

# Causation, Types and Outcome of Road Traffic-related Ocular Injury in University of Ilorin, Kwara, Nigeria

OLAWALE JOB OLADEJO<sup>1</sup>, DUPE SERIFAT ADEMOLA-POPOOLA<sup>2</sup>, AMASE NYAMNGEE<sup>3</sup>, FOLU OWOEYE<sup>4</sup>

## ABSTRACT

**Introduction:** Despite transportation liberating man and making him mobile, his increasing reliance on vehicular movement has conferred great facilities on him and his activities. The most profound culprit of all modes of transport is the road, of which traffic accidents are the most disturbing consequence of its use. Road traffic-related ocular injuries often have severe consequences and form a significant part of ophthalmic emergencies. These injuries may be missed and are therefore often underreported.

**Aim:** To determine the causation, types, and outcomes of road traffic-related ocular injuries at the University of Ilorin Teaching Hospital, Kwara, Nigeria.

**Materials and Methods:** This was a cross-sectional study conducted on 78 eyes of consecutive patients with road traffic-related ocular injuries who presented at the Accident and Emergency unit of the University of Ilorin Teaching Hospital, Kwara, Nigeria, between September 2012 and August 2013. The materials included the HOTV chart for vision assessment, which is a standardised, easy-to-use assessment method for both literate and illiterate individuals, a pen torch, direct ophthalmoscope, binocular indirect ophthalmoscope, slit lamp biomicroscope, Perkins tonometer, 2% fluorescein strip, 0.5% GuttTetracaine, and a handheld portable slit lamp

ophthalmoscope. Patients' demographics, duration of ocular injury before presentation, Visual Acuity (VA) at presentation, type of vehicle, place of injury, classification of ocular injury, treatment, and outcome on follow-up were recorded.

**Results:** There were 78 eyes (72 patients) with road traffic-related ocular injuries. The age range of the subjects was 3-55 years with a mean of 31.10 years. Forty-four (61.1%) patients were young men between 20-39 years. Fifty-one (70.8%) patients were males, and 21 (29.2%) were females, with a male-to-female ratio of 2.4:1. Most of the victims were traders (22, 30.6%), and fifty-two eyes (72.2%) presented within 12 hours of ocular injury. Motorcycles were associated with ocular injury in 37 (51.4%) patients. The most common injuries were of closed globe type (contusion, lamellar laceration, superficial foreign body) in 70 patients (89.7%).

**Conclusion:** Road traffic-related injuries have increased over the past eight years in Nigeria. Males are more commonly injured in Road Traffic Injury (RTI), and motorcycles were the most common cause of injury to road users. Three out of 36 people injured in a vehicle at the time of injury used seat belts, while none of the riders and passengers on motorcycles wore helmets. The importance of prevention, the use of safety devices, and the avoidance of risk behaviors on the road need to be emphasised.

**Keywords:** Eye injury, HOTV chart, Motorcycle, Visual outcome

## INTRODUCTION

Transportation of goods and services by air, road, or sea plays an important role in the socio-economic development of any nation. In Nigeria, about 70% of the movement of people and goods is done by road [1]. This is due to the absence of an effective transport system like the rail, the non-affordability of air transport, and the lack of an effective inland waterway [1]. RTI are the leading cause of death among young people aged 15-29 years [2]. More than 90% of the world's fatalities on the roads occur in low and middle-income countries, even though these countries have approximately half of the world's vehicles [2]. Motorcycles constitute one of the most important means of transportation in many Nigerian cities [3-5]. Nearly half of the people dying on the world's roads are "vulnerable road users" such as pedestrians and motorcyclists.

Ocular injuries form a significant part of ophthalmic emergencies in tertiary hospitals in Nigeria [6]. These injuries may be missed in the presence of life-threatening injuries and are therefore often underreported. The risk for ocular injury following a road traffic crash increases in the presence of facial fractures [7]. A patient with a facial fracture is 6.7 times more likely to have an ocular injury compared to patients with no facial fracture [7]. An apparent increase in road traffic-related ocular injuries has been noted. Therefore, the aim of this study was to determine the pattern of presentation and visual outcome of ocular injury among victims of RTIs.

