

# A profile of patients with lower limb trauma treated by the Hospital Metropolitano de Urgência e Emergência reconstructive surgery team

*Perfil de pacientes vítimas de trauma em membro inferior atendidos pela equipe de cirurgia reparadora do Hospital Metropolitano de Urgência e Emergência*

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## ABSTRACT

**Background:** In the area of medical emergency services, the incidence of trauma to the lower limbs is growing, and excessive damage may result in incapacity and physical disabilities. The aim of this study was to evaluate the epidemiological profile of patients with lower limb trauma who were treated by the reconstructive surgery team of Hospital Metropolitano de Urgência e Emergência. **Methods:** This prospective cohort study included patients with lower limb trauma who were under the care of the reconstructive surgery team. **Results:** The study mainly included young male road accident victims (primarily motorcycle) with dark complexions who were single and had not completed their elementary education. Ninety percent of the subjects had a paid occupation with a *per capita* mean monthly income of R\$290.76 [122.76 USD]. Sixty-five percent of these subjects were alcohol consumers and 35% were smokers. The majority of the patients came from interior areas of Pará. The most commonly sustained injuries were contused lacerated wounds of the leg with exposure of the underlying structures. The median length of time between the trauma occurrence and surgery was 32.5 days. The principal reasons for postponing surgery included delays in approval for patient assessment by the plastic surgery team and waiting for the wound condition to improve. Reconstruction with flaps was used in 65% of cases with or without grafts, with the most common procedure using reverse-flow sural flaps. A cutaneous graft alone was used in 35% of the patients. **Conclusions:** Young, low-income, motorcycle-riding males with poor education levels, dark complexions, and alcohol consuming and smoking habits are the most involved in accidents that cause injuries to the lower limbs and require surgical reconstruction.

**Keywords:** Plastic surgery. Lower extremity. Reconstructive surgical procedures. Surgical flaps. Wounds and injuries.

## RESUMO

**Introdução:** Nos serviços de urgências médicas, é crescente a incidência de lesões traumáticas de membros inferiores com perda de substância, que podem ocasionar deficiências e incapacitação física. O objetivo deste estudo foi avaliar o perfil epidemiológico das vítimas de trauma em membro inferior, atendidas pela equipe de cirurgia reparadora do Hospital Metropolitano de Urgência e Emergência. **Método:** Foi realizado um estudo de coorte prospectivo com pacientes que sofreram trauma de membro inferior e que se encontravam sob os cuidados da equipe de cirurgia reparadora. **Resultados:** A amostra foi majoritariamente composta por homens jovens, vítimas de acidente de trânsito (principalmente por motocicletas), pardos, solteiros e com ensino fundamental incompleto. Noventa por cento

This study was performed at the Hospital Metropolitano de Urgência e Emergência, Belém, PA, Brazil.

Submitted to SGP (Sistema de Gestão de Publicações/Manager Publications System) of RBCP (Revista Brasileira de Cirurgia Plástica/Brazilian Journal of Plastic Surgery).

Article received: March 9, 2013  
Article accepted: May 2, 2013

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dos pesquisados exerciam alguma atividade remunerada e apresentavam renda *per capita* mensal média de R\$ 290,76. Sessenta e cinco por cento dos pesquisados eram etilistas, dos quais 35% eram tabagistas. A maioria dos pacientes era proveniente do interior do Pará. As lesões mais comuns eram as lacerocontusas, localizadas na perna e com exposição de estruturas nobres. O tempo decorrido entre o trauma e a cirurgia apresentou mediana de 32,5 dias. Os principais motivos de retardar a cirurgia foram atrasos na solicitação para que a equipe da cirurgia plástica avaliasse o paciente e espera para melhorar as condições da ferida. Retalhos foram utilizados em 65% dos casos, acompanhados ou não de enxertos, sendo o mais frequente o sural de fluxo reverso. Em 35% dos pacientes, realizou-se enxerto cutâneo isoladamente. **Conclusões:** Homens jovens, de baixa renda, com pouca escolaridade, pardos, etilistas, tabagistas e usuários de motocicletas são os mais envolvidos em acidentes que ocasionam lesões em membros inferiores que necessitam de reparo cirúrgico.

**Descritores:** Cirurgia plástica. Extremidade inferior. Procedimentos cirúrgicos reconstrutivos. Retalhos cirúrgicos. Ferimentos e lesões.

## INTRODUCTION

In the area of medical emergency services, it is becoming increasingly more common to encounter patients with trauma to the lower limbs and excessive damage that may be accompanied by bone fractures<sup>1</sup>. When not fatal, these injuries frequently result in incapacity and temporary or permanent physical disability that can negatively interfere with quality of life<sup>2</sup>.

