

Research Article

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Motorcycle-Related Lower Extremity Trauma in Nigeria: A Review of Presentation, Etiology, Pain Management and Clinical Outcomes

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Abstract

Introduction: Commercial and personal motorcycles (Okada) are a major mode of intra-urban transportation and a significant contributor to road traffic crashes across West Africa, with lower extremity injuries causing substantial morbidity, disability, and socioeconomic burden, prompting this study to evaluate their epidemiology, clinical presentation, anatomical distribution, treatment modalities, pain management, and clinical outcomes.

Methods: We applied the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The research was conducted using databases, including PubMed, Google Scholar, Bielefeld Academic Search Engine, and CORE. The inclusion criteria were studies that assessed motorcycle-related foot and lower extremity injuries. Nine articles were considered in the research, of which one study met the inclusion criteria.

Results: Of the 587 patients with motorcycle injuries, 393 (67%) of them sustained extremity injuries. Motorcycle collisions with motor vehicles were the topmost mechanism of injury. The lower extremity was the most common site involved. Fractures, abrasions and lacerations were the three top injuries sustained.

Conclusion: Motorcycle-related foot and lower extremity injuries in Nigeria are a growing public health concern requiring improved road safety, mandatory protective gear, timely treatment, and modern orthopedic trauma care to reduce morbidity and disability.

Keywords: extremity; foot; motorcycle-related; trauma; Nigeria

Introduction

Lower extremity injuries caused by road traffic crashes are a matter of global public health. According to World Health Organization (WHO), fatal crashes on the road account for about 1.2 million live losses and various injuries to 50 million people worldwide each year [1]. The issue is more common in economically disadvantaged and developing nations [2]. This difficulty is intensified by the escalating deployment of motorcycles for commercial operations involving passenger conveyance, cargo distribution, and service delivery [3]. Motorcycles are among the most hazardous transportation modalities with crash exposure and mortality rates per unit distance traveled relative to conventional automobiles [4].

Numerous factors have been attributed to the proliferation of motorcycles on Nigerian roadways. These factors include the affordability of contemporary Asian motorcycle models alongside

their capacity to navigate through congested traffic conditions and deteriorated road infrastructure [3]. Nevertheless, traffic congestion is not a concern in rural communities. In reality, rural and suburban communities are characterized by an inadequate road network.

The structural configuration of motorcycles renders them inherently open and devoid of protective safety mechanisms. Consequently, during collision events, occupants are typically ejected from the vehicle and frequently sustain injuries resulting from contact with the ground surface. Additional injury mechanisms affecting motorcycle occupants include falls occurring during transit or preceding a collision, direct contact with other vehicles during impact events, entrapment of limbs within motorcycle wheel spokes, and thermal injuries sustained from contact with exhaust pipe systems [5]. A pedestrian hit by a motorcycle is also at risk of extremity injuries as a result of the collision.

Motorcycle extremity injury ranging from minor to limb or life-threatening ones may occur as an isolated injury limited to the extremities or as a component of injury in a polytraumatized victim [6]. The foot and distal lower extremity demonstrate exceptional susceptibility to injury during motorcycle accidents [7]. Given their direct exposure to ground contact, lateral collisions with motor vehicles, compressive forces applied against motorcycle frames, and potential entanglement within rotating wheel components, the foot frequently serves as an initial point of impact or compression. Although this vulnerability exists, individuals operating motorcycles and traveling as passengers in Nigeria infrequently utilize protective footwear, leather lower-body garments, or shin protection equipment. The morphological characteristics and pathophysiological mechanisms underlying motorcycle crashes demonstrate substantial variability, which consequently affects the anatomical localization, intensity, and clinical prognosis of sustained injuries [8]. The injury pattern is determined by multiple variables including velocity of travel, utilization of helmets and protective apparatus, impact characteristics, environmental road factors, and the anatomical positioning of the affected individual during the moment of collision [9]. Consequently, an exhaustive comprehension of injury mechanisms and their correlation with anatomical distribution, injury severity, and outcomes associated with motorcycle-related extremity trauma within a particular context is imperative. This evidence base can facilitate the development of context-appropriate preventive approaches, encompassing enhanced road safety infrastructure, judicious application of protective equipment, and population-level health interventions. Moreover, recognition of predominant injury configurations and associated sequelae can facilitate optimal prehospital

patient stratification, expedited clinical diagnosis, evidence-based therapeutic planning, and structured rehabilitation protocols, thereby enhancing patient outcomes and diminishing the persistent societal burden attributable to motorcycle-related injuries. While road traffic injuries have been extensively documented in Nigerian, the existing literature contains a notable scarcity of review specifically addressing motorcycle-related foot injuries, thereby underscoring the necessity for this research.

Methods

A literature search was carried out according to the PRISMA guidelines [10]. The databases searched were including PubMed, Google Scholar, Bielefeld Academic Search Engine, CORE, and regional databases such as the African Index Medicus. The search strategy used combinations of the following terms: "Motorcycle-Related Foot trauma in Nigeria", "Motorcycle-Related Lower Extremity Injuries in Nigeria", AND "Motorcycle-Related Foot and Extremity trauma in Nigeria". Studies were considered for inclusion if they: (a) were carried out in Nigeria; (b) Studies on motorcycle-related lower extremity injuries; (c) Studies involving riders, passengers, pedestrians injured by motorcycles; (d) Studies that focused on the types of injuries, anatomical locations and mechanism of injuries; (e) Studies that described the pain management of motorcycle related lower extremity injuries.

Results

We located Nine articles via the database search. After screening the titles and abstracts, the inclusion/exclusion criteria were applied to check the relevance of the articles. As a result, only one study was included in the final review, whereas the others were excluded due to the lack of the relevance to the research question.

Table 1: Lower extremity injury types and location.

