauma; falls from height; CA: Car accident; WCW: Wound by cutting weapon; Being hit by a car; Gate spear

Figure 1. Incidence of wrist and hand injuries

the causes of trauma for this group, followed by motorcycle accidents, bicycle accidents, and falls from standing height with 20% each (Figure 2).

Elbow

Grouped together were injuries that afflict the distal third of the humerus, and the proximal third of the radius and ulna, separately or associated. The main reasons for trauma were falls from height (28.57%), bicycle accidents (21.43%), motorcycle accidents (17.86%), and falls from standing height (10.72%) (Figure 3). Among the total of falls from height injuries, 50% were Monteggia type luxation-fractures, 37.5% were olecranon fracture, and 12.5% were radial head fracture. The average specific age for this population was 32.37 years. Bicycle accidents affected a lower average age, 9.66 years, when compared to the overall average of the population studied. The main injuries were supracondylar distal humerus fractures with 50%. Luxation-fractures, associated olecranon and radial head fractures, and condylar distal humerus fractures showed 16.67% each. As with bicycle accidents, motorcycle accidents also affected a lower average age, 14.8 years: in the evaluation of these individuals, they reported taking a ride on the vehicle at the time of the accident. The prevailing injuries in this group were supracondylar distal humerus fractures with 80% and epicondyle distal humerus fracture with 20%. Falls from standing height also followed a low average age pattern with 12.66 years. Noteworthy are the supracondylar distal humerus fractures with 66.67% of the cases and radial head fractures with 33.33%.

Arm

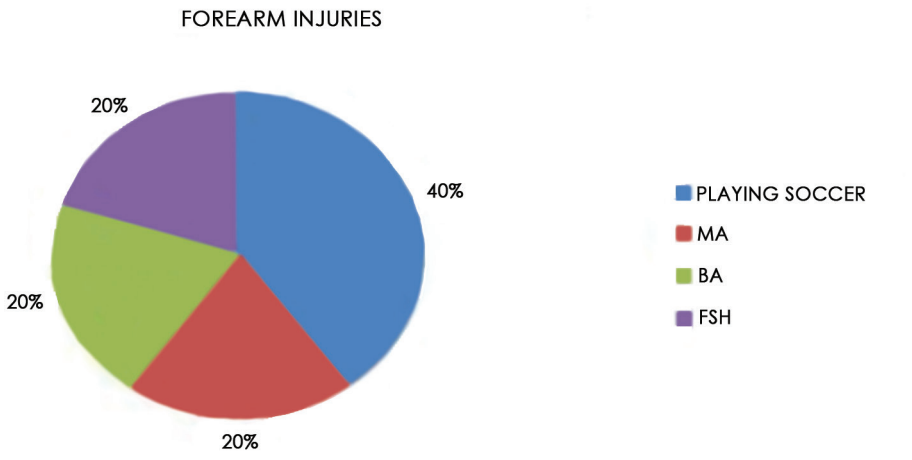
Diaphysis humerus fractures have two main causes: motorcycle accidents and physical aggression, with identical percentages, 25% each. The remainder is equally divided between car accidents, firearm wounds, falls from height, and falling on own arm with 12.5% each (Figure 4).

Shoulder

The most frequent causes for shoulder injuries were falls from standing height with 28.26%, motorcycle accidents with 23.91%, falls from stairs and direct trauma showed similar percentages, with 8.7% each. Other causes for trauma such as being hit by a car, falls from height, iatrogenesis, car accidents, physical aggression, and falls from bicycle showed low incidence in this study (Figure 5). Among the total injuries from falls from standing height, 38.46% were proximal humerus fractures (non specified), followed by shoulder luxation and greater tuberosity fracture with 23.08% each, while shoulder instabilities and rotator cuff injuries were 7.69% each. The specific average age of this population was 62.77 years. The most prevalent in motorcycle accidents were shoulder luxation (45.46%) and brachial plexus injury (27.27%). Falls from stairs was the third cause of trauma for traumatic shoulder injuries, especially the scapula fracture with 50% of the cases, followed by acromioclavicular luxation and rotator cuff injury with 25% each.

