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VICTIMS OF CRANIO-ENCEPHALIC TRAUMATISM: EPIDEMIOLOGICAL PROFILE IN A UNIT OF INTENSIVE THERAPY

VÍTIMAS DE TRAUMATISMO CRANIOENCEFÁLICO: PERFIL EPIDEMIOLÓGICO EM UMA UNIDADE DE TERAPIA INTENSIVA

VÍCTIMAS DE TRAUMATISMO CRANEOENCEFÁLICO: PERFIL EPIDEMIOLÓGICO EN UNA UNIDAD DE TERAPIA INTENSIVA

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ABSTRACT

Objective: to know the epidemiological profile of hospitalized patients with traumatic brain injury. **Method:** this is a descriptive, cross-sectional, retrospective study with a quantitative approach, carried out with the medical records of patients suffering from traumatic brain injury who had hospitalized in the Santa Casa de Misericórdia ICU. The data were tabulated in Excel and processed in the Epi Info program, version 3.5.1. Then, it was discussed in the literature. **Results:** most of them were male victims (94%), victims of traffic accidents (74.7%), 41.8% died, causing a very high cost to the State. As the average length of stay in the ICU was 4 to 7 days (39.3%). Regarding the occurrence of complications (30.1%) were victims of complications, of which the most frequent was pneumonia (56%). The outcome of the patients was (61.4%) hospital discharge. **Conclusion:** it is possible to define the profile of traumatic brain injury patients and based on this reality, to invest in educational campaigns aimed at traffic. **Descriptors:** Epidemiology; Craniocerebral Trauma; Intensive Care Units.

RESUMO

Objetivo: conhecer o perfil epidemiológico dos pacientes internados com Traumatismo Cranioencefálico. **Método:** estudo descritivo, transversal, retrospectivo, com abordagem quantitativa, realizado com os prontuários de pacientes vítimas de Traumatismo Cranioencefálico que estiveram internados na UTI da Santa Casa de Misericórdia. Os dados foram tabulados no Excel e processados no programa Epi Info, versão 3.5.1.; em seguida, discutidos com a literatura. **Resultados:** mostraram que a maioria são vítimas do sexo masculino (94%), vítimas de acidente de trânsito (74,7%), em que 41,8% evoluíram com óbito, ocasionando, assim, um custo muito elevado ao Estado. O tempo médio de permanência na UTI foi de 4 a 7 dias em (39,3%). Em relação à ocorrência de complicações, 30,1% dos pacientes foram vítimas de complicações, sendo que destas a mais frequente foi pneumonia, com 56%. O desfecho dos pacientes foi em 61,4% alta hospitalar. **Conclusão:** pode-se definir o perfil dos pacientes, vítimas de traumatismo cranioencefálico, e baseado nessa realidade investir em campanhas educativas voltadas para o trânsito. **Descritores:** Epidemiologia; Trauma Craniocerebral; Unidades de Terapia Intensiva.

RESUMEN

Objetivo: conocer el perfil epidemiológico de los pacientes internados con Traumatismo Cráneo Encefálico. **Método:** estudio descriptivo, transversal, retrospectivo, con enfoque cuantitativo, realizado con los prontuarios de pacientes víctimas de Traumatismo Craneoencefálico que estuvieron internados en la UTI de Santa Casa de Misericórdia. Los datos fueron tabulados en Excel y procesados en el programa Epi Info, versión 3.5.1., en seguida, discutidos con la literatura. **Resultados:** mostraron que la mayoría son víctimas del sexo masculino (94%), víctimas de accidente de tránsito (74,7%), de donde de este 41,8% fueron óbito, ocasionando un costo muy elevado al Estado. Como tiempo medio de permanencia en la UTI fue de 4 a 7 días (39,3%). En relación a la ocurrencia de complicaciones (30,1%) de los pacientes fueron víctimas de complicaciones, siendo que de estos las más frecuentes fue neumonía con (56%,). El desfecho de los pacientes fue en (61,4%) alta hospitalaria. **Conclusión:** se puede definir el perfil de los pacientes víctimas de traumatismo cráneo encefálico y basado en esa realidad invertir en campañas educativas dirigidas para el tránsito. **Descriptores:** Epidemiología; Traumatismos Craneocerebrales; Unidades de Cuidados Intensivos.