## MATERIALS AND METHODS

This was a cross-sectional study of patients with road traffic-related ocular injuries who presented to the surgical emergency room of the University of Ilorin Teaching Hospital (UITH), Kwara, Nigeria, from September 2012 and August 2013. Ethical approval was obtained from the Ethical Review Committee (ERC) of the University of Ilorin Teaching Hospital (UITH/CAT/189/15/431). UITH is the only major functional hospital with the capacity to promptly treat injured patients from Kwara, the northern parts of Oyo and Osun, the southern part of Niger, and the western parts of Kogi and Ekiti States of Nigeria, with a catchment area of about 10 million people [8]. All the patients who presented to the hospital with ocular injuries were included in the study.

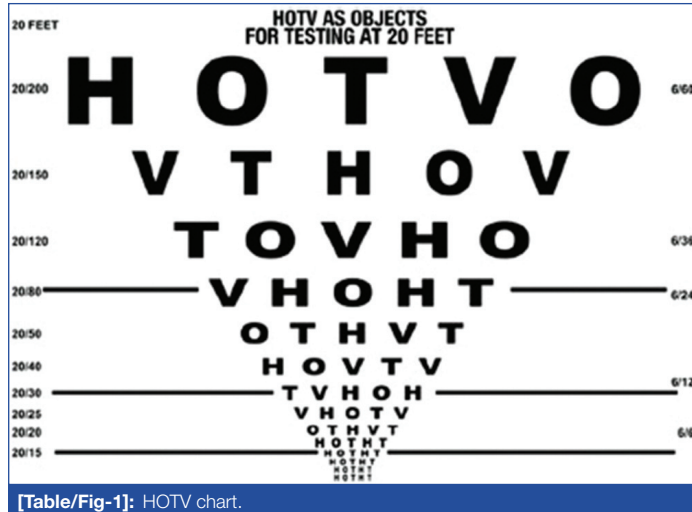
### Procedure

A total of 72 patients were included in the study with analysis of total 78 ocular injuries reported in the hospital.

Demographic data was collected through a proforma, which included the subjects' age, gender, occupation, injury status (whether driver, rider, passenger, or pedestrian), and type of collision (vehicle-vehicle, motorcycle-vehicle, motorcycle-motorcycle, motorcycle-pedestrian, lone motorcyclist, and other collisions). The injury arrival interval was categorised as 0-1 hour, >1-6 hours, >6-24 hours, >24-48 hours,

and >48 hours. Mechanism of injury, use of helmet, and use of seat belt were also recorded.

All accident victims suspected to have ocular injuries were observed at the Accident and Emergency unit. Prompt evaluation, including ocular examination, was carried out using the HOTV chart [Table/Fig-1], a pen torch, direct ophthalmoscope, binocular indirect ophthalmoscope, Perkins tonometer, % fluorescein strip, 0.5% tetracaine, and handheld portable slit lamp, especially in non-ambulating patients.



[Table/Fig-1]: HOTV chart.

A HOTV chart is a set of four optotypes that are recognisable and maximally distinguishable. It provides a good measurement of VA for four and five-year-old children, as well as adults, at a distance of 20 feet from the patient. Preoperative consent was obtained from all the patients by the researcher. The consent process included discussing the risks of multiple surgeries if required and the risk of globe eversion in case the eye was unsalvageable.

All patients with open globe injuries were operated on under general anaesthesia using an operating microscope. Preoperatively, the authors examined the eye, and during surgical exploration, the extent of ocular injuries was determined. Patients with penetrating ocular injuries received intravenous ciprofloxacin and metronidazole as prophylaxis. If a limbal laceration was present, it was identified and sutured first with a 10.0 Nylon suture. This was followed by repairing the cornea laceration with interrupted 10.0 Nylon sutures. Subsequently, the scleral laceration was explored and sutured with interrupted 6.0 Vicryl sutures.