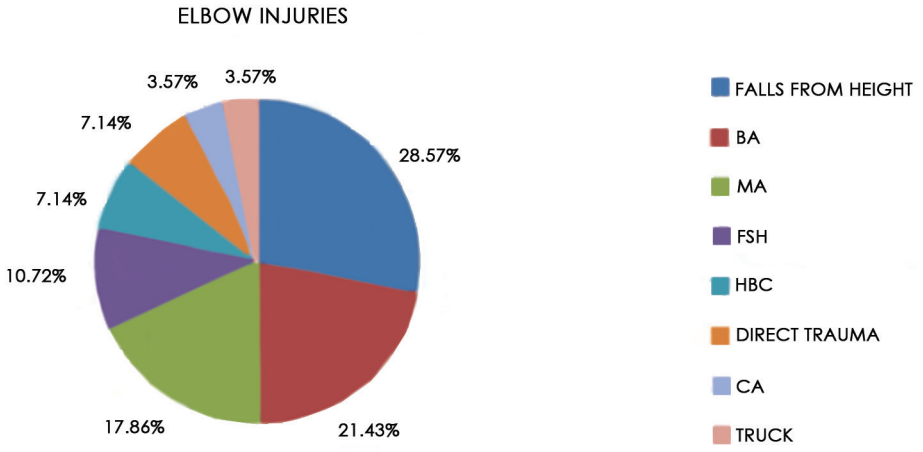
DISCUSSION

The present study demonstrated a strong predominance of males in the population, confirming other epidemiological studies



Soccer playing; MA: Motorcycle accident; BA: Bicycle accident; FSH: Falls from standing height

Figure 2. Incidence of forearm injuries



Falls from height; Bicycle accident; MA: Motorcycle accident; FSH: Falls from standing height; HBC: Hit by a car; direct trauma; CA: Car accident; Truck

Figure 3. Incidence of elbow injuries

on the upper limbs, which evaluated each articulation or pathologyseparately.[6] The sample had a high index of surgical treatment. This is possibly due to the level of complexity of the population treated at the Orthopedics/ Hand surgery Outpatient Clinic at the *Ribeirão Preto Clinics Hospital*, for the patients who were forwarded, evaluated, and treated at the Rehabilitation Center mostly come from this service.

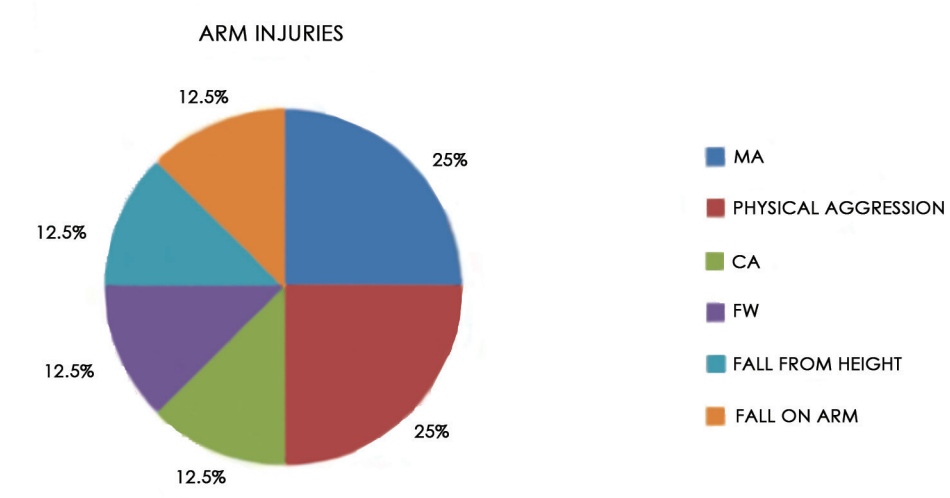
As for professional occupation, the technical level activity shows more incidence, including cabinet makers, carpenters, mechanics, masons, and blacksmiths. It is known that the individual is exposed to many situations of risk during work, especially those referring to the use of tools in their daily tasks. In concurrence with this study, Santos et al.[7] highlight that the most injured area in work accidents are the upper limbs with 42.1% of the total, and from those, 31.5% occurred in the hands and fingers.

