EAJNS East African Journal of Neurological Sciences
Official journal of East African Association of Neurological Surgeons

Original Article EAJNS 4(2): 94-103

Six-Year Survival of Patients with Traumatic Brain Injury in Cameroon

Authors: Mfoaupon Ewane Hervé Blaise[1,2], Eyenga Victor[2], Ndeme Mboussi Wilfried Steve[4], and Dijentcheu Vincent De Paul[4]

Affiliations

1. Faculty of Medicine and Biomedical Science, The University of Yaoundé I
2. Laquintinie Hospital, Douala, Cameroon
3. Faculty of Medicine and Pharmacy, The University of Douala
4. Faculty of Sciences, Department of Biochemistry, The University of Douala

Corresponding Author: Mfoaupon Hervé Blaise. Email: mfouaponewaneherve@gmail.com

Received: 24-01-2025; Revised: 26-02-2025; Accepted: 02-03-2025

DOI: https://dx.doi.org/10.4314/eajns.v4i2.2

Abstract

Background: Traumatic brain injury (TBI) is a major cause of morbidity and mortality, especially in developing countries such as Cameroon, where it is often caused by road traffic accidents and assaults. At Laquintinie Hospital in Douala, data on the long-term survival of patients who have experienced TBI are scarce. This study aimed to examine the six-year survival of patients followed for traumatic brain injury in the hospital's emergency unit and neurosurgery department. **Methodology:** We conducted a six-year prospective study from January 2017 to January 2023, including 8,902 patients who were admitted for traumatic brain injury management. Sociodemographic data, injury severity, interventions performed, and patient outcomes (alive or deceased) were collected. Kaplan-Meier estimator and Cox model were used to analyze survival among these patients. **Results:** We followed 8,902 patients. The survival probability (SP) of patients with severe TBI was lower than that of patients with mild TBI ($p<0.001$). The SP of patients aged 75 to 100 years was lower than that of patients aged 3 to 25 years ($p = 0.02$). Male patients had a lower SP than female patients ($p = 0.002$); similarly, this probability was significantly lower for individuals without formal education compared to those with a university education level ($p<0.001$). Age was the only factor increasing the risk of mortality (HR = 2.21, $p = 0.02$). **Conclusion:** Our results highlight the importance of early and appropriate care, particularly for elderly patients, as well as the influence of sociodemographic factors on post-traumatic survival.

Keywords: Survival, traumatic brain injury

BACKGROUND

Traumatic brain injury (TBI) is an injury to the skull, scalp, or brain caused by a blow, fall, or collision, which can lead to injuries ranging from minor contusions to severe brain damage, often resulting in lasting neurological and psychological sequelae (1). TBI is a major cause of global morbidity and mortality and represents a public health priority, particularly in developing countries where resources for its management are insufficient (1). Approximately 69 million people sustain a TBI each year, with a global incidence rate of 939 per 100,000 people and an average mortality rate of 21 deaths per 100,000 people, higher in low-income countries (2, 3). In Africa, and notably in Cameroon, TBI is a common cause of hospitalization, worsened by population density and rapid urbanization, which increase the risk of road traffic accidents (4-7). An in-depth study on the survival of TBI patients at Laquintinie Hospital in Douala would allow for an evaluation of six-year survival rates and identification of factors influencing survival, to optimize TBI management and adapt public health strategies in Cameroon.

METHODS

Study type, study period, and study site

We conducted a prospective study (Open cohort) over a six-year period, from January 2017 to January 2023, in the Emergency and Neurosurgery Departments of Laquintinie Hospital in Douala (Cameroon). This hospital offers a range of specialized services (neurosurgery, intensive care, medical imaging, etc.) and operates a 24-hour emergency department equipped with CT scanners and MRI, thereby allowing for optimal management of complex injuries such as traumatic brain injuries (TBI).

Study Population

All patients admitted to the Emergency and Neurosurgery Departments for a traumatic brain injury sustained during the study period were included. Patients for whom it was impossible to obtain all the required information (sociodemographic data, trauma context, injury severity, and follow-up) were excluded. This exclusion could introduce a selection bias, as certain groups of patients (for example, those with limited follow-up capacity or living outside the city) may be underrepresented

Data Collection and Patient Follow-Up.

