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CLINICAL-EPIDEMIOLOGICAL PROFILE OF INDIVIDUALS WITH TRAUMATIC BRAIN INJURY HISTORY

PERFIL CLÍNICO-EPIDEMIOLÓGICO DE INDIVÍDUOS COM HISTÓRICO DE TRAUMATISMO CRANIOENCEFÁLICO

PERFIL CLÍNICO-EPIDEMIOLÓGICO DE INDIVIDUOS CON HISTORIAL DE TRAUMATISMO CRANEOENCEFÁLICO

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Objective: to describe the clinical-epidemiological profile of individuals with traumatic brain injury history admitted to the public hospital of a city in the state of Bahia, and learn their clinical-epidemiological characteristics according to gender and causes (violent and non-violent). Method: a descriptive and exploratory study with a quantitative approach was carried out with patients hospitalized due to traumatic brain injury. Data were submitted to bivariate analysis with the use of Pearson's chi-square test. Result: the sample was made up of 1,140 medical records of individuals with a mean age of 37.6 (± 2.5) years, mostly men (81.9%). In casuistry, there was a prevalence of individuals with minor traumatic brain injury (36%), mostly caused by transport accidents involving motorcycles (30.5%), cars (16.4%) and falls from their own height (14.6%). Conclusion: the main victims of traumatic brain injury were young male adults and the main causes were transport accidents and falls.

Descriptors: Craniocerebral Trauma. Traumatic Brain Injuries. Epidemiology. Health Profile. Morbidity.

Objetivo: descrever o perfil clínico-epidemiológico dos indivíduos com histórico de Traumatismo Cranioencefálico atendidos em um hospital público do interior do estado da Bahia e conhecer as características clínico-epidemiológicas desses indivíduos segundo sexo e causas (violentas e não violentas). Método: estudo descritivo de abordagem

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quantitativa, exploratório, realizado com pacientes internados por Traumatismo Cranioencefálico. Os dados foram submetidos à análise bivariada, utilizando o Teste Qui-quadrado de Pearson. Resultado: compôs a amostra, um total de 1.140 prontuários de indivíduos com média de idade de 37,6 (± 20,5) anos, sendo a maioria do sexo masculino (81,9%). Predominou, na casuística, indivíduos com traumatismo cranioencefálico leve (36%), sendo as causas mais incidentes os acidentes de transportes envolvendo motocicleta (30,5%), automóvel (16,4%) e as quedas da própria altura (14,6%). Conclusão: as principais vítimas de traumatismo cranioencefálico foram adultos jovens do sexo masculino e as principais causas foram os acidentes de transporte e as quedas.

Descritores: Traumatismos Cranioencefálicos. Lesão Encefálica Traumática. Epidemiologia. Perfil de Saúde. Morbidade.

Objetivo: describir el perfil clínico-epidemiológico de individuos con historial de traumatismo craneoencefálico atendidos en hospital público del interior del estado de Bahia y conocer sus características clínico-epidemiológicas según sexo y causas (violentas y no violentas). Método: estudio descriptivo de abordaje cuantitativo, exploratorio, realizado con pacientes internados por traumatismo craneoencefálico. Datos sometidos a análisis bivariado, utilizándose el Test de Chi-cuadrado de Pearson. Resultado: muestra constituida por 1.140 historias clínicas de individuos con media etaria de 37,6 (±20,5) años, siendo la mayoría (81,9%) de sexo masculino. Predominaron en la casuística los individuos con traumatismo craneoencefálico leve (36%), resultando las causas más repetidas los accidentes de transportes involucrando motocicleta (30,5%), automóvil (16,4%) y caídas desde la propia altura (14,6%). Conclusión: las principales víctimas de traumatismo craneoencefálico fueron adultos jóvenes de sexo masculino, y las principales causas fueron los accidentes de tránsito y las caídas.

Descriptores: Traumatismos Craneocerebrales. Lesionas Traumáticas del Encéfalo. Epidemiología. Perfil de Salud. Morbilidad.

Introduction

Traumatic brain injury (TBI) affects millions of people worldwide. It is one of the main causes of morbidity and mortality, especially among young adults[1].

Data processed and made available by the Information Department of the Brazilian Unified Health System (DATASUS, as per its acronym in Portuguese) show that, between January 2008 and September 2018, Brazil reached a total of 1,090,258 hospitalizations due to intracranial injuries, mostly in the southeastern and northeastern regions of the country, corresponding to 42.5% (463,396) and 25.8% (28,907), respectively[2].