Motorcycle accidents were present in significant percentages as causes of traumas in all the regions of the upper limb. Some studies place the upper limb as one of the main regions with injury index by motorcycle accident. Harms[8] describes the lower and the upper limbs as the most injured body regions prolonging hospitalization time and also causing permanent disabilities. As for localization, Haddad[9] verified that the dorsal region was the most injured (37.7%), followed by the lower limbs (23.4%), head and neck (20.8%), and upper limbs (16.9%). Of all the traumatic injuries, wrist and hand injuries predominated in this study (60.99%), when compared to other upper limb regions. Some studies compare hand injuries to other injuries in various regions, caused by trauma mechanisms. The hand shows significant percentages: according to Fonseca et al.,[7] 27.5% of all traumatic injuries, and according to Angermann & Lohmann,[10] hand and wrist represented 28.6%.

Motorcycle accidents were the trauma mechanism with the most incidence in the wrist and hand afflictions, with 19.12%. In a short review of the literature, an increase of motorcycle accidents is observed with injuries to this region over the decades. In 1985, Smith et al.[11] reported that the main causes for injury were: falls at home, at work, on the street, or being the victim of physical aggression, and only a few accidents were caused by industrial machines. In 1993, Angermann & Lohmann[10] highlighted domestic, leisure, and professional accidents as the main causes, with traffic accidents showing only 5%. In 2006, Fonseca et al.[6]showed that the most frequent causes for hand traumas were traffic accidents, with 17.5%. In 2010, Debieuxetal.[12] specified only motorcycle traumas where upper limbs had 41.1% of the total injuries, with the hand and wrist representing 15.9% of the total afflicted regions. This result was similar to what was found in this study.

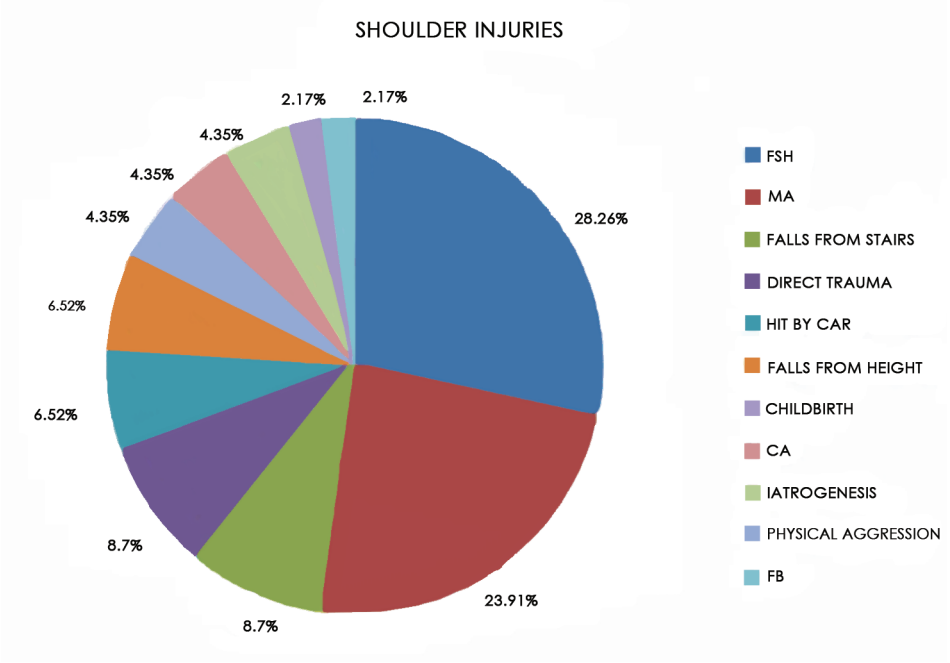
Accidents with machines followed in second place, especially the cut-contusion wound on the dorsal region. In specific studies of work accidents, the hands were the most injured body parts in accidents and with a greater number of injuries, 45.9%. The cut-contusion wound was the leader with 23.6% of the injuries.[13] Accidents with glass were related to the cut-contusion wounds to the volar region and to flexor tendons. Barbieri et al.[14] had already related cuts with glass to these injuries. Falls from standing height were related to age and to distal radius fracture. In 2007, Leite et al.[15] related distal radius fractures in youths with accidents of more energy, and in older individuals, with falls to the ground.