Data were collected using a structured questionnaire covering sociodemographic characteristics, the context and mechanism of injury, safety conditions, severity of lesions (assessed clinically and through imaging), and clinical outcome (death or survival). Patient follow-up aimed to measure six-year survival through regular hospital visits, telephone interviews, and review of medical records, with particular efforts to minimize loss to follow-up (alternative contact details, reminders, and cross-checking with civil and hospital records). Despite these measures, some patients remained unreachable, posing a potential source of bias. Furthermore, the exclusion of incomplete records and the risk of missing data (sociodemographic or long-term follow-up) also affected the representativeness of the sample and the reliability of six-year survival estimates.

Evaluation of Injury Severity

The severity of the TBI was assessed during our study using the Glasgow Coma Scale (GCS). In this study, the GCS score was systematically recorded for each patient upon admission, allowing classification of injuries into three categories: mild (score of 13-15), moderate (score of 9-12), and severe (score of 3-8).

Ethical Considerations and Administrative Authorizations

Ethical approval and administrative authorisation for the study were obtained from the Ethics Committee of Laquintinie Hospital in Douala. Informed consent was provided by participants or family members, and all collected data were kept strictly confidential with physical and electronic barriers.

Statistical Analyses

Data were entered into an Excel spreadsheet (Microsoft Office, USA) and imported into R software version 4.4.2 for Windows. Categorical variables were presented as frequencies (N, n) and percentages (%), while continuous variables were presented as mean ± standard deviation. The Shapiro-Wilk normality test was performed on continuous variables, and the non-parametric Mann-Whitney test was used to compare mean ages between the sexes. Fisher's and Pearson's chi-square independence tests were used to study the dependency between categorical variables. The Kaplan-Meier estimator was used to plot survival curves, and the Cox model was used to identify factors increasing the risk of mortality. For these tests, the confidence interval for the null hypothesis (Ho) was set at 95%, and the margin of error at 5% (Ho rejected if $p < 0.05$).

RESULTS

Sociodemographic Factors

The mean age of patients with traumatic brain injury (TBI) in our study was 35 ± 15 years, with an age range of 3 to 99 years. The most represented age group was 25 to 50 years (56%). The majority of patients resided in urban areas (96%) and had a secondary level of education (63%). Most patients were self-employed (35%). Mortality caused by TBI was associated with age group ($p = 0.021$), education level ($p < 0.001$), and occupation ($p < 0.001$) (Table 1).

Overall mortality

At the end of the six-year follow-up period, the overall mortality rate was 7.6% (n = 662).

Survival Probability by Trauma Severity

The survival probability of patients with severe traumatic brain injury was significantly lower than that of patients with moderate or mild traumatic brain injury ($p < 0.001$) (Figure 2).

Survival Probability by Age Group

Patients with traumatic brain injury aged between 75 and 100 years had a significantly lower survival probability than patients in other age groups (3–25 years, 25–50 years, 50–75 years) ($p = 0.02$) (figure 3). Survival

Probability by Sex

Male patients with traumatic brain injury had a significantly lower survival probability than female patients ($p = 0.009$) (Figure 4).

Survival probability according to residence

No difference was found in the survival probability of male patients living in urban areas who suffered a traumatic brain injury compared to those living in rural areas ($p = 0.9$) (Figure 5).

Survival Probability According to Education Level

Patients with a formal education who suffered a traumatic brain injury had a significantly lower survival probability compared to patients with a university, secondary, or primary education level ($p<0.001$) (Figure 6)

