

Neuropsychological and Social Outcome of Patients Sustaining Traumatic Brain Injury in Cotonou

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Abstract

This inaugural study in Benin was aimed at assessing neuropsychological and behavioural problems of patients with traumatic brain injury managed at the Hubert Koutoukou Maga Teaching hospital in Cotonou, and the impact on their standard of living. This was a prospective and cross-cutting study with a descriptive and analytical aim. It was carried out from 1 July to 30 October 2018. The study population included patients over 15 years of age who had experienced TBI. A purposive sampling of 585 patients with TBI was done, of which 142 patients could not be reached by phone while. The mean age of patients was 37.16 ± 13.9 years, with extremes ranging from 16 to 87 years. The most frequent complaints were behavioural disorder (79.5%), headache (63.8%) and memory loss (50.4%). The average duration of post-traumatic amnesia was 9.08 ± 38.56 days. Sixty-three patients (68.5%) had post-traumatic amnesia that lasted less than 30 minutes and 25 patients (19.2%) had post-traumatic amnesia that lasted over a month. Neuropsychological disorders were more frequent in patients with severe TBI. Attention disorders and difficulties in elaborating strategies were noticed without any statistically significant difference in mild, moderate as well as severe TBI. Nineteen patients lost their job, thus raising the unemployment rate in our sample from 6% to 21%. Among the 100 patients (75%) that recovered their job, 14% had medical follow-up and 10% returned to part-time work. Salary remained unchanged for 61.2% of TBI patients.

Keywords

Traumatic Brain Injury, Neuropsychological Disorder, Standard of Living, Bénin

1. Introduction

Traumatic brain injury (TBI) is a major public health problem because of its frequency, severity, immediate prognosis and the importance of the sequelae [1]. The sequelae can occur even in cases of head injury that are initially considered minor or moderate [2]. The neuropsychological deficits most frequently observed following such an accident involve several cognitive spheres, including attention, memory, executive functions and information processing speed [3]. Neuropsychological assessment of neuropsychological disorders consisted (in the 1970s-1980s) of collecting a set of symptoms (through clinical observation of patients and the use of neuropsychological tests), comparing them to existing syndromic groupings (e.g. Broca's aphasia, frontal syndrome, right hemispheric syndrome), and developing a hypothesis regarding the brain localizations corresponding to the identified syndromes [4]. More recently, revalidation has taken on a more ecological and global dimension, with the main objective of optimizing the functioning of patients in their daily lives, but also, more broadly, their well-being and quality of life [5].

In Benin, as in the other countries of the West African sub-region, several studies have been carried out on TBI [6]-[11]. They have been concerned to make a descriptive assessment of acute lesions. These studies have only vaguely or not at all considered the neuropsychological outcome and the actual long-term socio-professional reintegration of these patients.

The purpose of this inaugural study in Benin was to assess the neuropsychological and behavioural disorders of brain injured patients managed at the Centre National Hospitalier et Universitaire Hubert Koutoukou Maga in Cotonou (CNHU-HKM) and the repercussions on their quality of life.

2. Patients and Method

Benin is a low-income francophone country in West Africa. Its population was 11.485 million in 2018 and its Gross Domestic Product (GDP) was \$10.359 billion. The annual per capita income was \$870 and the poverty rate was 36.2%. Life expectancy was 61.17 years [12]. The potential labour force (15 - 64 years) represented 52.5% of the population. In 2012, the urban population was estimated at 45.7% [13]. It was a descriptive, prospective and analytical study. It was performed from 1 July to 30 October 2018. we obtained the agreement of the ethics committee of the medical school and of the patients included in our study.

The study population included patients over 15 years of age who had been victims of TBI. All these patients were managed at CNHU-HKM. Follow-up was between 6 months and 24 months. A reasoned sampling of 585 patients with TBI was done; 313 patients were not included due to lack of sufficient information from records or emergency cards; 142 patients could not be reached by telephone. Twelve patients declined to participate in the questionnaire. One hundred and thirty (130) agreed to participate in the survey, of which 71 by direct

questioning in consultation and 68 with a companion, and for 59 of the patients by telephone call, of which 32 through a relative. There were 127 patients who were victims of TBI and 3 people answered in place of patients who had died after discharge.