The aim of lower limb reconstruction is the surgical correction of defects and open wounds on a patient's leg to enable a patient to resume a normal life with the ability to walk and work, and avoid the need for amputation<sup>3</sup>.

This study aimed to establish an epidemiological profile of lower limb trauma victims treated at the Hospital Metropolitan de Urgência e Emergência (HMUE). Thereby, with a better understanding of the population profile involved, trauma-related risk factors can be identified, which can serve to prevent accidents.

## METHODS

All research participants were studied in accordance with principles of the Declaration of Helsinki and the Nuremberg Code with respect to the guidelines for conducting research involving humans of the National Health Council (Resolution 196/96). This followed project approval by the Núcleo de Pesquisa, Extensão e Pós-Graduação em Medicina [*Research, Extensions and Postgraduate Medical Unit*] of the Universidade do Estado do Pará, e do Comitê de Ética em Pesquisa [*Research Ethics Committee*] of Universidade do Estado do Pará.

All research subjects signed the free and informed consent form and completed a questionnaire.

This prospective cohort study was conducted between February and August 2012. The population studied was composed of 20 individuals of both sexes who were 15–65 years of age with deep wounds, exposure of the underlying structures and/or loss of cutaneous substance or extensive tissue destruction in at least one lower limb, and traumatic etiology, and who were admitted to the HMUE < 24 hours after the trauma.

Exclusion criteria were as follows: individuals who did not fulfill the above requirements, as well as those with a mental impairment, a dependency relation such as prisoners and the military, and those who did not correctly fill in the protocol data (e.g., did not complete the form).

Interviews were conducted to collect epidemiological data as well as information related to the experienced trauma and applied treatment.

Microsoft Excel 2010 was used to create the database, tables, and graphs, while Bioestat 5.0 was used to perform the statistical analyses.

## RESULTS

The mean age of the studied patients was 30.7 years. Most were male, and all had a dark complexion (Table 1). Half of these individuals were single and had not completed elementary education (Table 2 and Figure 1). With regard to religion, 55% were Catholic, 35% were evangelical, and 10% were atheist. The vast majority (90%) of the studied subjects had some form of paid occupation with or without an employment record book. The group's mean monthly income *per capita* was R\$ 290.76.

None of the researched subjects had comorbidities, such as arterial systemic hypertension, diabetes, or collagenosis.

The study verified the diets of the individuals and found that a large number of them consumed alcohol and/or tobacco (Figure 2).

There was a slight predominance of patients originating from rural areas of the state of Pará (55%) compared with Belém and metropolitan regions (45%). In half of the cases, the first instance of hospital care occurred at the HMUE. Automobile accidents represented the principal cause of trauma, with the majority involving motorcycles (Table 3).

A median time of 19 days was noted between hospital admittance and first evaluation by the plastic surgery team, while the median time taken between that evaluation and subsequent reconstructive surgery was 7 days. Overall, the median time between trauma and surgery was 32.5 days (Table 4). This delay in surgery was due to the delay of other specializations in requesting pre-plastic surgery evaluation as well as awaiting wound healing. It is worth noting that some cases involved more than one associated reason (Table 5).

The most common injury found was contusion laceration (90% of cases), followed by contused puncture (10%). Sixty percent of these injuries also had exposed underlying structures, such as bone or tendon. The leg was the most affected lower limb area in most of the cases (75%), principally in the middle third (40%) and distal third (45%) of the anterior surface.

Before surgical treatment was given, 90% of patients were administered antibiotic therapy. Among the performed surgical procedures, 35% were grafts and 65% were flaps with or without grafts, most being reverse sural fasciocutaneous flaps followed by anterior tibial fasciocutaneous flaps.

**DISCUSSION**

This epidemiological study demonstrated that trauma is more common in young males 15–44 years of age<sup>4</sup>. In a study conducted by MacKenzie et al.<sup>5</sup>, 71% of patients with lower limb trauma were 20–45 years of age and most were male, as seen in this study.