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INTRODUCTION

Trauma is considered a serious public health problem because it affects people in the productive age group, also contributing to the increase of morbidity and mortality in Brazil.¹ It is the main cause of death in people between 1 and 44 years old. Traumatic brain injury (TBI) is the main determinant of morbidity, disability, and mortality within this group. Severe head injury is associated with a mortality rate of 30% to 70%, and recovery of survivors is marked by severe neurological sequels and a poor quality of life.²

Traumatic brain injury is conceptualized as an injury to the skull or brain that is severe enough to interfere with normal functioning. This trauma represents a risk of death, or it results in physical and psychological dysfunction for the patient, changing not only his life, but also his family, the health system, and society.³

The overall incidence of traumatic brain injury in the United States was estimated at 538.2 per inhabitant, or about 100,000 new cases in 2003, slightly lower rates are reported in Europe (253 per 100,000) and Australia (322 per 100,000).¹

The TBI represents the disease most treated by neurosurgeons and the largest cause of hospitalizations in the Intensive Care Unit (ICU). It is a problem aggravated by the fact that it reaches the majority young individuals of productive age, leading to high costs for the society. The TBI is one of the most devastating and lethal catastrophes of humanity, with the highest incidence in the age group of 15 to 24 years old and occurring twice more in men than in women.⁴

Traumatic brain injury (TBI) is frequent Among injuries due to external causes, most of them are caused by automobile accidents, road accidents, cycling accidents, physical aggressions, falls, firearm injuries, among other less frequent causes.⁵

Currently, patients with severe TBI are being treated in the ICU, due to the human and technological resources found in this sector. It is important to emphasize that neurological diseases have a slow recovery process, requiring prolonged hospitalization and subjected to complications.^{3,5}

In Brazil, SUS expenditures due to hospitalization for TBI patients from 2001 to 2005 were approximately R\$ 58 million in the Southeast, R\$ 22 million in the Northeast, R\$ 10 million in the Center-west region and R\$ 12 million in the southern region and R\$ 2 million in the northern region.²

The experience as a professional in an Intensive Care Unit shows that there are many people hospitalized with traumatic brain injury, with a significant representation of young patients, who are in the productive stages of life, going through a long period in this service, presenting trauma complications, as well as the whole family dynamics compromised.

Considering also the fact that it is a public health problem, where the profile of these victims is known, public health policies can be worked out to prevent the occurrences and the economic impact that this generates for the State through the high chastity to the Single System (SUS) and the social security system.

Faced with the interest in the facts exposed, a study was carried out to identify the epidemiological profile of patients hospitalized with Traumatic Brain Injury in an Intensive Care Unit.

METHOD

This is a retrospective descriptive, cross-sectional study with quantitative approach. The use of this approach is indicated in descriptive procedures, where the objective is to discover and classify the relationship between variables, as in cases where we want to determine causal relationships between phenomena.⁶

The research was carried out at Santa Casa de Misericórdia de Sobral in Ceará (SCMS), a teaching hospital belonging to the Brotherhood of Santa Casa de Misericórdia, considered as a non-profit, charitable and philanthropic entity.

In its demographic reach, Sobral covers the demand of 75 cities with around 1,750,000 inhabitants being a Reference Center in trauma for the whole region of the State⁷, with nine beds of ICUs for adults.

It was used as inclusion criteria to confirm the diagnosis of TBI and to have been admitted to the Service Therapy Unit from July 2013 to June 2014. The exclusion criteria were those that were incomplete, and those who underwent a new surgical procedure where a new medical record was opened, it being impossible to find, once, that the enrollment available in the admission book was the one that was registered in the initial medical record.

There were 104 records found. Of them, 21 were excluded because they did not meet the exclusion criteria.