Among the 130 patients with TBI, 15 patients (11.53%) had a neuropsychiatric history, 9 patients (6.9%) were chronic ethylics and 5 patients (3.8%) were chronic smokers, 11 patients (8.4%) had a medical defect. There were 61 patients (46.9%) with a mild TBI, 28 patients (21.5%) with a moderate TCE and 41 patients (31.5%) with a severe TBI. Seventy-three patients (56.2%) had a brain CT-scan, 21 (16.2%) underwent surgery, 25 (19.2%) had intensive care, and 36 (27.7%) had periodic medical follow-up.

The data were collected using the European Brain Injury Assessment Document or EBIS (European Brain Injury Society) document [14]. The dependent variables assessed were: impairments and disabilities according to the WHO classification, dependence on one's environment according to the Glasgow Outcome Scale, and the quality of life of brain injured persons.

The data were collected using EPI-DATA software. Data were cleaned and analyzed using STATA/IC 11.0 statistical software. A descriptive analysis of the variables under study was conducted. Thus, for qualitative variables, frequencies and proportions were determined. Comparisons were made using the Chi2 test or the Fisher exact test if the expected values were less than 5. For quantitative analyses, means with their standard deviation, medians, minima and maxima were described. Comparisons were made with the Student's test.

3. Result

The mean age of the patients was 37.16 ± 13.9 years with extremes of 16 and 87 years. The median age was 33 years. Of these patients, 113 (86.9%) were male. The sex ratio was 6.6. The socio-demographic characteristics of the patients were reported in **Table 1**. Ninety-two patients (70.2%) were living with a partner. The mean number of dependent children per patient with ESRD was 2.82 ± 2.36 with extremes of 0 and 8 children.

The mean duration of hospitalization for patients was 17.07 ± 27.83 days. The mean duration of post-traumatic amnesia was 9.08 ± 38.56 days. Sixty-three patients (48.5%) had post-traumatic amnesia of less than 30 min and 25 patients (19.2%) had post-traumatic amnesia of more than one month. The mean duration of coma was 4.64 ± 9.78 days with extremes of 1 day and 66 days for the 41 cases of severe TBI.

The brain lesions observed on CT scan were: hemorrhagic contusion 22 cases; acute extradural hematoma 10 cases; acute subdural hematoma 7 cases; intraparenchymatous hematoma 5 cases; subarachnoid hemorrhage 5 cases; diffuse axonal lesions 1 case. There were also 4 cases of polytrauma. Immediate neurological complications were: post-traumatic epilepsy 9 cases, chronic subdural haematoma 6 cases and meningoencephalitis 1 case.

Table 1. Socio-demographic characteristics of TBI.

| | Mild TBI | Moderate TBI | Severe TBI | Total (%) |
|---|----------|--------------|------------|--------------|
| Number of patients | 61 | 28 | 41 | 130 |
| Sex | | | | |
| <i>Male</i> | 55 | 23 | 35 | 113 (86.9) |
| <i>Feminine</i> | 6 | 5 | 6 | 17 (13.1) |
| Age (Average age: 37.16 ± 13.9) | | | | |
| <i>15 - 20</i> | 2 | 0 | 4 | 6 (4.6) |
| <i>20 - 30</i> | 22 | 8 | 11 | 41 (31.5) |
| <i>30 - 40</i> | 20 | 7 | 13 | 40 (30.8) |
| <i>40 - 50</i> | 12 | 2 | 6 | 20 (15.4) |
| <i>>50</i> | 5 | 11 | 7 | 23 (17.7) |
| Marital status | | | | |
| <i>lives alone</i> | 15 | 6 | 17 | 38 (29.2) |
| <i>lives with a partner</i> | 46 | 22 | 24 | 92 (70.8) |
| Education level | | | | |
| <i>Primary</i> | 19 | 9 | 13 | 41 (31.5) |
| <i>Secondary</i> | 23 | 9 | 16 | 48 (36.9) |
| <i>University</i> | 13 | 6 | 7 | 26 (20.0) |
| <i>Unschoolled</i> | 6 | 4 | 5 | 15 (11.5) |
| Occupation (pre-accident activity) | | | | |
| <i>Active</i> | 57 | 26 | 40 | 123 (94.61%) |
| <i>Inactive</i> | 4 | 2 | 1 | 7 (5.3%) |
| Location of origin | | | | |
| <i>Urban</i> | 52 | 16 | 18 | 86 (66.2) |
| <i>Rural</i> | 9 | 12 | 23 | 44 (33.8) |

