REVISTA O MUNDO DA SAÚDE

Functional profile of patients with traumatic brain injury at hospital discharge

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Abstract

The lesions caused by a Traumatic Brain Injury (TBI) of macro or micro character can physically and/or psychologically compromise an individual. Being a disease of modern society that affects any age, it is considered the main cause of morbidity and mortality in Brazil as it covers the economically active population. It can temporarily or permanently disable people, consequently generating an impact on their quality of life, and is difficult to measure their functional profile, level of recovery, and how long they will remain in a given profile. In order to determine and classify the functional profile of individuals with TBI at hospital discharge, an analytical, observational, and cross-sectional study was carried out in which the Glasgow Outcome Scale/Glasgow Extended Outcome Scale (GOSE) was applied through a form for data collection and interviews. The study population consisted of 26 volunteers, admitted for treatment at Hospital Universitario Sao Francisco de Braganca Paulista, Sao Paulo with a confirmed diagnosis of TBI through imaging tests between September 2019 and March 2020. We found evidence of 88.46 % belonging to the males, and 11.54% female, where the mean and standard deviation of age 35.73±16.76 were observed. Among the most common types of traumas, polytrauma stood out with 80.77% and GOSE had the highest scores where 46.15% had a score of 8. Most participants of the study were discharged from the HUSF with the functional profile of good recovery and may return to their lives before the trauma. Through functional classifications, it is possible to guide professionals responsible for the rehabilitation of those who were affected by trauma and were left with sequelae, as well as guide family members and community assistance centers.

Keywords: Traumatic Brain Injury. Glasgow Outcome Scale. Functional Profile.

INTRODUCTION

Traumatic brain injury (TBI) consists of a lesion in brain tissue whose severity is classified as macro or microscopic. The different anatomical aggressions such as falls, traffic accidents, and firearm projectiles can lead to lesions involving the scalp, skull, meninges, or brain[1].

Andrade[2] adds that the lesions can be classified as open when it involves penetration of the scalp, skull, and dura mater with penetrating objects (firearms, bladed weapon, and crushing), or closed when there is a ricochet of the brain against the skull. In accordance with the pathophysiology, the primary lesions result from an aggressive force directly provoked by some type of trauma,

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from fractures with anatomical interruption of the bone envelope, brain contusions resulting from mechanical forces on small vessels, and other tissues of the neural parenchyma, resulting in focal lesions of the gray matter of the cortex, or even diffuse axonal injury when there is micro rupture of axons in the white matter along the major tracts of the cerebral hemispheres and the corpus callosum.

Secondary injury is a physiological response to the initial trauma due to the damage caused to the Central Nervous System (CNS) that can start at the time of the trauma and be expressed sometime later (intracranial hematomas, cerebral edema, swelling, or infection). They can occur due to isolated arterial injuries or are associated with fractures and lacerations as in the case of an epidural hematoma. The epidural hematoma occurs by laceration of a meningeal artery collecting blood between the dura mater and the bones of the skull. A subdural hematoma forms between the outer layer and the middle layer (arachnoid mater) in parietal and frontal regions, and intraparenchymal hematoma occurs when there is bleeding from the brain parenchyma[2].

Neto *et al.*[3] concluded their studies on TBI highlighting that it can disable the individual temporarily or permanently and is considered the main cause of morbidity and mortality in Brazil, covering the economically active population of the country between the age groups of 21 to 60 years old. It is estimated that each year, due to an increase in the consumption of drugs, drinks and recklessness in traffic, more young people are likely to be involved in accidents with traumatic brain injury.

The Ministry of Health[4] considers that TBI should be seen as a disease of modern society, as it affects any individual at any age and covers all territories, generating important impacts on quality of life. Whether the damage is temporary or permanent when affecting the individual in their biopsychosocial aspect, it is difficult to measure their functional profile, their levels of recovery, and how long they will remain in a given profile.

The sequelae can be classified as physical sequelae, which are proportional to the affected area and the degree of injury, behavioral related to emotional behavior, exaggeration of personality changes existing before the trauma, cognitive sequelae such as memory loss, attention and concentration difficulties, and medical sequelae that include systemic disorders[5].

In pre-hospital care, health professionals work with the application of a scale called by Teasdale and Bond[6] as the Glasgow Coma Scale (GCS), in order to measure and assess the level of consciousness of a person who suffered a head trauma. This scale makes it possible to standardize a language to facilitate the writing of this information on the patient's evaluation form. Furthermore, during the data collection procedure each item is evaluated separately, and the patient receives a score for each variable. The total score, given by the sum of the variables, will classify the patient's condition as severe (needing immediate intubation), moderate, and mild[7].