Table 1: Sociodemographic Factors

Sociodemographics factors	Patient deaths			p-value
	Overall (N = 8665)	No (N = 8003)	Yes (N = 662)	
Age (years)	35±15[3-99]	35±15[3-99]	35±16[3-95]	0.6
Age group (years)				0.021
25-50 years	4,886 (56%)	4,540 (52%)	346 (4.0%)	
3-25 years	2,547 (29%)	2,343 (27%)	204 (2.4%)	
50-75 years	1,108 (13%)	1,019 (12%)	89 (1.0%)	
75-100 years	113 (1.3%)	97 (1.1%)	16 (0.2%)	
Residence				>0.9
Urban	8,253 (96%)	7,662 (89%)	591 (6.9%)	
Rural	319 (3.7%)	297 (3.5%)	22 (0.3%)	
Education Level				<0.001
Secondary-High School	4,603 (63%)	4,354 (59%)	249 (3.4%)	
Primary School	1,741 (24%)	1,640 (22%)	101 (1.4%)	
Tertiary-College	473 (6.5%)	451 (6.2%)	22 (0.3%)	
No formal education	421 (5.7%)	372 (5.1%)	49 (0.7%)	
University	86 (1.2%)	85 (1.2%)	1 (<0.1%)	
Occupation				<0.001
Self-Employed	2,391 (35%)	2,216 (32%)	175 (2.6%)	
Salaried Worker	1,622 (24%)	1,540 (22%)	82 (1.2%)	
Student	770 (11%)	717 (10%)	53 (0.8%)	
Housewife	582 (8.5%)	553 (8.1%)	29 (0.4%)	
FarmerAgricultural Worker	466 (6.8%)	424 (6.2%)	42 (0.6%)	
Unemployed	361 (5.3%)	329 (4.8%)	32 (0.5%)	
Unemployed (able to work)	301 (4.4%)	275 (4.0%)	26 (0.4%)	
Retired	183 (2.7%)	161 (2.3%)	22 (0.3%)	
Professional technical managerial	148 (2.2%)	138 (2.0%)	10 (0.1%)	
Clericaladministrative	35 (0.5%)	31 (0.5%)	4 (<0.1%)	

Data are presented as mean ± standard deviation (SD), frequency (N), and percentage (%). P-value: The non-parametric Mann-Whitney test and Pearson's Chi-squared test were performed to compare mean ages and to assess the dependence of categorical variables between deceased and non-deceased individuals, respectively. For these tests, the confidence interval for the null hypothesis (Ho) was set at 95%, with a margin of error of 5% (significant if $p < 0.05$).

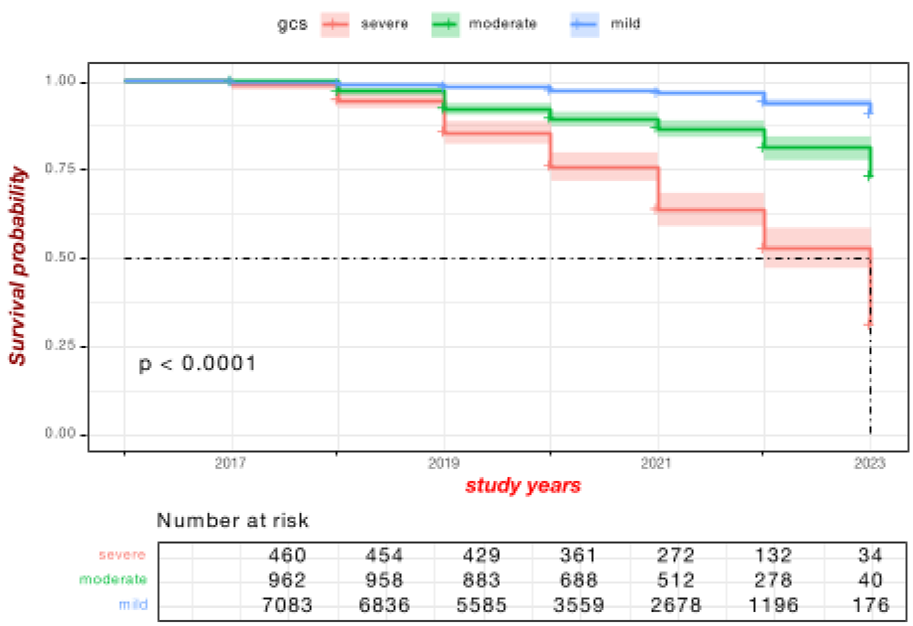

Figure 2: Kaplan-Meier curve estimating the survival probability of patients with traumatic brain injury based on trauma severity