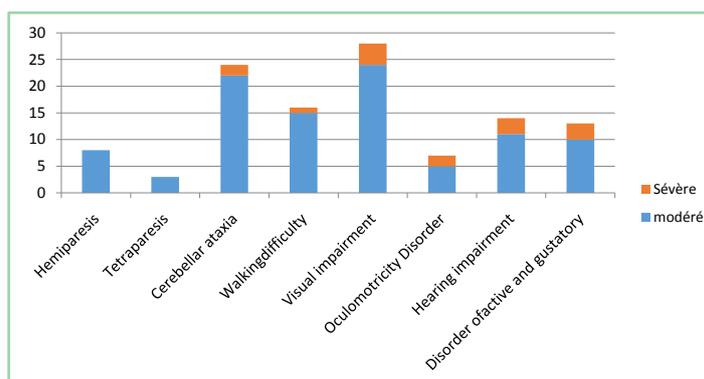
At the time of the study, 36 patients were on medical treatment: analgesics 23 cases, antiepileptics 6 cases, anxiolytics 7 cases, antidepressants 7 cases, neuroleptics 3 cases and corticosteroids 2 cases. Twenty-nine patients were followed up in functional rehabilitation and 4 in psychiatry.

The complaints reported were behavioural disorders (79.5%), headaches (63.8%) and amnesic disorders (50.4%). All of these complaints were reported in **Table 2**.

Of the 127 patients examined, 119 patients (93.7%) were right-handed, 5 patients (3.9%) were left-handed and 3 patients (2.4%) were ambidextrous. Cerebellar ataxia, and other disorders such as walking and visual disturbances were the most frequently neurological disabilities observed (**Figure 1**).

Table 2. Breakdown of patient complaints.

| | Number of patients (n = 127) | % |
|-----------------------------------|------------------------------|------|
| Psychiatric Complaints | | |
| Behavioural disorders | 101 | 79.5 |
| Road and other phobias | 8 | 6.3 |
| Suicide attempts | 1 | 0.8 |
| Post traumatic psychoses | 1 | 0.8 |
| Neurological complaints | | |
| Noise Irritability | 46 | 36.2 |
| Chronic headaches post-TBI | 81 | 63.8 |
| Confusions | 2 | 1.6 |
| Amnesic disorders | 64 | 50.4 |
| Crises convulsives | 8 | 6.3 |
| Dizziness and balance disorders | 14 | 11.0 |
| Language disorders | 12 | 9.4 |
| Sleep Disorders | 4 | 3.1 |
| Cervicalgias | 2 | 1.6 |
| Laterality changes | 1 | 0.8 |
| Motor deficits | 10 | 7.9 |
| Walking disorder | 1 | 0.8 |
| Otolaryngologic complaints | | |
| Hearing Disorders | 10 | 7.9 |
| Olfactive disorders | 5 | 3.9 |
| Post-traumatic sinusitis | 2 | 1.6 |
| Rhinitis | 1 | 0.8 |
| Urological complaints | | |
| Erectile disorders | 5 | 3.9 |
| General Complaints | | |
| Asthenia | 43 | 33.9 |
| Anorexia | 1 | 0.8 |
| Weight loss | 1 | 0.8 |
| Other pains | 21 | 16.5 |
| Ophthalmologic Complaints | | |
| Visual disorders | 9 | 7.1 |
| Hormonal disorders | | |
| | 1 | 0.8 |

**Figure 1.** Distribution of neurological disorders.

Neuropsychological disorders were more common in patients with severe BBI, but attention deficit disorders and difficulties in strategy development were also observed without a statistically significant difference **Table 3**. These neuropsychological disorders lead to dependence on others (**Table 4**). The quality of life of the patients as well as that of their entourage is affected, especially as the TBI is severe (**Table 4**). Thus, 19 patients lost their jobs after the BBI, so the unemployment rate among our sample rose from 6% to 21%. Among the 100 patients (79%) who found their jobs again, 14% had medical follow-up, and 10% had returned to part-time work. Remuneration remained unchanged for 61.2% of the BITs after their trauma.