B-scan ultrasonography was performed, especially for patients with posterior segment injuries and media opacity. Cases of severe ocular injuries were admitted to the ward for surgical intervention, as indicated. Unsalvageable globes were eviscerated, and ocular prosthesis implantation was performed. Patients with multiple injuries, such as maxillofacial, orthopedic, neurosurgical, and musculoskeletal injuries, were co-managed with the relevant specialist team. Superficial corneal foreign bodies were removed under local anaesthesia (0.5% Tetracaine) using a sterile needle tip. Conjunctival foreign bodies were removed with Moorfields forceps, while small particles were flushed out of the eye with normal saline. Subconjunctival hemorrhage following contusion injuries were managed on an outpatient basis. The final VA was assessed at the end of the four-month follow-up period, allowing for the resolution of intraocular inflammation and accurate assessment of the best-corrected VA in patients who underwent postoperative cataract surgery.

The standardised International classification [9,10] of ocular trauma, approved by the World Health Organisation, was used. It considers the type, severity, and extent of the injury, as well as the VA at presentation, as a predictive factors for visual outcome with a high degree of accuracy. Closed globe injuries include those involving blunt force resulting in contusion, superficial foreign body, or lamellar

laceration. Open globe injuries include ruptured globe, penetrating, perforating, and intraocular foreign body.

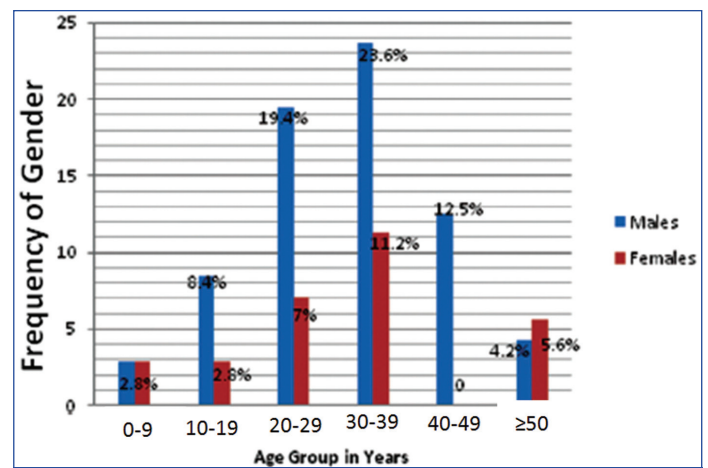
## STATISTICAL ANALYSIS

The data were analysed using SPSS version 16.0 (SPSS, Inc., Chicago, IL, US). Statistical analysis of quantitative data, including descriptive statistics, was performed. The results were analysed using frequency distribution for categorical variables and measures of central tendency for quantitative variables. A statistical significance level of p-value <0.05 was set. Fisher's exact test was applied. The presentation of the results was done using frequency tables, charts, and figures.

## RESULTS

A total of 885 (60.3%) patients had RTI. Among these, 72 (8.1%) patients had traffic-related ocular injuries affecting 78 eyes.

The mean age of patients with traffic-related ocular injuries was 31.1±13 years. The majority of patients (44, 61.1%) were in the age range of 20-39 years. Out of the total, 51 (70.8%) were males and 21 (29.2%) were females, resulting in a male-to-female ratio of 2.4:1 [Table/Fig-2].



[Table/Fig-2]: Age/Sex distribution of 72 patients with road traffic-related ocular injury.

Traders, technicians/artisans, and individuals with no formal education were found to be more vulnerable to traffic-related ocular injuries, accounting for 22 (30.6%), 21 (29.2%), and 32 (44.4%) cases, respectively [Table/Fig-3].