Data collection was guided by a structured script, built based on the information

available in the hospital chart. The following variables were used in the study: age, gender, origin, education, family income, marital status, hospitalization time, alcohol use, type of accident, cause and type of TBI, use of mechanical ventilation, ICU stay, the outcome of the case, hospitalization costs.

The data were tabulated in Excel and processed in the Epi Info program, version 3.5.1. Being discussed according to the literature.

Given that the research subjects are human beings, we will obey the provisions of Resolution 466/12 of the National Commission for Research Ethics of the National Health Council of the Ministry of Health⁸.

The project was sent to the Department of Education and Research of Santa Casa de Misericórdia de Sobral, after its authorization was registered in the Brazil platform, with subsequent evaluation and approval by the Ethics Committee of the School of Public Health of Ceará, with the release of the Opinion Approved #946,443 of February 5, 2015.

RESULTS

In the period, 388 people were hospitalized in the adult ICU of the Santa Casa de Misericórdia, 83 of them had a diagnosis of traumatic brain injury. Showing an incidence of 26.8% of this cause of hospitalization.

We observed that 94% of the patients are male. The age group up to 29 years old stood out with 48.2%. Regarding the Regional of Health, most belong to Tianguá with 36.1%, followed by Sobral with 31.3%. As for the place where they lived, 57.8% live in the urban area. (Table 01)

As for the cause of the trauma, the three main reasons were motorcycle accident with 63.9%, 10.8% of a car accident, followed by 13.3% who fell victims. Dividing by injury, it was observed that 80.7% of the patients were victims of traffic accidents, 13.3% of falls and 6% of violence. (Table 01)

The use of helmets or not by motorcycle accident victims was recorded in only 26.4% (14) of the medical records, of which only one was using safety equipment. Regarding the presence of alcohol use, 32.1% (17) of the records showed the information on the subject, where 70.6% (12) showed signs of intoxication.

Regarding the classification of TBI, using the Glasgow Coma Scale at the time of admission, almost half, 48.2% were severe, as they presented 8 to 3 points on this scale. Regarding the treatment performed 51.8% was

a conservative treatment, and 48.2% the treatment was surgical. (Table 1)

Variables such as color, education, family income were excluded from the survey because there was not informed in the medical records and few medical records contained the information of the presence of helmet and alcohol use.

Table 1. Distribution of the number of patients, according to age, gender, Ceres, zone, causes of trauma, classification of TBI, type of treatment performed. Sobral (CE), Brazil, 2014.

Variables	n	%
Age group		
Younger than 18 years old	12	14.5%
18 to 19 years old	5	6.0%
20 to 29 years old	23	27.7%
30 to 39 years old	20	24.1%
40 to 49 years old	12	4.5%
50 to 59 years old	6	7.2%
Older than 60 years old	5	6.0%
Gender		
Male	78	94%
Female	5	6.0%
Ceres		
Fortaleza	1	1.2%
Sobral	26	31.3%
Acaraú	9	10.8%
Tianguá	30	36.1%
Camocim	1	1.2%
Crateús	15	18.1%
Other State	1	1.2%
Zone		
Urban	48	57.8%
Rural	35	42.2%
Causes of trauma		
Car accident	9	10.8%
Motorcycle accident	53	63.9%
Bike accident	2	2.4%
Running over	3	3.6%
Firearm fire damage	3	3.6%
Fall	11	13.3%
Beating	2	2.4%
Classification of TBI		
Mild	6	7.2%
Moderate	21	25.3%
Severe	40	48.2%
Without information	16	19.3%
Type of treatment		
Conservative	43	51.8%
Surgical	40	48.2%

Regarding the length of stay in the emergency block waiting for a vacancy in the ICU, 80.7% were from 1 to 3 days, only 2.4% was more than seven days. In the ICU, the distribution time was more homogeneous: 7.2% less than 24 hours, 27.2% from 1 to 3 days, 32.5% from 4 to 7 days, 32.5% more than seven days. (Table 2).