Among the patients, 73.2% were unable to receive compensation; in 30.7% of the cases the person responsible for the accident could not afford to compensate the victim, in 42.5% of the cases the person responsible had escaped at the time of the accident. Of the patients compensated, 11% were compensated directly by insurance and 2.4% were compensated after a lawsuit. The compensation procedure was in progress at the insurance company in 7.9% of cases and at the court level in 2.4% of cases. Four patients (3.1%) did not start compensation proceedings.

Table 3. Neuropsychological disorders as a function of the severity of TBI.

| | Mild and moderate TBI | Severe TBI | p | OR [IC 95%] |
|---|-----------------------|------------|----------|---------------------|
| Attention deficit disorder | 13.6 | 47.8 | 0.0492 | 2.06 [1.00 - 4.27] |
| Mental control disorders | 14.8 | 53.8 | 0.000056 | 6.73 [2.84 - 15.93] |
| Oral comprehension disorders | 3.4 | 15.8 | 0.02160 | 5.31 [1.25 - 22.5] |
| Speech fluency disorders | 11.8 | 46.2 | 0.000022 | 6.42 [2.58 - 16.0] |
| Reading disability | 3.1 | 25.0 | 0.00705 | 10.5 [1.85 - 59.45] |
| Spelling disability | 1.6 | 15.0 | 0.0403 | 11.1 [1.08 - 113.7] |
| Spatial disorientation | 8.0 | 28.2 | 0.0025 | 4.54 [1.60 - 12.8] |
| Time disorientation | 2.3 | 15.4 | 0.0103 | 7.81 [1.50 - 40.7] |
| Reasoning disorder | 25.0 | 50.0 | 0.0059 | 3.00 [1.35 - 6.66] |
| Difficulties in the sequence of thought | 3.4 | 17.9 | 0.00537 | 6.12 [1.49 - 25.15] |
| Anosognosias | 3.4 | 15.4 | 0.0238 | 5.15 [1.21 - 21.80] |
| Difficulties in strategy development | 2.3 | 10.3 | 0.0713 | 4.91 [0.86 - 28.06] |
| Mental arousal, leugorrhoea | 12.5 | 30.8 | 0.01365 | 3.11 [1.22 - 7.87] |
| Difficulties in maintaining personal hygiene | 2.3 | 23.1 | 0.00039 | 12.9 [2.63 - 63.10] |
| apragmatism | 4.5 | 17.9 | 0.0195 | 4.59 [1.25 - 16.75] |
| Mental depression | 33.7 | 61.0 | 0.00345 | 3.07 [1.42 - 6.61] |
| Anxiety | 31.8 | 69.2 | 0.000087 | 4.82 [2.13 - 10.8] |
| Sexual dysfunction | 17.0 | 59.0 | 0.000031 | 6.99 [3.00 - 16.3] |

Table 4. Head injury dependencies and quality of life as a function of severity.

| | | TCE léger | TCE moyen | TCE grave | Pvalue |
|---|---|-----------|-----------|-----------|--------|
| Extended Glasgow outcome Scale: | | | | | |
| Good recovery | | | | | |
| <i>Superior level</i> | 8 | 0 (0.0) | 1 (100.0) | 0 (0.0) | |
| <i>Inferior level</i> | 7 | 45 (81.8) | 5 (9.1) | 5 (9.1) | |
| Moderate disability | | | | | |
| <i>Superior level</i> | 6 | 9 (39.1) | 6 (26.1) | 8 (34.8) | <0.001 |
| <i>Inferior level</i> | 5 | 3 (10.7) | 7 (28.6) | 17 (60.7) | |
| Severe disability | | | | | |
| <i>Superior level</i> | 4 | 1 (10.0) | 5 (50.0) | 4 (40.0) | |
| <i>Inferior level</i> | 3 | 2 (20.0) | 3 (30.0) | 5 (50.0) | |
| Vegetative state | 2 | 0 (0.0) | 0 (0.0) | 0 (0.0) | |
| Dead | 1 | 1 (33.3) | 0 (0.0) | 2 (66.7) | |
| Living standard | | | | | |
| <i>very satisfied</i> | | 44 (77.2) | 8 (14.0) | 5 (8.8) | <0.001 |
| <i>average quality of life</i> | | 11 (23.4) | 10 (21.3) | 26 (55.3) | |
| <i>not at all satisfied</i> | | 1 (8.2) | 10 (45.5) | 8 (36.4) | |
| Level of satisfaction of the carer with the patient's situation: | | | | | |
| <i>Very satisfied</i> | | 46 (76.7) | 9 (15.0) | 5 (8.3) | <0.001 |
| <i>Average quality of live</i> | | 10 (20.0) | 10 (20.0) | 30 (60.0) | |
| <i>Not at all satisfied</i> | | 4 (25.0) | 8 (50.0) | 4 (25.0) | |
| Accompanying person's opinion on his or her current quality of life: | | | | | |
| <i>Very satisfied</i> | | 52 (71.2) | 9 (12.3) | 12 (16.4) | <0.001 |
| <i>average quality of life</i> | | 8 (14.8) | 19 (35.2) | 27 (50.0) | |