After scientifically proving the efficiency of GCS application during the assessment of hospitalized patients in the acute phase of the injury, a scale originally named as the Glasgow Outcome Scale (GOSE) was developed in 1975 by Jennett and Bond[8] which consists of five levels of assessments that are able to predict the return to normal life, recovery time, and the level of injury resulting from trauma, based on the physical, social, and cognitive sequelae which have become an assessment tool of capacity and overall functionality, used in patients with some type of brain trauma.

According to Jennett and Bond[8], due to

cases of partial or total disability requiring continuous social support from humanitarian entities, in order to guarantee the quality of life of these individuals whose sequelae are combinations of physical and mental characteristics, the scale allows for guiding families and professionals involved as to the real needs for treatment, with the aim of providing a predictive prognostic value[9].

Given the low age group reached by the TBI and the concern with the prospect of survival in the community in highly dependent conditions for many years with an indefinite level of recovery, it was necessary to develop and firstly apply the scale, which later began to be used in a hospital environment to facilitate clinical decisions about patient discharge, especially in cases where they are discharged from a non-specialized ward[10]. For Jennett *et al.*[9] despite its easy applicability, the unstructured approaches were limited, so an extension between the variables of the scale for Glasgow Outcome Scale Extended (GOSE) was necessary, proposing more sensitive measures of recovery in the affected individuals.

For defining results, a set of structured interviews using a standard format by Teasdale et al[11] was applied to achieve greater objectivity and reliability, based on identifying pre- and post-injury functional change to assess the alterations and restrictions that occurred as a result of head trauma.

The application of the GOSE guides both the hospitalized patient's family and the multidisciplinary treatment team in a hospital environment on the degree of dependence and post-injury functionality, with the aim of offering targeted care for each profile.

The present study aimed to determine the functional profile at the time of possible hospital discharge of patients involved in the study from the application of the GOSE and, thus, classify them with certain functionalities proposed by the scale.

METHODOLOGY

This is an analytical, observational, cross-sectional study approved by the Research Ethics Committee of Universidade Sao Francisco (No. 4.148.763) (ANNEX I). The study population consisted of 26 volunteers aged between 18 and 90 years, victims of traumatic brain injury (TBI) resulting from accidents or falls admitted for treatment and clinical follow-up after TBI at Hospital Universitario Sao Francisco (HUSF) in Braganca Paulista, SP, with a confirmed diagnosis through imaging tests between September 2019 and March 2020.

The inclusion criteria were individuals at the time of hospital discharge who were still dependent on the hospital and who agreed to participate in the study by signing the Informed Consent Form (ICF) (ANNEX II). In cases where the patient was considered incapable of answering the questionnaire, the form was directed to the companion/guardian through the Informed Consent Form for Those Under 18 Years Old (ANNEX III), where they assumed responsibility for the answers by the individual. Individuals with CNS diseases and severe cognitive disability prior to the trauma, and individuals who refused to participate in the research, were excluded from the study. In all, 24 patients were excluded due to the aforementioned exclusion criteria. The volunteers' data were initially obtained through data from the medical records of each patient and through the individual assessment of the patient made by the researchers, where the patient's full name, gender, age, Glasgow

Coma Scale score, type of lesion, surgical interventions (number), date of admission, and date of hospital discharge were recorded (ANNEX IV).

To evaluate the results, a questionnaire was applied, from a set of structured interviews, using a standard format[11]. In order to acquire greater objectivity and reliability, there was a need for the questionnaire to be translated by the researchers. The questionnaire is based on identifying post-injury functional changes, that is, what the individual stopped doing or started doing after the TBI sequelae compared to what they did before the trauma. There are a total of eight objective questions with subdivisions related to post-injury status. The answers are simple with "yes" or "no" criteria. The study offered minimal risk to the population studied, such as some emotional discomfort regarding the limitation of movements resulting from the trauma.

The variables studied were entered into an Excel spreadsheet (Microsoft) and subsequently analyzed. Thus, the following descriptive analyses were represented with frequency of absolute values (n) and percentages (%), measurements of position (mean) and dispersion (standard deviation).

RESULTS

Quantitative variables were described as mean and standard deviation, where the following were observed: Age 35.73±16.76 years; Length of stay 12.89±28.97; GOSE Outcome Scale Score 5.81±2.61.

The nominal qualitative categorical variables are presented in percentage and showed that 88.46% of the sample belonged to the male gender, and 11.54% were female.

Regarding the age group, it was comprised between 18 and 90 years old, being: 7.69% between 0 and 18 years old; 38.46% between 19 and 26 years old; 7.69% between 27 and 34 years old; 19.23% between 35 and 42 years old; 7.69% between 43 and 50 years old; 7.69% between 51 and 59 years old; and 11.54% between 60 and 90 years old.