Studies show that traumatic brain injury is the main cause of death and sequelae in the age group from one to 44 years. The mortality rate of severe TBI is above 30%. The main sequelae caused by severe TBI are neurological, compromising the quality of life of the individuals affected[3].

The most common TBI causes are accidents involving vehicles, especially among adolescents and young adults. Falls are responsible for the second largest group of injuries and are more common among children and elderly people. In some places, injuries from firearms cause more TBI than those from car accidents[3].

For the development of strategies able to minimize TBI causes and consequences in a population, it is necessary to know all the factors involved in the process. Therefore, the most vulnerable groups, as well as sociodemographic and clinical aspects associated with this type of trauma must be identified, in order to undertake planning and prevention actions with more effectiveness.

In this perspective, the objective of the present study was to describe the clinical-epidemiological profile of individuals with traumatic brain injury history admitted into the public hospital of a city in the state of Bahia, and learn their clinical-epidemiological characteristics according to gender and causes (violent and non-violent).

Method

This was a descriptive and exploratory epidemiological study with a quantitative

approach, carried out in Jequié, a city in the state of Bahia, with patients admitted into the Prado Valadares General Hospital (HGPV, as per its acronym in Portuguese) with TBI in their medical records. The HGPV is qualified as a high complexity care unit in traumatology and orthopedics. The target population admitted into the abovementioned institution are users of the Brazilian Unified Health System (SUS).

The participants in the study were patients with a hospitalization history in the HGPV due to TBI and who met the following inclusion criterion: Being hospitalized due to any TBI severity from 2009 to 2014. For identification of the participants in the study, a survey in the statistic medical record service (SAME, as per its acronym in Portuguese) was carried out on patients admitted into the emergency unit of the HGPV with a diagnosis of TBI in the period studied.

The length of hospital stay was recorded considering the days since hospitalization up to hospital discharge (or death) and classified into "short", "normal", or "long" according to criteria established by the Brazilian Ministry of Health, available in applications of the Management System of the Table of Procedures, Medications, Orthotics, Prosthetics, and Special Materials (SIGTAP).

To classify the length of hospital stay into short, normal, or long, the specific mean of days for each diagnosis of minor, mild, or severe TBI was used as a parameter, or the neurosurgical procedure undertaken, when applicable. The mean of days considered normal for each case was established according to the SIGTAP. Only patients with a record of TBI severity score and who did not have injuries associated with the potential to interfere with the mean of days estimated for each case had their hospital stay calculated.

The present study respected the guidelines of the resolution no. 466/2012 of the Brazilian National Health Council, which addresses the ethical aspects of research involving human beings. The project was submitted for analysis to the research ethics committee of the State University of Southwestern Bahia and approved under protocol no. 961.356.

After obtaining authorization for data collection, a survey on all medical records of patients with a TBI diagnosis with or without neurosurgical treatment was carried out, in which data for the sample's characteristics were collected.

The researchers prepared a form for the record of sociodemographic and clinical information (gender, age, length of hospital stay, associated injuries, treatment, etc.) available in the medical records. These data were subsequently fed into the database for analysis.

The Glasgow Coma Scale (GCS) was used as reference to categorize patients into severity levels defined as minor TBI (GCS from 13 to 15), mild TBI (GCS from 9 to 12), and severe TBI (GCS from 3 to 8)[4].

The causes were dichotomized into violent (violent trauma due to firearm or knives, physical aggression, beating) and non-violent (accidents involving transport vehicles in general, falls, and non-intentional blows).

The data were tabulated and organized into the application "Google Sheets", transferred to Microsoft Excel, and, from this, to the Statistical Package for the Social Sciences (SPSS) software. Subsequently, they were submitted to simple descriptive statistical analysis, by means of calculations of means and standard deviation for the quantitative variables, and presentation of absolute and relative frequencies of the categorical variables. The data were submitted to bivariate analysis to estimate TBI proportions in the groups by gender (male and female) and causes (violent and non-violent). Pearson's chi-square test was used with a 5% significance level (0.05).

Results

The clinical-epidemiological characteristics of the 1,140 individuals who comprised the population in this study are presented in Table 1. The mean of hospital stay including the whole sample was 11.0 (±15.7) days, with a median of 6.0. The minimum hospital stay was zero and the maximum was 188 days.