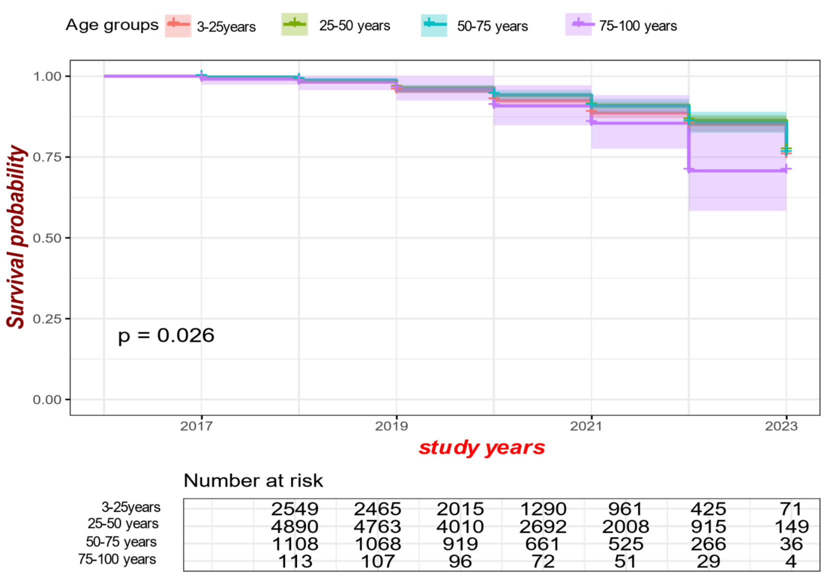

Figure 3: Kaplan-Meier curve estimating the survival probability of patients with traumatic brain injury based on age group.

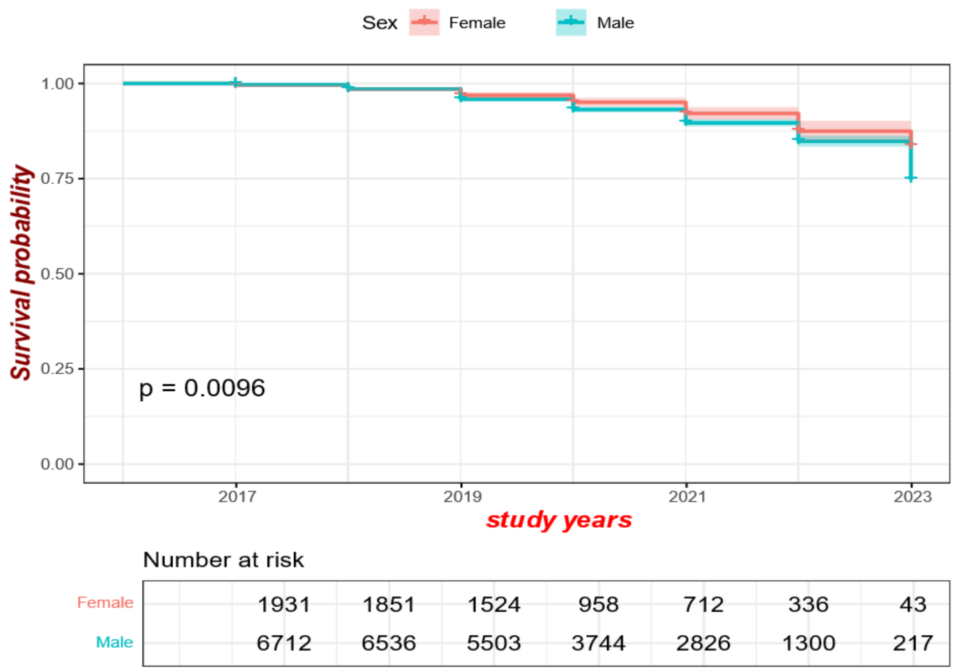

Figure 4: Kaplan-Meier curve estimating the survival probability of patients with traumatic brain injury based on sex.