Of the patients that participated in the study, 92.8% did mechanical ventilation, with a stay of 1 to 3 days in 16.9%, 4 to 7 days in 39.3%, with more than seven days in 36, 1% of respondents. (Table 2)

Regarding the occurrence of complications, 30.1% of the patients were victims of complications, of which the most frequent

were pneumonia with 56%, sepsis 37% and acute renal failure with 12%. The outcome of the patients in 61.4% was hospital discharge, and 38.6% was death. (Table 2)

Regarding the cost of hospitalization patients, 12% of the patients surveyed were spent up to 5 thousand reais, 29% were 5 to 10 thousand reais, 34.9% were 10 to 15 thousand reais, 20.5% was spent more of 15 thousand reais and 6% of the analyzed medical records, did not have this information. (Table 2)

Table 2. Distribution of the number of patients, when using mechanical ventilation, and duration of mechanical ventilation, complications, main complications, the outcome of the case, the cost of ICU hospitalizations. Sobral (CE), Brazil, 2014.

Variables	n	%
Made use of mechanical ventilation		
Yes	77	92.8%
No	6	7.2%
Length of stay on mechanical ventilation		
The days	6	7.2%
1 to 3 days	14	16.9%
4 to 7 days	33	39.8%
More than seven days	30	36.1%
Length of stay in ICU		
Less than 24 h	6	7.2%
1 to 3 days	23	27.7%
4 to 7 days	27	32.5%
More than seven days	27	32.5%
Complications Occurrence		
Yes	25	30.1%
No	58	69.9%
Complications occurred		
Pneumonia	14	56%
Sepsis	8	37%
WILL	3	12%
Outcome of the case		
High	51	61.4%
Death	32	38.6%
Costs of Hospitalizations		
Up to 5 thousand	10	12%
From 5 to 10 thousand	29	29%
10 to 15 thousand	22	34.9%
More than 15 thousand	17	20.5%
No information	5	6%

When relating the age of the victims and the cause of the TBI, it was observed that in all age groups the highest proportion is in traffic accidents. Violence is prevalent in the 20-29 age group. All admissions in the age group of 30 to 39 years old were due to a traffic accident, as well as in cases over 60 years old. (Table 3)

Table 3. Distribution regarding the age group x the type of trauma in patients hospitalized in the ICU. Sobral (CE), Brazil, 2014.

fx_age	Acd trans	Violence	Fall	Total
< 18 years old	8	0	4	12
Line %	66.7	0.0	33.3	100.0
Col %	11.9	0.0	36.4	14.5
18 to 19	4	1	0	5
Line %	80.0	20.0	0.0	100.0
Col %	6.0	20.0	0.0	6.0
20 to 29	17	3	3	23
Line %	73.9	13.0	13.0	100.0
Col %	25.4	60.0	27.3	27.7
30 to 39	20	0	0	20
Line %	100.0	0.0	0.0	100.0
Col %	29.9	0.0	0.0	24.1
40 to 49	9	0	3	12
Line %	75.0	0.0	25.0	100.0
Col %	13.4	0.0	7.3	14.5
50 to 59	4	1	1	6
Line %	66.7	16.7	16.7	100.0
Col %	6.0	20.0	9.1	7.2
≥60 years old	5	0	0	5
Line %	100.0	0.0	0.0	100.0
Col %	7.5	0.0	0.0	6.0
TOTAL	67	5	11	83
Line %	80.7	6.0	13.3	100.0
Col %	100.0	100.0	100.0	100.0

At the intersection of Glasgow with the cause of the TBI, it was verified that 53.7% of hospitalized patients' victims of traffic accident had Glasgow <8, showing the severity of the accidents of transits. Only 6% of traffic accidents were considered mild TBI and later evolved with neurological complications. The 45.5% falls at admission were classified as moderate TBI.

Inpatients victims of violence 60% of them stayed between 7 to 14 days in the ICU, showing the severity of the aggression.