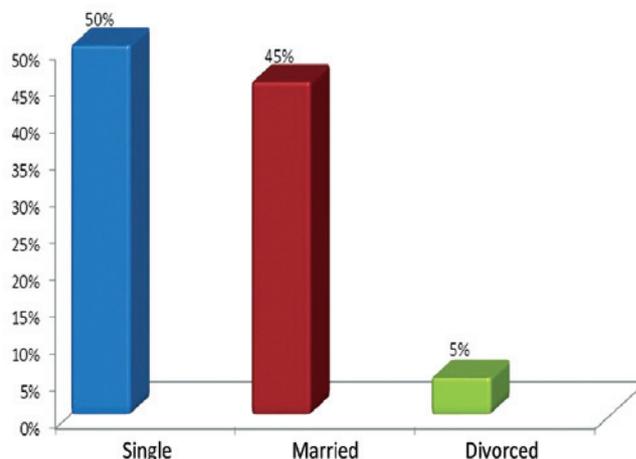
The predominance of young men is perhaps influenced by their general tendency to be more aggressive in traffic and

**Table 1** – Age and gender of the patients interviewed in the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

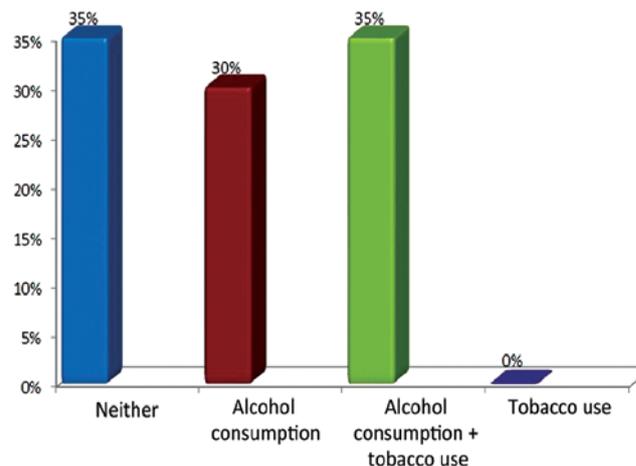
Characteristics	n = 20
Age (years)	
Mean ± standard deviation	30.7 ± 11.96
Median	29.5
Minimum to maximum	15–64
Gender, N (%)	
Feminine	4 (20)
Masculine	16 (80)

**Table 2** – Education data of patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

Schooling	n (%)
No education	—
Incomplete elementary education	10 (50)
Complete elementary education	3 (15)
Incomplete secondary school education	4 (20)
Complete secondary school education	1 (5)
Incomplete higher education	1 (5)
Complete higher education	1 (5)
Total	20 (100)



**Figure 1** – Marital status of patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.



**Figure 2** – Alcohol consumption and tobacco use habits of patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

**Table 3** – Causes of trauma in absolute numbers (n) and percentages (%) in the patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

Cause of trauma	n (%)
Traffic accident	
Automobile accident	—
Motorcycle accident	11 (55)
Run-over accidents	4 (20)
Aggression (firearms)	2 (10)
Fall	2 (10)
Crushed	1 (5)
Total	20 (100)

**Table 4** – Length of time from trauma to the first evaluation by the plastic surgery team and from the first evaluation to surgery in the patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

Length of time (days)	n
Trauma – Surgery	
Median	32.5
Minimum-maximum	14-247
Mean ± standard deviation	48.15 ± 55.66
Coefficient of variation	115.61
Trauma – first evaluation by the plastic surgery team	
Median	19
Minimum to maximum	5–246
Mean ± standard deviation	39 ± 57.92
Coefficient of variation	148.5
First evaluation by the plastic surgery team – Surgery	
Median	7
Minimum to maximum	1–27
Mean ± standard deviation	9.1 ± 6.84
Variation coefficient	75.2

**Table 5** – Reason for surgery delay in absolute numbers (n) and percentages (%) in the patients interviewed at the Hospital Metropolitano de Urgência e Emergência, February to August 2012.

Reason for surgery delay	n (%)
Infection	5 (25)
To improve wound condition	13 (65)
To improve general condition	3 (15)
Delayed requisition by another specialty	13 (65)

characteristics such as impulsiveness, immaturity, a desire for intense feelings, limited driving experience, motivation, peer pressure, and delinquent behavior<sup>6</sup>.

As in the study conducted in Piauí in 2008, this study had a dominance of patients with incomplete elementary and secondary education who had a low monthly *per capita* income less than the minimum salary<sup>6</sup>. It is possible that many of these casualties are workers who use their vehicles in the rural properties where they work and since these motorcycles are not licensed, they have had no particular maintenance and have not been through any standard control checks by official bodies<sup>6</sup>. It is also worth noting that Pará still has a significant number of poorly educated people who do not have a perfect knowledge of road signs.

The majority of individuals treated by the department were single, which contributed to the fact that the majority of victims were young. This particular group tends to have strong emotions, and be novelty seeking and more likely to risk their well-being to achieve these things<sup>6</sup>. With regard to the studied habits of the subjects, especially that of tobaccoism, the Ministry of Health<sup>7</sup> in 2011 released details of smoking prevalence by Brazilian city. While there was a national prevalence of 7.8–22.6%, Belém had a percentage of 12.5%. This study's sample had a higher percentage, which was similar to that observed by Mackenzie et al.<sup>5</sup>, who reported that 37% of patients with lower limb traumas were smokers.