Table 1 – Clinical-epidemiological characteristics of the individuals with traumatic brain injury history admitted into the Prado Valadares General Hospital. Jequié, Bahia, Brazil – 2015 (N=1140) (continued)

Variables	Frequency	
	n	%
Gender		
Female	206	18.1
Male	934	81.9
Age group (96% response rate)		
1 – 9	43	3.8
10 – 19	158	14.0
20 – 29	297	26.4
30 – 39	200	17.8
40 – 59	241	21.4
60 – 74	101	9.0
≥ 75	86	7.6
Traumatic brain injury causes		
Transport accidents involving motorcycles	348	30.5
Transport accidents involving cars or heavy vehicles	187	16.4
Transport accidents with individuals hit by cars	101	8.9
Transport accidents involving bicycles	40	3.5
Violent trauma caused by firearms	28	2.5
Violent trauma caused by knives	13	1.1
Violent trauma caused by beating/physical aggression	85	7.4
Falls from one's own height	167	14.6
Falls from height	84	7.4
Bruises and non-intentional blows	18	1.6
Trauma without an identified cause	69	6.1
Associated injuries		
Without a record	634	55.6
Fractures of extremities	59	5.2
Facial fractures	35	3.1
Polytrauma without a record of fracture and/or dislocation	128	11.2
Polytrauma with fracture and/or dislocation	68	6.0
Spinal column fracture and/or dislocation	17	1.5
Excoriations and bruises without a record of fracture	199	17.4
Traumatic brain injury severity		
Minor	410	36.0
Mild	194	17.0
Severe	237	20.8
No record	299	26.2
Treatment		
Conservative	985	86.4
Surgical	111	9.7
No record	44	3.9
Length of hospital stay		
Short	156	13.7
Normal	277	24.3
Long	88	7.7
Not calculated	619	54.3

Table 1 – Clinical-epidemiological characteristics of the individuals with traumatic brain injury history admitted into the Prado Valadares General Hospital. Jequié, Bahia, Brazil – 2015 (N=1140) (conclusion)

Variables	Frequency	
	n	%
Hospital death		
No	984	86.4
Yes	126	11.1
No record	30	2.6

Source: Created by the authors.

Data from Table 2 show the relationship between the clinical-epidemiological characteristics of the individuals and TBI history, and their violent and non-violent causes. Statistically significant results (p≤0.05) were found for the following characteristics: age group (p=0.043), associated injuries (0.013), treatment (0.001), and hospital stay (0.012). There was a prevalence of minor severity (87.1%) and conservative treatment (89.2%) in the TBI of non-violent causes.

Table 2 – Clinical-epidemiological characteristics of the individuals with traumatic brain injury history according to its cause (non-violent or violent). Jequié, Bahia, Brazil - 2015 (N=1140) (continued)

Variables	Non-violent		Violent		p-value*
	n	%	n	%	
Gender (93.9% response rate)					
Female	173	91.1	17	8.9	0.184
Male	772	87.6	109	12.4	
Age group (92.8% response rate)					
1 – 9	40	97.6	1	2.4	0.043
10 – 19	131	87.3	19	12.7	
20 – 29	247	86.7	38	3.3	
30 – 39	167	86.5	26	13.5	
40 – 59	192	86.5	30	13.5	
60 – 74	86	92.5	7	7.5	
≥ 75	72	97.3	2	2.7	
Associated injuries (93.9% response rate)					
No record	511	86.5	80	13.5	0.013
Fractures of extremities	55	94.8	3	5.2	
Facial fractures	30	90.9	3	9.1	
Polytrauma without a record of fracture and/or dislocation	105	89.0	13	11.0	
Polytrauma with fracture and/or dislocation	64	100.0	-	-	
Spinal column fracture and/or dislocation	16	100.0	-	-	
Excoriations and bruises without a fracture record	164	85.9	27	14.1	
Traumatic brain injury severity (70.0% response rate)					
Minor	338	87.1	50	12.9	0.235
Mild	172	91.5	16	8.5	
Severe	193	86.5	30	13.5	
Treatment (90.7% response rate)					
Conservative	830	89.2	100	10.8	0.001
Surgical	81	77.9	23	22.1	

Table 2 – Clinical-epidemiological characteristics of the individuals with traumatic brain injury history according to its cause (non-violent or violent). Jequié, Bahia, Brazil - 2015 (N=1140) (conclusion)

Variables	Non-violent		Violent		p-value*
	n	%	n	%	
Length of hospital stay (43.8% response rate)					
Short	124	83.2	25	16.8	0.012
Normal	236	89.4	28	10.6	
Long	67	77.0	20	23.0	
Hospital death (91.5% response rate)					
No	820	88.6	106	11.4	0.894
Yes	104	88.1	14	11.9	

Source: Created by the authors.