Of the hospitalized patients, 41.8% of those who were victims of a traffic accident had death, showing the severity of the aggression, when the causes were falls and violence 72.7% and 80.0%, respectively, evolved with hospital discharge, showing a more satisfactory result.

DISCUSSION

It was evidenced in this research how traumatic brain injury reaches the population in the young adult age group, 51.8% were between 20 to 39 years old, people who are in an active life period. Corroborating with the study, a study carried out in Teresina showed a prevalence in the number of traumatic brain injury, in the range of 21 to 40 years old, approximately 50% of hospitalized for TBI.⁹

Trauma is the leading cause of death in the first four decades of life and represents a huge and growing challenge to the country in social and economic terms².

Regarding the gender variable, there was a significant male predominance, 94%, and it could be related to the lifestyle where it is

most exposed to the risk factors for the traumas, acting more recklessly.

In similar surveys conducted, data show that men are compromised with traumatic brain injury, two or three times more frequent than women.²

An expressive number of patients are from CERES Tianguá, located in the Serra da Ibiapaba, where it may be related to the lack of existing surveillance, as well as being a region with dangerous roads. Following the Sobral region, the urban area was the one with the highest prevalence of people who were victims of TBI, because they are places with larger numbers of inhabitants, with more vehicles and because it is the region closest to the study hospital.

Due to the large number of people living in the city, there are consequently many vehicles circulating, leading to the conclusion that there is more exposure to the risk factors for accidents.¹⁰

In this survey, the main cause of the traumas were motorcycle accidents, 63.9% and third, car accidents, 10.8%, so traffic accidents are a serious public health problem, where many motorcyclists do not use helmets and drive drunk increasing the risk of accidents. It is also emphasized that in the interior there are many motorcycles circulating in the cities, as a result of being cheap and fast transportation and also the fact that there is no effective supervision. An important fact is that 41.8% of hospitalized victims of traffic accidents had a death outcome, showing the severity of the aggression.

A previous research⁹ shows that traffic accidents were the main cause of TBI. Particularly noteworthy are the motorcycle accidents, which stand out regarding quantity, regardless of the gravity of the TBI, occupying the always the first place.

The number of motorcycle accidents is still quite high, and a fact that still draws attention is that most victims do not use protective gear required as the helmet. There are some characteristics related to this population, such as immaturity, feelings of omnipotence, which may be exacerbated by using alcohol and drugs associated with driving, as well as by speeding, reckless maneuvers and non-use of safety equipment.²

Another study also carried out in Sobral observed that the accidents involving motorcycles are increasing. It was also notable the number of accidents involving irregularities such as the non-use of safety equipment, for example, helmet, and the ingestion of alcoholic beverage.¹¹

The Glasgow coma scale is a variable used to evaluate the severity of the trauma, where the values are from 0 to 15. A significant number of patients were identified who did not have this record in the medical record, severe 48.2%, corroborating with these data shows a research in which 40.8% TBI are considered serious, according to Glasgow Coma Scale scores after admission of the patient to the emergency department.¹²

The TBI lethality is related to the initial ECG score, the lower the score, the greater the probability of the occurrence of death. The higher death rates for patients diagnosed with severe TBI was observed in this study.⁹

The treatment indicated that 48.2% was surgical, which highlights the severity of the trauma, as well as the cost increase with the surgical treatment since the costs of neurosurgery are quite high.

In a study performed at the same service, 45.7% of the patients were submitted to neurosurgical intervention, which classifies TBI as a very frequent neurosurgical urgency in our daily lives. From these data, it is well known that the superiority of surgical treatments weighs heavily on the public health budget since the recovery of such patients is more time consuming, requiring more intensive care and specialized monitoring.⁹

Regarding the time of permanence in the emergency block, 2.4% were more than 7 days, and it should be noted that in this sector there are beds intended for severe patients and they are mechanically ventilated, and

many of the patients surveyed were in the emergency room in a bed with conditions similar to ICU for an extended period, awaiting transfer to the ICU.