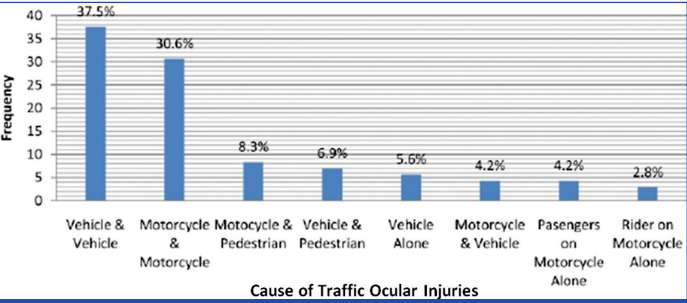
Occupation			Educational background		
	No. of patients	%		No. of patients	%
Trading	22	30.6%	No formal education	32	44.4
Technician/ Artisan	21	29.2%	Elementary	16	22.2
Students	11	15.3%	Secondary	14	19.5
Professionals	9	12.5%	Tertiary	10	13.9
Preschool	5	6.9%			
Farmer	2	2.8%			
Unemployed	2	2.8%			
Total	72	100		72	100

[Table/Fig-3]: Occupation and educational background of 72 patients with road traffic related ocular injury.

Fifty-two (72.2%) patients presented within 12 hours of injury, with a mean injury arrival time of 1.36±0.21 hours.

The position of the patients at the time of ocular injury revealed that motorcycle riders (27, 37.5%) were predominantly involved. Others included non-front seat passengers (20, 27.7%), bus/car drivers (5, 6.9%), and pedestrians (9, 12.0%) who were hit by a motorcycle

or car. Among the ocular injuries, 37 (51.4%) were associated with motorcycles. The causes of accidents leading to ocular injuries are stated in [Table/Fig-4].



[Table/Fig-4]: Cause of traffic accidents leading to ocular injury.

Out of the 36 people who were injured inside a vehicle, three (8.3%) were using seat belts at the time of the injury, while none of the motorcycle riders or passengers were wearing helmets. In terms of eye involvement, the left and right eyes were affected in 35 (48.6%) and 31 (43.1%) cases, respectively. Both eyes were involved in 6 (8.3%) patients. All the patients with bilateral ocular injuries were males, including four motorcycle riders, a passenger, and a pedestrian.

According to the Standardised International Classification of Ocular Injuries, closed globe injuries occurred in 70 (89.7%) eyes, while open globe injuries occurred in 8 (10.3%) eyes. Closed globe injuries included contusion, lamellar laceration, and superficial foreign bodies. Among the eyes, 54 (77.1%) had contusion injuries, 2 (2.9%) had lamellar lacerations, 6 (8.6%) had superficial foreign bodies, and 1 (2.9%) had a mixed type injury. At presentation, 48 eyes had a Visual Acuity (VA) of 20/40 or better, while at the end of the 4-month follow-up, 55 eyes had a VA of 20/40 or better ( $p \leq 0.001$ ). Eyes with open globe injuries showed no improvement in visual acuity and had VA ranging from 19/200 to 5/200 ( $< 6/60$ ) at the end of the 4-month follow-up. Five eyes had No Perception of Light (NPL) [Table/Fig-5].

Visual acuity (Snellen's equivalent)	Initial VA (eyes)	%	Final VA	%
Closed globe injury				
≥20/40 (6/12 or better)	48	68.6	55	78.6
20/50-20/200 (<6/15-6/60)	5	7.1	7	10
19/200-5/200 (<6/60->1/60)	4	5.7	3	4.3
4/200-PI (<2/60-PL)	3	4.3	3	4.3
NPL	2	2.9	2	2.9
Undetermined	8	11.4	-	-
Total	70			
Open globe injury				
<6/60-PL	5	62.5	5	62.5
NPL	3	37.5	3	37.5
Total	8	100	8	100

[Table/Fig-5]: Initial Visual Acuity (VA) compared with final VA. \*VA of eight eyes with closed globe injury was undetermined at the time of presentation but determined within 24 hours of admission when altered sensorium resolved

DISCUSSION

Road traffic-related ocular injuries accounted for 8.1% of all traffic injuries treated in the hospital. This percentage is higher (2.8%) than that reported in a previous study [11]. The increase in ocular injuries may be attributed to the higher number of motorcycles and vehicles on the roads over the last decade, without a corresponding improvement in the enforcement of traffic regulations.