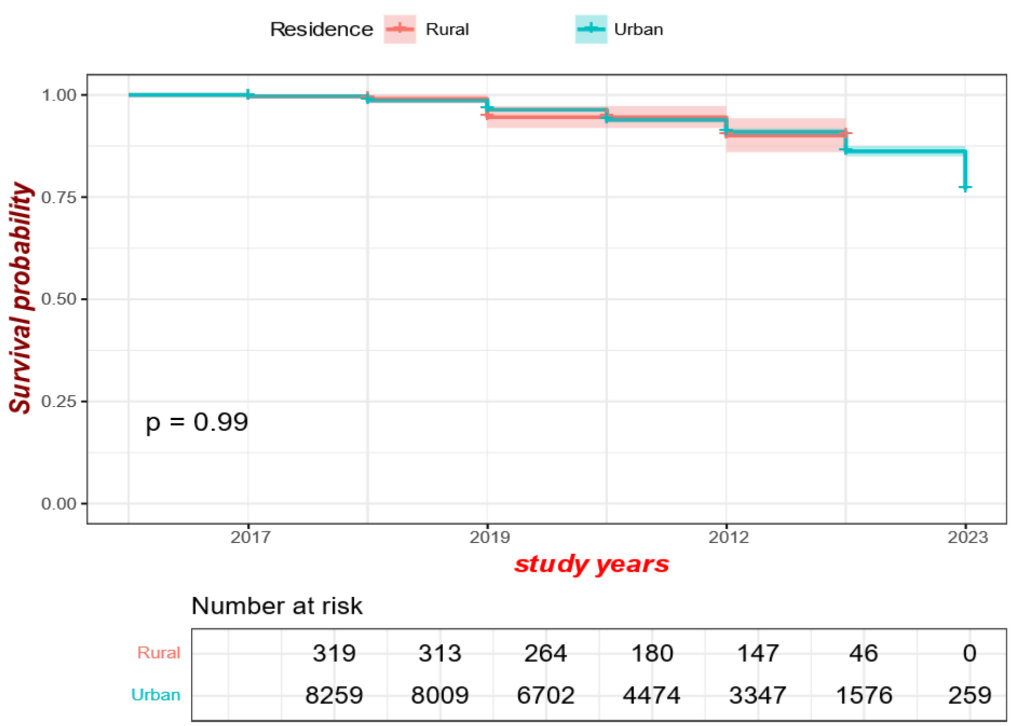

Figure 5: Kaplan-Meier curve estimating the survival probability of patients with traumatic brain injury according to place of residence.

Estimation of Mortality Risk

The factor increasing the risk of mortality was age (patients aged between 75 and 100 years) (HR = 2.21, p = 0.02). Patients with moderate or mild traumatic brain injury had a significantly reduced mortality risk compared to those with severe traumatic brain injury (p < 0.001). Patients with primary, secondary, or higher education levels had a significantly reduced mortality risk compared to those with formal education only (p < 0.001) (Figure 7).

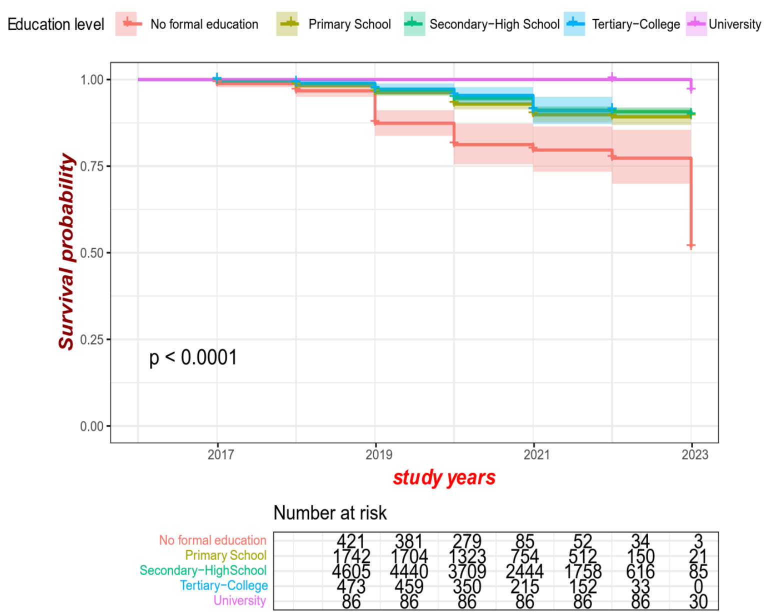

Figure 6: Kaplan-Meier curve estimating the survival probability of patients with traumatic brain injury according to education level