Patients who require an ICU bed are serious patients, and most of them require mechanical ventilation. In this study, 92.8% needed ventilation, and when they arrived at the service, they were already patients identified as severe TBI and while others after surgical procedures or due to instability presented progressed to mechanical ventilation.

Most neurological patients who are in ICU beds require mechanical ventilation. However, as early as possible the weaning of mechanical ventilation fewer complications the patient will have. In the study a portion of 36.1% remained more than seven days in mechanical ventilation, being in agreement with similar studies carried out. As shown in studies with patients with TBI, the mean time in which patients remained under mechanical ventilation was 8.45 days. Another survey conducted in general ICU shows that 75 (35.7%) had ventilation $\geq$ seven days. The average number of days was 9.3 ± 14.3 days.¹³

Patients with severe TBI (ECG <8) require intubation and mechanical ventilation to maintain arterial PO₂ above 80 mmHg and arterial PCO₂ around 34 to 38 mmHg.³ A long hospital stay is related to the patient's chance of presenting larger in this study, the prevalence was of patients with a time greater than 7 days, where this is related to the period of mechanical ventilation, with the severity of the trauma, since those patients who stayed less than 24 hours were related to the deaths.

A study¹³ reveals that the average length of stay of patients in Brazilian ICUs, reported by the 2nd Brazilian ICU Census is from one to six days, and in a systematic review of the literature, the mean was 5.3 ± 2 , six days of hospitalization in international ICUs. However, with the continued improvement of new technologies, the seriously ill patient is maintained for an extended period in these units, even when death is inevitable. It should be noted that these studies are carried out in a mixed population, and this research was directed to the TBI, a pathology in which it requires a prolonged period of rehabilitation.

The long hospitalization periods have a high impact on the health system: they prevent bed occupancy by new patients and congestion prompt care, among other difficulties.¹⁴

Patients who are hospitalized in the ICU usually present clinical complications, and a study¹ shows the most common intercurrents found, such as pneumonia, followed by sepsis and acute renal failure.

The lethality of TBI patients is considered high compared to other pathologies and even with other traumas, where 38.6% of patients with TBI in the research died. Corroborating with our findings, a survey¹⁵ showed that the overall mortality rate was high (40%).

The costs that a victim of TBI causes to the public coffers are very high, for several reasons such as needing to occupy an ICU bed, a high-tech service and a multidisciplinary team, a high permanence that in many cases there is the need for a surgical intervention, due to clinical complications, and by a person who had been inactive for a long time, where 34.9% of hospitalized patients had treatment costs of 10 to 15 thousand Reais.

It is stated that TBI is the fifth highest cost of injuries, being smaller than multiple trauma, hip, abdomen, and upper limb. However, the impact of TBI is high due to the high prevalence. In 2012, the total amount spent by SUS for external causes was greater than 1 billion reais in 998,994 admissions, and an average hospitalization of R\$ 1,079.60, an average of 5.3 days, and a mortality rate of 2.48%.⁹

CONCLUSION

Most patients with TBI were male, with a predominance of 18 to 29 years old, living in the urban area, being the cause of the trauma the traffic accidents, especially motorcycle accidents, and during admission it was configured as a severe TBI, a significant portion underwent neurosurgery, requiring mechanical ventilation. Patients suffering from traffic accidents had a high mortality rate.

From the identified profile, it was found that TBI is a serious public health problem that affects productive people, seriously compromising the quality of life and reduced survival. It is necessary to intensify educational campaigns on traffic, as well as monitoring, especially in regions where traffic accidents have been more common and ensuring that all citizens have high-quality public roads.

A limitation of the research was variables such as education, and family income were not included in the medical records, color, and marital status were filled as brown, and singles, generating uncertainty in the legitimacy of information, besides important

data about the patient as a scale Glasgow coma, helmet use at the time of the accident and presence of alcohol, did not include this information in many medical records, making it necessary to question why important information about the patient is not recorded.

It is emphasized the importance in professional practice of registering any information and procedure performed to the patient, as it facilitates the conduct of research, directs the assistance provided, as well as if the victim needs this documentation he has access.

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