Sites	Abrasion (%)	Bruises (%)	Laceration (%)	Avulsion (%)	Crush (%)	Dislocation (%)	Fracture (%)
Hip	0	5 (1.3)	2 (0.5)	1 (0.3)	0	3 (0.8)	18 (5.2)
Thigh	6 (1.5)	13 (3.4)	5 (1.3)	1 (0.3)	1 (0.3)	-	44 (12.5)
Knee	3 (0.8)	16 (4.1)	8 (2.1)	2 (0.5)	0	-	4 (1.0)
Leg	8 (2.0)	38 (9.8)	40 (10.4)	2 (0.5)	5 (1.3)	-	77 (21.4)
Ankle	2 (0.5)	9 (2.3)	6 (1.5)	2 (0.5)	0	6 (1.5)	1 (0.3)
Foot	2 (0.5)	14 (3.6)	32 (8.3)	19 (4.9)	4 (1.0)	1 (0.3)	5 (1.3)

As seen in Table 1 above, significant proportion of injuries occurring in ankle and foot according to the researchers [11]. The lower extremity, specifically the

leg, represented the predominant anatomical location for contusions, abrasions, and lacerations, whereas avulsion injuries occurred most frequently in the foot

region, as demonstrated in the aforementioned table. Laceration on the foot occurred in 8.3 percent of the study subjects while crush injury occurred among 4 people.

The researchers reported that the three predominant injury mechanisms comprised motorcycle collisions with four-or-more-wheel motor vehicles, motorcycle-to-motorcycle collisions, and single-vehicle collisions. The majority of single-vehicle collisions (47, 71.2%) occurred when motorcyclists lost control and the vehicle departed the roadway, subsequently colliding with a ditch. Additional contributing factors to single-vehicle collisions included excessive speed, road obstructions and barriers, tire rupture, slippery sandy road surfaces, abrupt braking application at elevated velocity, brake system failure, and collision resulting from evasive maneuvers to avoid animals. Concerning the temporal distribution of accidents, 287 patients (73.0%) sustained injuries during daylight hours, while 106 patients (23.0%) sustained injuries during nighttime hours.

Discussion

Out of the nine articles identified, only one met the inclusion criteria. This indicates that there is limited data on motorcycle foot and lower limb trauma in Nigeria. The study found various forms of injuries including bruises, abrasions, lacerations, avulsions, crushes, and fractures. The lower leg was the most commonly affected part of the body with multiple injuries while the foot had high incidences of laceration and avulsion [11]. The main causes of injuries were collision with larger vehicles, collision between two or more motorbikes, and single vehicle crashes.

The lower extremities sustained 77 fractures (21.4%), 40 lacerations (10.4%), and 38 contusions (9.8%) according to the examined research [11]. The foot accounted for 32 lacerations (8.3%) and 19 avulsions (4.9%). Thus, the high frequency of the lower extremity injuries may be associated with the strong impact on it during an accident, falls, and sliding on the road. These injuries require extensive surgery, advanced wound care, and therapeutic intervention if bones, soft tissues, nerves, or blood vessels are injured [12].

The leading causes of crashes were crashes of three or more wheeled motor vehicles, motorcycle versus motorcycle, and single motorcycle crashes. In single motorcycle crashes, 47 (71.2%) of the crashes were caused by riders losing control and running off the

road before hitting a ditch. Other causes reported were speeding, obstacles on the road, punctured tires, slippery roads, sudden application of brakes, faulty brakes, and avoiding animals [11].

Most of the reported injuries occurred during daylight hours (287; 73.0%), while 106 (23.0%) were registered during nighttime. This can be explained by the fact that people are more inclined to drive motorcycles and be exposed to traffic during daylight. However, without having information on exposure, it is not possible to state that the risk for an individual is higher during daytime.

The nature of injuries reported indicates the need for extensive medical assessments, appropriate diagnostic imaging, timely treatment of wounds, fractures management, and individualized pain relief interventions. Depending on the severity, the pain can be treated with paracetamol, non-steroidal anti-inflammatory drugs if available, opioids, or anesthetic procedures [13]. Severe cases may require surgical interventions and institutional management. However, the data provided in the study was limited in terms of pain management, analgesia, and treatment outcomes, which makes generalization of findings highly difficult in context of Nigeria.

The most effective motorcycle safety interventions include the regulation of speed, maintenance of infrastructure, strict enforcement of traffic rules, and training riders [14]. At the same time, medical facilities need to improve emergency treatment, optimal use of analgesics, surgeries, and post-surgery therapies.

Conclusion

In conclusion, the trauma of the foot and lower limbs resulting from motorcycle accidents is considered to cause significant morbidity and functional impairment. The reviewed study identified the leg as one of the most commonly injured anatomical regions and revealed collisions and loss of control as the leading crash mechanisms. Effective prevention, timely treatment, post-traumatic recovery, and pain control measures are of particular importance. However, the overall lack of sufficient evidence highlights the need for further studies to evaluate the relevant incidence, treatment outcomes, and therapeutic interventions for motorcycle-related injuries in Nigeria.

Limitation

A single study significantly limits the applicability of this review and impedes substantive analysis across

diverse Nigerian contexts. The absence of comprehensive data regarding pain management protocols and extended-term outcomes constitutes a critical deficiency in the existing evidence. The lack of podiatric education resources in Nigeria may have contributed to the inadequate identification, management, and rehabilitation of complex foot and lower limb deformities.

Declarations

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Conflict of Interest

The authors affirm that they do not have any financial affiliations presently or within the preceding three years with any organizations that could potentially influence the submitted work. They further assert that no other associations or engagements might give rise to perceived influences on the submitted work. The authors confirm the absence of any conflicts of interest. All authors provide their consent for the publication of this manuscript.

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