Considering the causes of shoulder injury traumas, falls from standing height had the most incidence, with a predominance of



MA: Motorcycle accident; Physical aggression; CA: Car accident; FW: Firearm wound; Falls from height; Falls on own arm

Figure 4. Incidence of arm injuries



FSH: Falls from standing height; MA: Motorcycle accident; Direct trauma; Falls from stairs; HBA: Hit by automobile; Falls from height; Childbirth; CA: Car accident; Iatrogenesis; Physical aggression; FB: Falls from bicycle

Figure 5. Incidence of shoulder injuries

proximal humerus fractures. In the study by Kristiansen & Christensen[16] they state that proximal humerus fractures result from low energy traumas and this fact was confirmed in 85% of the cases. This is probably due to the bone frailty of the humerus proximal third, characteristic of older patients. Thus, our study with an average age of 62.77 years is consonant with the literature when related to the predominance of this type of fracture.

Motorcycle accidents were second in relation to causes for shoulder traumas with emphasis on shoulder luxation and brachial plexus injuries. Shoulder luxation is easily explained by the typically high impact energy of motorcycle accidents. Nevertheless, brachial plexus injuries are described as typical in motorcycle accidents. Its mechanism reflects the great exposure of the driver at the moment of impact. Any subsequent paralysis may be reversible, but many cause severe or permanent disabilities.[17]

Falls from stairs was the third leading cause for shoulder injuries, with greater incidence of scapula fracture. In 2001, Barbieri et al.[18] reported that fractures of the scapula were relatively rare, accounting for no more than 5% of those of the shoulder girdle and 1% of all fractures. In that study, falls from height represented 11.7%, emphasizing the high-energy traumas for this type of fracture.

Taking into consideration the elbow injuries, the cause for trauma with the most prevalence were falls from height with predominance of the Monteggia type luxation-fracture of the elbow. According to Chicketal,[19] complex traumatic injuries of the proximal end of the forearm bones are the two main types, with the Monteggia luxation-fracture being the most common. This study, while agreeing with Checchia et al.[20] shows the prevalence of falling as a trauma mechanism. However, what stands out among the elbow injuries are the supracondylar humerus fractures. In this study, elbow trauma mechanisms such as bicycle accidents, motorcycle accidents, and falls from standing height show a population with an average age below the rest of the sample, which varies from 9.66 to 14.8 years. This fact correlates with studies that indicate that supracondylar humerus fractures correspond to 17% of childhood fractures, with the upper limb as the most frequent in children, totaling 60% of the occurrences.[21] It is strange that the average age of the victims of motorcycle accidents is below 18 years of age, which is the minimum legal age to obtain a license to drive a motorcycle, but when reporting the story, those victims reveal they were in the back seat. This fact occurred in the same way in a study by Koizumi.[17]

Diaphysis humeral fractures and forearm fractures had lower incidence. The diaphysis humeral fractures were caused by motorcycle accidents, physical aggression, car accidents, firearm wounds, falls from height, and falling on the arm. These mechanisms are also present in the study by Benegasetal.[22] showing the similarity of the trauma mechanisms for the diaphysis humeral fracture.

As for forearm fractures, the trauma mechanism was playing soccer. No articles that showed exactly this cause were found - however, the fracture can be related to the injury mechanism that may occur due to a fall on an open hand, or a direct blow to the region of the forearm, which is routine in sports.[23]

Among the limitations of this study is the absence of functional evaluation, which, in a future study, may allow a better view of the rehabilitation and sequelae acquired by those individuals.

The fact of the CER being classified as a tertiary service is noteworthy and, as a consequence, brings a concentration of the most complex cases of upper limb injuries. It is believed that a more general service would have cases of lower complexity.

CONCLUSION

In the sample analyzed, it was possible to trace the profile of the patients who had their upper limbs treated by physiotherapy. The majority of that population was made up of male adults, afflicted on their dominant side. The most commonly affected occupations were of a technical nature. Motorcycle accidents stood out as the leading trauma mechanism in all the articulations evaluated. The wrist and hand articulations were the most afflicted. In that way, the characteristics of that population were verified, so that in the future there might be an improvement to specific protocols of treatment and an investment in accident-prevention campaigns.

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