Among the most common types of traumas, polytrauma stood out among 80.77% of the sample, 15.38% had a fall from their own height and 3.85% had a direct collision. Regarding the number of surgical interventions: 43.48% do not perform interventions; 26.09% performed only one intervention; 8.70% performed two interventions; 17.39% performed three interventions; and 4.35 performed five interventions.

Regarding the length of stay, 22.22% remained hospitalized for a period of 24 hours to 7 days, 66.67% from 8 to 14 days, and 11.11% remained more than 15 days. The predominant GCS result was 15 (66.67%), followed by GCS = 6 (9.52%); GCS = 3 (9.52%); GCS = 7 (4.76%); GCS = 11 (4.76%); GCS = 13 (4.76%); and the other classifications were 0%.

The Glasgow Outcome Scale Extended (GOSE) was distributed as Score 1 = 3.85%; Score 2 = 19.23%; Score 3 = 3.85%; Score 4 = 3.85%; Score 5 = 7.69%; Score 6 = 3.85%; Score 7 = 11.54%; and Score 8 = 46.15%.

Table 1 – Sample Characterization (n=26).

VARIABLES	MEAN ± STANDARD DEVIATION
Age	35.73±16.76
Hospitalization time	12.89±28.97
Surgical Interventions	1.17±1.40
Glasgow Outcome Score Extended (GOSE)	5.81±2.61

Table 2 – Age group of the sample studied (n=26).

AGE GROUP (years)	N	%
0-18	2	7.69%
19-26	10	38.46%
27-34	2	7.69%
35-42	5	19.23%
43-50	2	7.69%
51-59	2	7.69%
60-90	3	11.54%
TOTAL	26	100%

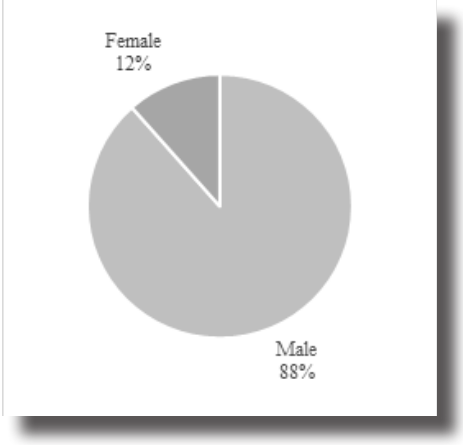

Figure 1 – Graphic representation of gender of the sample studied (n= 26).

Table 3 – Surgical Interventions, Hospitalization Time, and Types of Trauma (n= 26).

	n	%
SURGICAL INTERVENTIONS		
Did not perform	10	43.48%
Only one	6	26.09%
Only two	2	8.70%
Only three	4	17.39%
Only four	0	0%
Only five or more	1	4.35%
TOTAL	23	100%
HOSPITALIZATION TIME (days)		
≥ 24 hours to 7 days	2	22.22%
8 to 14 days	6	66.67%
≥ 15 days	1	11.11%
TOTAL	9	100%
TYPES OF TRAUMA		
Polytrauma (accident)	21	80.77%
Fall from standing height with TBI	4	15.38%
Direct collision	1	3.85%
TOTAL	26	100%

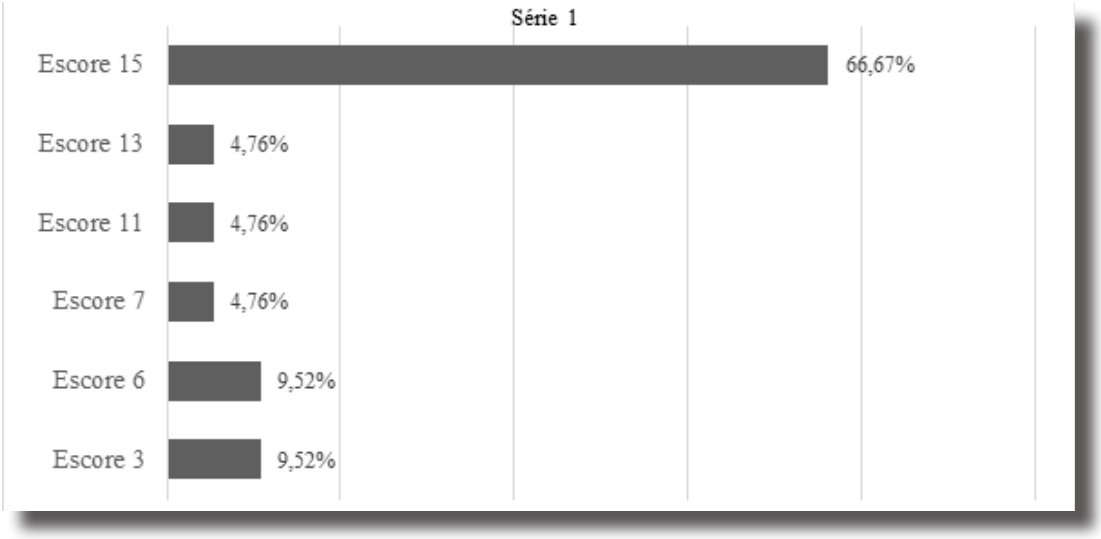

Figure 2 – Result of the Glasgow Coma Scale Score.

