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Road Safety Concerns in Nigeria: Evidence on Mechanisms and Demographic Correlates of Mild Traumatic Brain Injury from a Tertiary Trauma Centre

Running Head: Mechanisms and Demographic Correlates of Mild Traumatic Brain Injury

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Abstract

Background: Mild traumatic brain injury (mTBI) constitutes the majority of traumatic brain injuries worldwide and is associated with substantial healthcare utilization. Contemporary epidemiological data from low- and middle-income countries are limited. Wherefore this study provides evidence for planning and prevention of this public health burden.

Methods: A descriptive cross-sectional study was conducted among adult patients presenting with mTBI at a tertiary trauma centre in Abuja, Nigeria. Demographic characteristics and mechanisms of injury were analysed.

Results: A total of 103 patients were included. Young adult males predominated, and road traffic accidents were the leading mechanism of injury.

Conclusion: mTBI in Nigeria disproportionately affects economically productive males and is largely attributable to preventable road traffic injuries.

Keywords: *Road safety, mild traumatic brain injury; epidemiology; road traffic accident; Nigeria; trauma; low- and middle-income countries.*

Introduction

Traumatic brain injury (TBI) represents a major and growing public health problem worldwide, contributing substantially to mortality, disability, and socioeconomic burden(1). Mild traumatic brain injury (mTBI) constitutes approximately 70–90% of all TBIs presenting to emergency departments globally.[2] Despite its classification as "mild," mTBI is associated with significant short- and long-term morbidity, healthcare utilization, and economic impact.[3] Recent epidemiological data highlight substantial regional variation in mTBI mechanisms and affected populations. In high-income countries, falls among the elderly increasingly predominate, whereas in low- and middle-income countries (LMICs), road traffic accidents (RTAs) remain the leading cause.[4–6] The reasons are that in high-income countries, sustained investments in road safety legislation, vehicle design, and organized trauma care have resulted in a gradual shift in the epidemiology of mTBI, thereby allowing falls among older adults to be represent the dominant mechanism of injury in these settings, reflecting demographic transitions and population ageing.[7] In contrast, LMICs continue to experience a disproportionate burden of road traffic–related head injuries due to rapid urbanization, motorisation, inadequate road infrastructure, and weak enforcement of traffic regulations.[8] Sub-Saharan Africa bears a disproportionate burden due to rapid urbanization, poor road infrastructure, limited enforcement of traffic regulations, and increasing motorcycle use.[9] Nigeria, the most populous country in Africa, contributes significantly to the regional trauma burden. The World Health Organization's 2023 Global Status Report on Road Safety estimates Nigeria's road traffic fatality rate among the highest globally.[8] Structural deficiencies in road design, limited pedestrian infrastructure, poor vehicle roadworthiness, and inadequate public transportation systems have resulted in widespread reliance on commercial motorcycles and tricycles ("okada" and "keke"), which are associated with a high risk of head injury. However, hospital-based epidemiological data on mTBI remain sparse, fragmented, and often outdated, particularly for urban trauma centres managing large volumes of mild head injury patients.

Within West Africa, similar patterns have been reported in Ghana, Sierra Leone, and Côte d'Ivoire, where road traffic accidents remain the dominant cause of TBI among young adults.[10–12] Motorcycle-related crashes, in particular, account for a growing proportion of head injuries in urban and peri-urban areas, often involving riders and passengers who do not use protective helmets. Weak enforcement of helmet legislation, combined with socioeconomic pressures and limited public awareness, continues to undermine prevention efforts across the subregion. Beyond mortality, non-fatal mTBI imposes a substantial but underappreciated socioeconomic burden. Individuals with mTBI frequently experience persistent post-concussive symptoms that interfere with employment, education, and social participation. In economically productive age groups, even mild brain injuries can result in significant income loss and long-term economic hardship for affected households.[3,13] Health systems in Nigeria and much of West Africa are ill-equipped to manage this cumulative burden, given competing health priorities, limited diagnostic resources, and shortages of trained personnel.

Understanding demographic patterns and mechanisms of mTBI is essential for targeted prevention strategies, resource planning, and policy development. Contemporary trauma systems increasingly emphasise injury surveillance as a cornerstone of public health intervention.[14] Despite the magnitude of the problem, contemporary hospital-based epidemiological data on mTBI in Nigeria remain sparse. Many existing studies focus primarily on moderate-to-severe TBI or aggregate all head injuries into a single category, limiting their usefulness for targeted prevention and policy development.[15,16] Robust, context-specific data on mTBI are therefore essential to inform evidence-based interventions, guide policy decisions by agencies such as the Federal Road Safety Corps (FRSC), and support the development of effective trauma surveillance systems. This study therefore examines the demographic characteristics and mechanisms of mild traumatic brain injury in an urban Nigerian tertiary trauma centre, providing updated epidemiological insights relevant to prevention and healthcare planning as well as road safety.

Methods

This descriptive cross-sectional study was conducted at the Trauma Centre of the National Hospital Abuja between November 2021 and July 2022. All consecutive adult patients aged 16 years and above who presented within 24 hours of blunt head injury and had a Glasgow Coma Scale score of 13–15 were eligible. Patients with penetrating head injuries, polytrauma requiring immediate operative intervention, or incomplete clinical records were excluded. Ethical approval was obtained from the Health Research Ethics Committee of the National Hospital Abuja on the 7th December 2020 (Approval No: NHA/EC/108/2020). The study was conducted in accordance with the Declaration of Helsinki, and all patient data were anonymized.