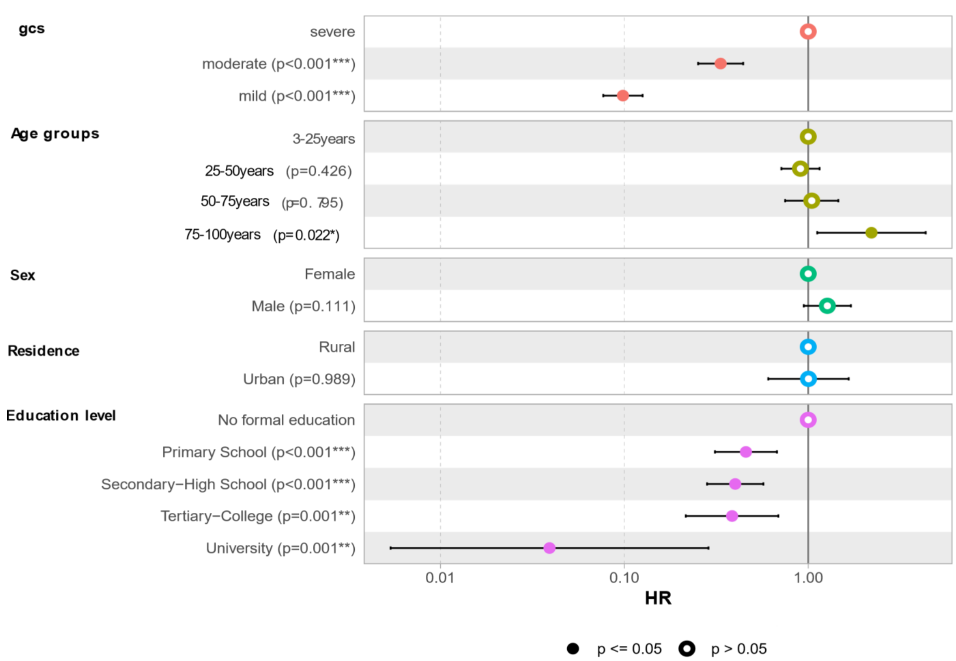

Figure 7: Cox model estimating the mortality risk in patients with traumatic brain injury.

DISCUSSION

The findings of this study highlight the substantial burden of traumatic brain injury (TBI) in Cameroon, with the average patient age of 35 ± 15 years and a prevalence in the 25–50 age group (56%). These results are consistent with global observations indicating that young adults, particularly men, are most affected by TBI due to high-risk activities, such as road traffic incidents and manual labor (9). Urban areas accounted for 96% of the cases, reflecting the impact of population density, rapid traffic growth, and urban violence on TBI incidence, as reported in other African studies (13,14). Additionally, most patients had secondary education (63%), which may be associated with employment in higher-risk jobs that often lack adequate safety measures.

Beyond sociodemographic parameters, clinical factors played a decisive role in survival. Injury severity was one of the strongest predictors of mortality, aligning with global evidence showing that lower Glasgow Coma Scale scores are associated with worse outcomes (17). In sub-Saharan Africa, limited access to intensive care units and advanced diagnostic tools can further compromise survival rates among patients with severe TBI (15,19). Advanced age similarly increased the mortality risk, as elderly patients often have decreased neuroplasticity and a higher burden of comorbidities (19,20). Moreover, male patients showed lower survival rates than females, which may be attributed to greater involvement in dangerous activities and possible neuroprotective effects of female hormones like estrogen (21,22). Lower education levels were also linked to poorer outcomes, explained by reduced awareness of safety measures, delayed hospital presentation, and financial barriers to comprehensive care (14,15,23,24). Comparable findings in Kenya and Cameroon underscore the need for broader public health interventions, including education campaigns and improved healthcare coverage (19,27).

These disparities in healthcare access likely influenced the survival outcomes observed. Delays in emergency interventions—due to traffic congestion or limited ambulance services—can critically affect prognosis in severe TBI. Although Laquintinie Hospital is relatively well-equipped, the ratio of neurosurgeons and intensive care beds to the population remains low, often leading to treatment delays. Financial barriers, such as out-of-pocket payments for diagnostic imaging and neurosurgical procedures, can deter timely management or lead to premature discharge for patients who cannot afford continuous care. Additionally, patients from rural or remote regions may face even greater challenges in reaching tertiary centers like Laquintinie Hospital. Addressing these socioeconomic and structural constraints is therefore vital. Strengthening prehospital care systems, expanding neurosurgical resources, and implementing targeted preventive strategies (e.g., enforcement of helmet and seatbelt laws, occupational safety regulations) are essential steps toward reducing TBI-related morbidity and mortality in Cameroon and other low- and middle-income countries.