Table 4 – The Glasgow Outcome Scale Extended (GOSE) of the sample studied (n=26).

GOSE SCORE	N	%	PROGNOSIS FOR SIX MONTHS
1	1	3.85%	Death
2	5	19.23%	Vegetative state
3	1	3.85%	Low Severe Disability
4	1	3.85%	Upper Severe Disability
5	2	7.69%	Low Moderate Disability
6	1	3.85%	Superior Moderate Disability
7	3	11.54%	Good recovery
8	12	46.15%	Good Superior Recovery
TOTAL	**26**	**100%**	

DISCUSSION

The present study showed that head trauma (TBI) was observed more frequently in men than in women, showing that the male gender has accidents in a frequency of 88.46% of the cases when compared to the female gender, with a considerable number involving mainly the economically active age group in the country, reaching 38.46% of cases. These findings can be corroborated by the results described by Sampaio et al.[12], which classify TBI as the first cause of death among individuals aged between 20 and 40 years of age, that is, in the phase in which the individual is most productive.

Jennett *et al.*[8] point out that brain damage at age 25 is no more devastating than at age 65 in its emotional impact on those who have witnessed it; however, it is more sig-

nificant in economic terms, since it mainly affects the economically active class of the country. The data on the average age of the participants was 34.73 years, corresponding to a potentially productive stage of life, as also concluded by Oliveira *et al.*[5].

Among the different types of TBI analyzed, polytrauma was present in 80.77%, which usually results from traumatic events such as traffic accidents, being run over, and firearm injuries[12].

Many patients who previously did not survive accidents with great traumatic impact are currently able to survive due to the evolution of the multidisciplinary work of health teams. However, when the brain is the organ affected, the persistence of the disability usually comprises both mental and physical disabilities that can seriously impair quality of life[8].

Despite polytrauma being the most evident type of trauma, the GCS results corresponded to 66.67% of the cases which were admitted with a score of 15, classified as mild trauma described by Teasdale *et al.*[6]. Moreover, 43.48% of the participants did not undergo surgical interventions, and despite demonstrating an average hospital stay of 12.89, it was shown that 46.15% of the participants had a GOSE score of 8, indicating a good prognosis for superior recovery[13]. This means they are capable of returning to everyday life with the same former capacity without persistent physical or mental deficits that interfere with quality of life.

Most of the sample entered the ward with the highest GCS score, without the need for further treatments or even had complications, this fact supports the functional prognosis of good recovery, bringing a lower morbidity impact when compared to those with sequelae arising from procedures and interventions.

The important factors for a good functional result are: Age, GCS, type of trauma, number of interventions, and length of stay. These serve to assess the severity of the disability and are important to evaluate and consider the duration in which the individual remains within the affected pattern like the intensity of the traumatic impact[9].

The GOSE allows a realistic assessment as a functional predictor based on the impact that the injury had on the quality of life of individuals affected by trauma. Such predictions can help promote decisions related to the management of care by the professionals involved, as well as counseling for the patient and their families[5]. Therefore, GOSE has been very useful as a prognostic index tool, indicating the possibility of improvement in neurological evolution[5].

Among the limitations of the study, the difficulty of finding information in the patients' charts, such as the date of discharge from the hospital, can be included. In many cases, the patient was discharged from the hospital and the patient's medical record already followed a protocol to be archived, making access to this information difficult, or it took days for this information to be computed in the electronic medical record, information being lost many times by physical and electronic file restrictions. In addition, a portion of the participants was in the operating room to perform some intervention and spent a certain period sedated without being able to answer the questionnaire on their own and without family monitoring and were thus disregarded for participation in the study. Another factor was the issue of the COVID-19 pandemic at the beginning of 2020, which limited the researchers' access into the hospital to obtain a greater number of participants, and thus increase the relevance of the study.

CONCLUSION

Through the results found, it can be concluded that most TBI patients who were discharged from HUSF had a functional profile of a good recovery, in which they will be able to return to daily life with the same quality of life prior to the trauma. The tool used to infer the results proved to be satisfactory, since it can show levels of the functional profile according to the proposed classification.

It is also concluded that the development of new studies is necessary, since the work presented herein was a pilot study in which few references corroborate the findings, which could imply that through functional classifications could guide professionals responsible for biopsychosocial rehabilitation of those who were affected by trauma and were left with sequelae, as well as guide family members and community assistance centers.

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