4. Discussion

This study was conducted with a 6- to 24-month follow-up, which can be a bias in the evaluation of disorders since some neurological disorders can improve if the follow-up is 2 years for all patients. The use of the EBIS document allowed an overall assessment using a validated and reproducible European tool [14], which is a simple means of use, especially as the other scales used in the published literature are diverse and include elements that may not all be related to overall subjective QDV. In patients, this technique does of course come up against the problem of anosognosia, favoured by the trauma, but our results show that the difference with the patient's QDV as perceived by his or her entourage is relatively modest (Table 4). The absence of a standardised and validated QDV scale adapted to brain damaged patients is regrettable. Other elements have been analysed such as neurological disorders, dependence and social impact. Furthermore, descriptive and statistical analyses are limited due to the differences in severity of TBIs. However, this method also allowed us to see the differences in the evolution of TBIs in terms of neurological disorders and their quality of life.

Our study confirms that TBI mainly concerns the active male population in Benin [6] [8] [9]. The economic impact is significant, and we find in our study that 73.2% of TBIs did not receive compensation because the person responsible for the accident had fled or because the motorcycle or vehicle was uninsured.

Only 13.4% of the victims received compensation, which confirms the low rate of vehicles (5%) with insurance, which we had already reported in 2017 [9]. Also, the direct cost of the TBIs ranged from €188.19 to €522.08 [9], whereas the Minimum Guaranteed Wage is €64, which has a significant financial impact on the whole family, all the more so as the victims were working men, and often the main source of financial support for the family. In this study, 15% of the patients did not return to their original jobs and 10% were reclassified to a lower level, 38.8% had a decrease in income due to the trauma. The quality of life of this working population was also impaired (Table 4), which obviously had repercussions on the quality of life of the people they are now dependent on. The reasons for this dependency were mainly due to the neuropsychological sequelae:

- The intellectual disorders observed were difficulties in strategy development and attention disorders, which were frequent phenomena without significant difference between severe and minor or moderate TBIs.
- Observed impairments in executive function were apraxism, sequencing of thinking and reasoning related to the severity of the TBI.
- Self-criticism and poor personal hygiene were also linked to the severity of TBI.
- Reported sexual disorders were primarily sexual hyperexcitability, decreased libido and erectile dysfunction.
- The psychological and social disorders identified were communication disorders (fluency in speech, reading and spelling), mood and behavioural disorders (excitability, depression, anxiety, personal hygiene, sexuality) with a statistically significant correlation related to the severity of TBI. However, anxiety and depression may also be related to other life events, but the prevalence of depressive syndrome in patients with head injury is 7.5 times higher than in the general population [15]. This depressed mood reflects the fact that patients are distressingly aware of their sequelae.

These situations can be summed up by the quote from Blaise [16]: *overnight, the rules of the game are being shaken up. What he could do, he can no longer do, what he used to be able to do, he no longer knows, what he used to like to do, he no longer loves it. He is mourning a part of himself. There's a break in his life course. He is no longer "as he was before". He lives only in trouble. This quote was unfortunately the reality of our patients. It is important that a policy of prevention of traffic accidents and education of the population be implemented in order to reduce the occurrence of these accidents.* it seems necessary to us to adopt an integrative approach neuropsychological evaluation, which does not reduce the difficulties of the patients to their brain injury, but which also takes into account the various psychological, socio-cultural and social factors that affect and environmental factors involved in the quality of life of a person with brain injury.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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