CONCLUSION

This six-year study at Laquintinie Hospital in Douala shows that TBI remains a major cause of mortality, particularly among patients with severe TBI, older patients, males, and those with low education levels. The results indicate that the probability of survival is significantly lower in older patients (75-100 years) compared to younger ones (3-25 years), and that male gender and lack of formal education are associated with an increased risk of post-TBI mortality. Additionally, age is the factor most strongly correlated with a higher mortality rate.

Limitations

The main limitations of this study include: 1) Monocentric nature: Since the study was limited to a single hospital (Laquintinie), it is challenging to generalize the findings to the entire Cameroonian population. 2) Absence of certain variables: Important factors such as post-acute care level, quality of rehabilitation, comorbidities, and social support were not considered. 3) Incomplete follow-up for some patients: Loss to follow-up may limit the accuracy of long-term survival estimates.

Future Perspectives

For optimal management of TBI in Cameroon, it is essential to develop multicenter studies to improve data representativeness. The results of this study also highlight the importance of reinforcing preventive measures, particularly in road safety and violence prevention. Furthermore, follow-up and rehabilitation programs for TBI patients could help improve long-term survival rates.

Consent to publication: All authors have read and agreed that the article should be published.

Conflicts of interest: We declare no conflict of interest

Funding: We have not received any funding for this work.

Authors' contributions

Data collection, analysis and visualisation: Mfouapon Ewane Hervé Blaise, Ndeme Mboussi Wilfried, Eyenga Victor and Djientcheu Vincent De Paul

Resources and software: Mfouapon Ewane Hervé Blaise, Ndeme Mboussi Wilfried and Djientcheu Vincent De Paul

Manuscript Writing: Mfouapon Ewane Hervé Blaise and Djientcheu Vincent De Paul

Acknowledgements

We thank all the patients who consented to participate in this study, as well as the administration of Laquintinie Hospital in Douala for their support in patient recruitment. We also express our gratitude to STATVISION for conducting the statistical analyses for this study.

REFERENCES

1. Aladawi M, Elfil M, Abu-Esheh B, et al. Guillain Barre Syndrome as a Complication of COVID-19: A Systematic Review. Canadian Journal of Neurological Sciences / Journal Canadien des Sciences Neurologiques. 2022;49(1):38-48. doi:10.1017/cjn.2021.102.
2. 2. Kollár K, Liptai Z, Rosdy B, Móser J. Guillain-Barré-szindróma gyermekkorban [Guillain-Barré syndrome in childhood]. Ideggyogy Sz. 2009 Nov 30;62(11-12):399-404. Hungarian. PMID: 20025130.Kapessa ND, Banza MI, Ntalaja J, et al. Hydrocéphalie de l'enfant: aspects clinique, paraclinique et thérapeutique dans quatre formations médicales de Lubumbashi, Pan Afr Med J. 2022 Oct 31;43:114, doi: 10.11604/pamj.2022.43.114.27919. PMID: 36721474; PMCID: PMC9860090.
3. Nathalie Dinganga Kapessa et al. Hydrocéphalie de l'enfant: aspects clinique, paraclinique et thérapeutique dans quatre formations médicales de Lubumbashi. Pan African Medical Journal. 2022;43(114).10.11604/pamj.2022.43.114.27919.
4. Abdulaziz ATA, Zhou D, Li JM. Hydrocephalus in Guillain barre syndrome: A case report and review of the literature. Medicine (Baltimore). 2020 Apr;99(16):e18638. doi: 10.1097/MD.0000000000018638. PMID: 32311917; PMCID: PMC7220732.
5. Ersahin Y, Mutluer S, Yurtseven T. Hydrocephalus in Guillain-Barré syndrome. Clin Neurol Neurosurg. 1995 Aug;97(3):253-5. doi: 10.1016/0303-8467(95)00041-h. PMID: 7586859.
6. Denny-Brown DE. The changing pattern of neurologic medicine. N Engl J Med

1952;246:839–46.