* Pearson's chi-square test with a 5% significance level (p<0.05).

Note: Conventional signal used:
- Numerical data equal to zero not resulting from rounding up.

Table 3 shows the clinical-epidemiological characteristics of the individuals with TBI history according to gender, with statistically significant proportional differences (p≤0.05) for age group (p=0.000) and associated injuries (p=0.040). The mean age among female individuals was 43.9 years (±25.5), whereas for males it was 36.3 years (±18.9). No statistically significant proportional differences were fo und between genders in other characteristics analyzed (p>0.05).

Table 3 – Clinical-epidemiological characteristics of individuals with traumatic brain injury history according to gender. Jequié, Bahia, Brazil – 2015 (N=1140) (continued)

Variables	Male		Female		p-value*
	n	%	n	%	
Age group (98.7% response rate)					
1 – 9	34	79.1	9	20.9	0.000
10 – 19	126	79.7	32	20.3	
20 – 29	261	87.9	36	12.1	
30 – 39	173	86.5	27	13.5	
40 – 59	207	85.9	34	14.1	
60 – 74	73	72.3	28	27.7	
≥ 75	50	58.1	36	41.9	
Associated injuries (98.5% response rate)					
No record	521	82.2	113	17.8	0.040
Fractures of extremities	40	67.8	19	32.2	
Facial fractures	26	74.3	9	25.7	
Polytrauma without a record of fracture and/or dislocation	107	83.6	21	16.4	
Polytrauma with fracture and/or dislocation	60	88.2	8	11.8	
Spinal column fracture and/or dislocation					
Excoriations and bruises	164	82.4	35	17.6	
Traumatic brain injury severity (73.7% response rate)					
Minor	331	80.7	79	19.3	0.350
Mild	160	82.5	34	17.5	
Severe	202	85.2	35	14.8	
Treatment (96.1% response rate)					
Conservative	800	81.2	185	18.8	0.260
Surgical	95	85.6	16	14.4	

Table 3 – Clinical-epidemiological characteristics of individuals with traumatic brain injury history according to gender. Jequié, Bahia, Brazil – 2015 (N=1140) (conclusion)

Variables	Male		Female		p-value*
	n	%	n	%	
Length of hospital stay (45.7% response rate)					
Short	132	84.6	24	15.4	0.485
Normal	224	80.9	53	19.1	
Long	75	85.2	13	14.8	
Hospital death					
No	803	81.9	177	18.1	0.635
Yes	101	80.2	25	19.8	

Source: Created by the authors.

* Pearson's chi-square test with a 5% significance level ($p<0.05$).

Discussion

The recognition of TBI as a public health concern is explained in several studies given its association with high morbidity and mortality rates and because it affects, especially, the age group of active individuals of the population[3,5-7]. In the present study, there was a higher prevalence of TBI cases among men and in age group from 20 to 29 years (26.4%), as also found in several studies[5-6,8-9].

Accidents involving transport vehicles are among the main causes of TBI, highlighting those involving motorcycles[8-12] as shown in this study, whose prevalence corresponded to 30.5% of the cases found. However, some studies point out falls as the first cause of TBI, especially falls from one's own height[13-14]. The high rates in this type of fall are associated with the age group of the following populations: elderly people or children. In the case of elderly people, they are due to physiological changes they undergo over time[13]. In children, these rates are explained by characteristics of their growing process, as well as childhood behaviors[14].

According to the Brazilian Mortality Information System database (SIM, as per its acronym in Portuguese), a total of 101,593 deaths due to accidents involving motorcycles occurred in Brazil from 2008 to 2016, with a prevalence in the northeastern and southeastern regions of the country[2]. The increasing use of motorcycles as a means of transport may be associated with their low cost, as well as speed and agility that they provide in increasing traffic jams.

A study carried out in 2011 in the same city as the present study reported that the lack of quality in public transportation has led the population to seek for motorcycles since these are easier and cheaper means of transport. This situation, associated with an increase in unemployment rates, led many individuals to acquire motorcycles to work as moto-taxis in the city; however, there is no appropriate regulation nor monitoring regarding this service in the abovementioned city[12].

The level of consciousness of individuals after trauma significantly influences the prognosis of patients with a TBI diagnosis[11]. Therefore, severity classification according to the GCS is important, which is a neurological evaluation method that qualifies the level of consciousness of individuals after trauma, in addition to serving as an indicator of brain function improvement[11,14].