Table 1. Demographic Characteristics of Patients with Mild Traumatic Brain Injury

Variable	Frequency	Percentage (%)
Male	91	88.3
Female	12	11.7
Age 21–40 years	67	65.0

Demographic and injury-related data were collected using a structured proforma. Variables recorded included age, sex, occupation, and mechanism of injury. Mechanisms of injury were categorized into road traffic accidents, assaults, falls, sports-related injuries, and domestic accidents. Data were analysed using IBM SPSS version 25 and summarized using descriptive statistics.

Results

A total of 103 patients with mild traumatic brain injury were analysed and presented in tables and figures. The mean age of patients was 32.5 ± 12.3 years, with the majority (65%) aged between 21 and 40 years. Males constituted 91 cases (88.3%), giving a male-to-female ratio of 7.6:1.

Road traffic accidents were the most common mechanism of injury, accounting for 63.1% of cases. Assaults and falls each accounted for 13.6% of injuries, while sports-related and domestic accidents accounted for smaller proportions. Artisans (24.3%) and students (20.4%) were the most affected occupational groups.

Discussion

This study provides contemporary evidence on the epidemiology of mild traumatic brain injury from a major urban tertiary trauma centre in Nigeria. Table 1 shows findings that demonstrate a clear predominance of young adult males while Table 2 and figure 1 identify road traffic accidents as the principal mechanism of injury, accounting for nearly two-thirds of cases. These observations are consistent with reports from Nigeria and other West African countries and underscore the persistent public health challenge posed by preventable road traffic injuries.[10–12,16]

Demographic Patterns in Contemporary Context

The marked male predominance observed aligns with recent epidemiological studies across Africa and Asia, where males constitute 70–90% of TBI patients.[10,12] This trend reflects gender-based differences in occupational exposure, driving behaviour, and risk-taking activities. The concentration of cases in the 21–40-year age group underscores the significant socioeconomic impact of mTBI, as this demographic represents the most economically productive segment of the population. In contrast, high-income countries have reported a demographic shift toward older adults, largely driven by falls.[7] The persistence of a younger age profile in Nigeria highlights structural differences in injury mechanisms and emphasises the need for context-specific prevention strategies.

Table 2. Mechanisms of Injury among Patients with mTBI

Mechanism of Injury	Frequency (%)
Road traffic accident	63.1
Assault	13.6
Fall	13.6
Sports injury	4.9
Domestic accident	4.8

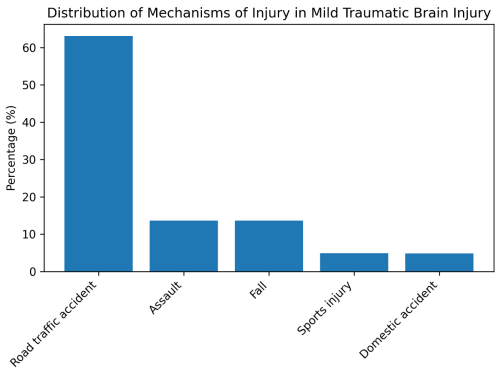

Figure 1. Distribution of Mechanisms of Injury

Mechanisms of Injury and Public Health Implications

Road traffic accidents were the dominant mechanism of injury, consistent with WHO estimates and recent Nigerian and sub-Saharan African trauma series.[7,11] Factors contributing to this pattern include poor road conditions, weak enforcement of traffic laws, low helmet and seatbelt compliance, and high commercial motorcycle usage. Assaults and falls accounted for a significant minority of cases, reflecting urban interpersonal violence and occupational hazards. Similar distributions have been reported in recent Nigerian and West African studies, suggesting persistent social and environmental determinants of injury.[12,17]

Implications for Prevention and Policy

The epidemiological profile observed in this study has direct implications for injury prevention. Contemporary trauma literature emphasises the importance of evidence-based interventions such as helmet legislation, speed control, alcohol enforcement, and public education campaigns.18,19] Nigeria's ongoing road

safety challenges indicate a need for stronger multisectoral collaboration between health, transport, and law enforcement agencies as road safety includes both the methods and measures used for prevention of accidents.[20] From a healthcare planning perspective, the predominance of mTBI underscores the importance of efficient emergency department triage and imaging stewardship. Integration of validated clinical decision rules could complement prevention strategies by optimising resource use while maintaining patient safety.[13]

Comparison with Contemporary African Data

Recent hospital-based studies from Nigeria, Ghana, and Kenya report similar patterns of male predominance and RTA-driven mTBI, confirming the external validity of the present findings.[11,12] However, variability in reported mechanisms highlights the need for standardized trauma registries and continuous surveillance systems across the region.

Limitations

This study is limited by its single-centre design and modest sample size. Additionally, prehospital fatalities and patients with minor injuries who did not present to hospital were not captured, potentially underestimating true community incidence. Nonetheless, the findings provide valuable contemporary data from a major urban trauma centre.

Conclusion

Mild traumatic brain injury in Nigeria predominantly affects young adult males, with road traffic accidents remaining the principal mechanism of injury. These findings underscore the urgent need for strengthened road safety policies, targeted injury prevention strategies, and improved trauma surveillance. Updated epidemiological data such as these are essential to inform public health interventions and healthcare system planning in low- and middle-income countries. These approaches will help mitigate the long-term socioeconomic impact of brain injury in Nigeria and West Africa.

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