There are more than 4,000 chemical agents present in cigarettes. Among them, nicotine and carbon monoxide are the most significant in terms of negatively affecting wound healing<sup>8</sup>. The majority of institutions recommend smoking cessation 4 weeks prior to surgery and lasting until 4 weeks after surgery<sup>8</sup>. None of our patients who were smokers used cigarettes during the course of hospitalization.

A large proportion of our study population used alcohol; however, there are no data on whether these patients were under its effect at the time of their accidents. Alcohol use is commonly associated with motor vehicle accidents and has wide cultural acceptance and easy access. In addition to behavioral changes, alcohol can cause psychomotor retardation as well as loss of concentration, thought, attention, and judgment<sup>9</sup>. It is worth emphasizing that, in accordance with the traffic code, driving under the influence of alcohol is a severe violation that carries charges, the possible suspension of one's license, and even imprisonment in some cases. In terms of educational action, advertisements are being produced that show the social repercussions of traffic accidents caused by alcohol consumption<sup>6</sup>.

With regard to injury type, this study determined that the most common injury is contusion laceration. The result corroborates the findings of Koizumi<sup>10</sup>, which demonstrated that the most common lesions of the lower limbs were lacerations, contusions, excoriations, and contused wound

injuries. However, there are no current studies available for further comparison.

There were no data in the literature on the specific regions of trauma in the lower limbs, which prevented a comparison of our results and those of other studies. An exception was the division of the leg into three parts, in which the most affected area was the middle third, followed by the distal and proximal thirds<sup>1</sup>. This study showed that the distal and middle thirds are affected at almost equal frequencies.

The majority of our patients had exposed bones and/or tendons, which posed a risk for complications such as osteomyelitis, osteonecrosis, and sepsis. It is worth emphasizing that exposed tendons can become necrotic and dry, while exposed blood vessels are at risk of rupture<sup>3</sup>.

The literature shows that motorcycle accidents constitute the most frequent accident and are identified as the cause of trauma in 27–86% of cases<sup>1,4,11</sup>. However, in terms of lower limb trauma specifically, the principal cause is car accidents, with a recorded incidence of 27–52%<sup>5,12</sup>. One can associate the great number of accidents involving motorcycles to its huge popularity by virtue of the cost/benefit ratio<sup>6</sup>.

The interval identified by this research between trauma and surgery is considered high compared to that in numerous studies supporting early reconstruction despite the fact that the definition of “early” can be extremely variable<sup>13-15</sup>. In 1986, Godina<sup>13</sup> confirmed that the microsurgical reconstruction of lower limb complex injuries must be undertaken during the first 72 hours. Yet Byrd et al.<sup>15</sup> reported that the complication rate was lower in surgery performed during the first week compared to that in surgeries performed after the first week. Conversely, in 2005, Kneser et al.<sup>16</sup> obtained better results for the viability of flaps conducted 7–15 days after trauma. Other authors believe that complete serial debridement is more important than the time taken to cover the wound<sup>17</sup>.

In contrast with this study, in 2008, Karanas et al.<sup>14</sup> reported that the delays in surgery were due to the presence of other associated injuries (71%), the transfer of patients to other hospitals (36%), and the limited availability of theaters and trained teams. In terms of wound condition improvement, findings in the literature are in accordance with the fact that one must await local improvement by performing debridement and applying dressings, and definitive surgery may proceed only after the appropriate clinical and local conditions are achieved<sup>1</sup>.

This study reported that the vast majority of patients also received prior antibiotic therapy. Those who did not, were generally readmitted electively. The lack of physiological wound healing can be intimately related to the presence of infection, which tends to prolong healing time. This apparently inhibits collagen production by fibroblasts<sup>18</sup>. Therefore, the conduction of prior antibiotic therapy in the case of infection is justified with the aim of promoting an improved surgical response.

This study’s findings agree with those in the study by Parrett et al.<sup>19</sup>, who reported that the majority (56.6%) of surgical procedures involved flap reconstruction. However, in 2010, Milcheski et al.<sup>20</sup> showed a predominance of graft reconstruction (85.7%) in severe wounds only.

The series of cases researched in this study was small due to its inclusion and exclusion criteria as well as the time taken for data collection, which could have interfered with the definition of a more realistic epidemiological profile.

## CONCLUSIONS

Young motorcycle-riding men with low income levels, poor education, and dark complexions, who are alcohol and tobacco consumers are the most commonly involved in accidents causing injuries to the lower limbs requiring surgical repair.

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