Traumatic brain injuries classified as minor were the most commonly found (36%) among the individuals studied, whereas TBI reported as severe and mild represented 20.8% and 17%, respectively. Similarly, a higher prevalence of minor TBI regarding severity was found in other studies[8,11,13-14]. It is worth mentioning that 26.2% of the medical records checked did not present a GCS record, corroborating other studies where

the medical records consulted did not have initial severity trauma data duly recorded[11,14].

The prevalent treatment type was the conservative, following the highest occurrence rate of minor severity trauma, similar to one study that presented a 77.18% conservative treatment rate of the individuals hospitalized, together with the prevalence of minor severity trauma[13]. The mean time of hospital stay found was 11.5 days, higher than the value found in studies that presented a mean of 7.2 and 8.7 days[13,15].

Injuries associated with TBI depend on mechanisms and kinetic energy imposed to individuals. In this respect, there are occurrence reports in higher or equal frequency of traumas (abdomen, chest, face, and limbs) and otorrhagia, and in lower incidence, of systemic fractures[13]. In the present study, the most common injuries found were excoriations and bruises without a fracture record, and polytrauma without fracture and/or dislocation.

The mortality rate found in the present study was 11.1%, with 66.3% of these cases corresponding to individuals with records of severe GCS. In this regard, studies have presented an inversely proportional relationship between the number of deaths and the initial GCS score, that is, the lower the GCS score analyzed right after the trauma event, the higher the mortality rate among individuals[8]. A significant number of medical records without a GCS record was identified in the present study (26.2%); however, as observed in other studies, minor TBI always prevails over other severities and death rates[8-9,12,14].

In the present study, non-violent traumas were those that did not involve intentional external causes, such as the use of knives, firearms, or any other means of physical aggression. Regarding the group of individuals with TBI history due to non-violent causes, this study showed a prevalence of minor severity traumas (87.1%) with conservative treatment (89.4%) and no death outcome (88.6%). These results corroborate those found in most of the studies consulted[8-9,10-14].

Studies show a prevalence of men among TBI victims[5-6,8-9]. In addition, they are responsible for the highest rates of hospitalization and mortality[6]. This fact was also observed in the present study, although differences in both genders regarding the prevalence of severity type, treatment, length of hospital stay, and death were not found.

The limitations found in the present study are related to the lack of important records on patients, among them the GCS score at admission, injuries associated with trauma, and length of hospital stay. The lack of such information implies less detailed knowledge on the clinical-epidemiological profile of cases involving TBI.

Conclusion

The results of the present study allowed to describe the clinical-epidemiological profile of individuals with TBI history and learn their clinical-epidemiological characteristics according to gender and causes (violent and non-violent). The results enabled to identify, in the population studied, that there is a prevalence of TBI among young men with a mean age of 37.69 years and severity level classified as minor. Accidents involving motorcycles were the main causes of TBI and a conservative treatment was the most commonly adopted. The mean of hospital stay was 11.05 days and hospital death rate was 11.1%. The main injuries associated with TBI were excoriations and bruises without a fracture record, and polytrauma without a record of fracture and/or dislocation.

All these results showed a prevalence of non-violent causes that can be prevented, especially by educational preventive measures and monitoring, such as prevention campaigns in roads and schools, and the promotion of advertisements by means of mass media (television, radio, newspaper, magazines, social media, etc.).

Collaboration:

1. conception, design, analysis, and interpretation of data: Jocinei Ferreira Constâncio,

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2. writing of the article and relevant critical review of the intellectual content: Jocinei Ferreira Constâncio, Maitana Carvalho Cardozo, and Tatiane Oliveira de Souza Constâncio;

3. final approval of the version to be published: Jocinei Ferreira Constâncio and Tatiane Oliveira de Souza Constâncio.

References

1. Klein AM, Howell K, Vogler J, Grill E, Straube A, Bender A. Rehabilitation Outcome of Unconscious Traumatic Brain Injury Patients. J Neurotrauma [Internet]. 2013 [cited 2016 Aug 10];30(17):1476-83. Available from: Doi: 10.1089/neu.2012.2735

2. Brasil. Departamento de Informática do SUS - DATASUS. Informações de Saúde [Internet]. Brasília; 2018 [cited 2018 Nov 23]. Available from: http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sih/cnv/niuf.def

3. Gaudêncio TG, Leão GM. A epidemiologia do traumatismo crânio-encefálico: um levantamento bibliográfico no Brasil. Rev Neurocienc [Internet]. 2013 [cited 2016 Aug 30];21(3):427-34. Available from: Doi: 10.4181/RNC.2013.21.814.8p

4. Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. Lancet [Internet]. 1974 [cited 2016 Aug 30];2(7872):81-4. Available from: https://www.ncbi.nlm.nih.gov/pubmed/4136544

5. Vieira RCA, Hora EC, Oliveira DV, Vaez AC. Relevamiento epidemiológico de los accidentes motociclísticos atendidos en un Centro de Referência de Trauma de Sergipe. Rev Esc Enferm USP [Internet]. 2011 [cited 2018 Sep 1];45(6):1359-63. Available from: Doi: http://dx.doi.org/10.1590/S0080-62342011000600012

6. Dantas IEF, Oliveira TT, Machado Neto CD. Epidemiologia do traumatismo crânio encefálico (TCE) no Nordeste no ano de 2012. REBES [Internet]. 2014 jan-mar [cited 2018 Sep 10];4(1):18-23. Available from: https://www.gvaa.com.br/revista/index.php/REBES/article/view/2573/1985

7. Walder B, Haller G, Rebetez MML, Delhumeau C, Bottequin E, Schoettker P, et al. Severe traumatic brain injury in a high-income country: an epidemiological study. J Neurotrauma [Internet]. 2013 Dec [cited 2016 Sep 10];30(23):1934-42. Available from: Doi: 10.1089/neu.2013.2955

8. Lopes RD, Costa PP, Carvalho FT. Perfil epidemiológico dos pacientes acometidos por trauma cranioencefálico assistidos em um hospital público de Teresina. Rev Bras Neurol Psiquiatr [Internet]. 2013 [cited 2017 Aug 28];7(3):80-90. Available from: https://www.revneuropsiq.com.br/rbnp/article/view/27/17

9. Moura JC, Rangel BLR, Creôncio SCE, Pernambuco JRB. Perfil clínico-epidemiológico de traumatismo cranioencefálico do Hospital de Urgências e Traumas no município de Petrolina, Estado de Pernambuco. Arq Bras Neurocir [Internet]. 2011 [cited 2018 Aug 27];30(3):99-104. Available from: http://files.bvs.br/upload/S/0103-5355/2011/v30n3/a2709.pdf

10. Nnadi MON, Bankole OB, Fente BG. Motorcycle-related traumatic brain injuries: helmet use ante treatment outcome. Neurosci J [Internet]. 2015 [cited 2018 Sep 3];2015:1-6. Available from: Doi: http://dx.doi.org/10.1155/2015/696787

11. Barbosa IL, Andrade LM, Caetano JA, Lima MA, Vieira LJES, Lira SVG. Fatores desencadeantes ao trauma crânio-encefálico em um hospital de emergência municipal. Rev baiana saúde pública [Internet]. 2010 [cited 2018 Sep 3];34(2):240-53. Available from: http://files.bvs.br/upload/S/0100-0233/2010/v34n2/a1795.pdf

12. Gomes IO, Reis LA, Mascarenhas CHM. Perfil dos pacientes acometidos por trauma cranioenfálico admitidos em um hospital público do município de Jequié na Bahia. Rev Saúde Com [Internet]. 2011 [cited 2018 Aug];7(1):14-22. Available from: http://www.uesb.br/revista/rsc/v7/v7n1a02.pdf

13. Maia BG, Paula FRP, Cotta GD, Cota MAL, Públio PG, Oliveira H, et al. Perfil clínico-epidemiológico das ocorrências de traumatismo cranioencefálico. Rev Neurocienc [internet]. 2013 [cited 2018 Sep];21(1):43-52. Available from: Doi: 10.4181/RNC.2013.21.786.10p

14. Santos F, Casagranda LP, Lange C, Farias JC, Pereira PM, Jardim VMR, et al. Traumatismo Cranioencefálico: causas e perfil das vítimas atendidas no pronto-socorro de Pelotas/Rio Grande do Sul, Brasil. REME rev min enferm [Internet]. 2013 [cited 2018 Aug 30];17(4):882-7. Available from: http://www.reme.org.br/artigo/detalhes/893

15. Ramos EMS, Silva MKB, Siqueira GR, Vieira RAG, França WLC. Aspectos epidemiológicos dos traumatismos cranioencefálicos atendidos no Hospital Regional do Agreste de Pernambuco de 2006 a 2007. RBPS [Internet]. 2010 [cited 2018 Sep 2];23(1):4-10. Available from: Doi: http://dx.doi.org/10.5020/1164

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