7. Korinthenberg R, Trollmann R, Felderhoff-Müser U.and al. Diagnosis and treatment of Guillain-Barré Syndrome in childhood and adolescence: An evidence- and consensus-based guideline. Eur J Paediatr Neurol.2020 Mar;25:5-16.doi: 10.1016/j.ejpn.2020.01.003. Epub 2020 Jan 7. PMID: 31941581.
8. Anastasopoulou S, Lindefeldt M, Bartocci M, Wickström R. Acute inflammatory demyelinating polyradiculoneuropathy in a newborn infant. Eur J Paediatr Neurol. 2016;20(5):754-7.
9. Vedrenne-Cloquet M, Maincent K, Billette de Villemeur T, Mayer M. Guillain-Barré syndrome in infancy: The importance of electroneuromyography. Arch Pediatr. 2016;23(2):184-7.
10. Janeway R, Kelly DL., Jr Papilledema and hydrocephalus associated with recurrent polyneuritis. Guillain-Barre type. Arch Neurol 1966;15:507–14. [PubMed] [Google Scholar]
11. Liu CY, Kao CD, Chen JT, Yeh YS, Wu ZA, Liao KK. Hydrocephalus associated with Guillain-Barre syndrome. J Clin Neurosci. 2006 Oct;13(8):866-9. doi: 10.1016/j.jocn.2005.11.035. Epub 2006 Sep 7. PMID: 16959489.
12. Gilmartin RC, Ch'ien LT. Guillain-Barré syndrome with hydrocephalus in early infancy. Arch Neurol. 1977 Sep;34(9):567-9. doi: 10.1001/archneur.1977.00500210069013. PMID: 889500.
13. Hantson P, Horn JL, Deconinck B, et al. Hydrocephalus in GuillainBarre syndrome. Eur Neurol 1991;31:426–7.
14. Barzegar M, Malaki M. Guillain-Barre syndrome presenting with severe hydrocephalus in a child. J Pediatr Neurosci 2013;8:175-6.
15. Reid AC, Draper IT. Pathogenesis of papilloedema and raised intracranial pressure in Guillain-Barre syndrome. Br Med J 1980;281:1393–4.
16. Ozdemir O, Calisaneller T, Sonmez E, et al. Atypical presentation of Guillain-Barre syndrome with acute hydrocephalus. Acta neurochirurgica 2008;150:87–8.
17. Morley JB, Reynolds EH. Papilloedema and the LandryGuillain-Barre syndrome. Case reports and a review. Brain 1966;89:205–22.
18. Doxaki C, Papadopoulou E, Maniadaki I, Tsakalis NG, Palikaras K and Vorgia P (2021) Case Report: Intracranial Hypertension Secondary to Guillain-Barre Syndrome.Front. Pediatr. 8:608695.doi: 10.3389/fped.2020.608695.
19. Avila-Smirnow D, Córdova-Aguilera M, Cantillano-Malone C, Arriaza-Ortiz M, Wegner-Araya A. Guillain-Barré Syndrome and Hydrocephalus in an infant with Wiskott-Aldrich Syndrome. Rev Chil Pediatr. 2020 Feb;91(1):105-110. English, Spanish. doi: 10.32641/rchped.v91i1.1208. Epub 2019 Dec 3. PMID: 32730420.
20. Mantadakis Elpis, Spanaki Anna-Maria, Psaroulaki Anna, and al. Encephalopathy complicated by guillain-barre syndrome and hydrocephalus and associated with acute bartonella quintana infection. The Pediatric Infectious Disease Journal 26(9):p 860-862, September 2007.DOI: 10.1097/INF.0b013e318124aa08.
21. Okumura A, Ushida H, Maruyama K, Itomi K, Ishiguro Y, Takahashi M, Osuga A, Negoro T, Watanabe K. Guillain-Barré syndrome associated with central nervous system lesions. Arch Dis Child. 2002 Apr;86(4):304-6. doi: 10.1136/adc.86.4.304. PMID: 11919115; PMCID: PMC1719164.
22. Farrell K, Hill A, Chuang S. Papilledema in Guillain-Barré syndrome. A case report. Arch Neurol. 1981 Jan;38(1):55-7. doi: 10.1001/archneur.1981.00510010081018. PMID: 6970030.
23. Tisell M. Normal pressure hydrocephalus and polyneuropathy. South Med J. 2006 Oct;99(10):1052. doi: 10.1097/01.smj.0000223694.03309.bd. PMID: 17100020.