The male-to-female ratio of 2.4:1 in the present study is consistent with ratios reported in other studies, ranging from 2.4:1 to 5:1 [4,6,12]. This ratio is largely due to the fact that driving and riding

are predominantly male activities in Nigeria. The higher number of individuals affected in the 30-39 years age range in this study, compared to the 21-30 years age range reported in another study [13], may be attributed to the economic challenges in our country. These challenges have made commercial motorcycling a common job among people in the first four decades of life. Additionally, this age group is more prone to engaging in risk-taking behaviors, such as reckless overtaking, maneuvering, and speeding.

It is notable that the majority of the injured patients were traders (30.6%), followed by technicians/artisans (29.1%) and others (27.8%). This is likely because trading and semi-skilled work are predominant in this society. Traders often travel long distances by road to hinterland markets to earn their livelihood, making them more susceptible to traffic injuries. Technicians and artisans move from place to place in pursuit of materials for their jobs, while university and polytechnic students are at a higher risk of road traffic injuries during their journeys to and from school on motorcycles.

In the present study, approximately 84.7% of patients with ocular injuries presented within 24 hours of the injury. This is similar to the reports of other Nigerian studies, which reported percentages between 80% and 85% [3,6,11]. This may be due to the acute nature of the injury, the presence of other road users who assist with transportation to the hospital, and police cases requiring incident reports. However, this is different from the 28.9% reported by another study conducted in Irrua, Benin-City [13].

Motorcycles were involved in approximately 50% of the cases, followed by cars and other vehicles. There were also more motorcyclists and non-front seat passengers involved. This is similar to what other Nigerian authors have reported regarding road traffic injuries, with motorcycles being the most common, followed by private cars [4,14]. Motorcycles are ubiquitous, have increased acceptability, are easy to acquire, and have less attention paid to compliance with regulations and eye safety measures by riders, making them more vulnerable. Non-front seat passengers are least likely to be immediately aware of danger, while a front seat passenger may quickly hold onto a fixed object in the vehicle. Unfortunate pedestrians are often oblivious to danger, as walkways may not be available, not used, or zebra crossings may not be available.

It is notable that only 3 (4.2%) out of 36 people injured in a vehicle at the time of the injury were using seat belts, while none of the motorcycle riders or passengers were wearing helmets. This may be due to ignorance and poor enforcement of existing traffic regulations. Compulsory seat belt legislation and enforcement in Germany and Great Britain led to a 60% to 75% reduction in ocular injuries [15-17]. In this study, the left eye was more involved. This may be attributable to the majority of people being right-handed, which may provide more stability on the right side and expose the left side to a higher risk of injury, especially when riding a motorcycle [18]. Both eyes were involved in six patients. A previous study had shown that bilateral ocular injuries are more common in road traffic injuries than in injuries caused by other factors [19].

In the present study, 70 eyes had closed globe injuries at presentation, out of which 48 (68.6%) had an initial Visual Acuity (VA) of 20/40 or better. At the end of the 4-month follow-up, 55 eyes (78.6%) had a final VA of 20/40 (6/12) or better, suggesting a good visual outcome in closed globe injuries. The eight eyes with open globe injuries had a poor final VA of 19/200-5/200 ( $< 6/60$ ). This is in agreement with other studies that inferred that patients with severe intraocular damage and open globe injuries have worse visual outcomes [20-23]. Therefore, the use of protective goggles by drivers or riders of motorcycles should be encouraged. Additionally, road signs, educational programs, proper training of drivers/riders, passenger rights, educative signboards, caution signs on roads, and speed limit enforcement are advised.



## Limitation(s)

The study conducted was a hospital-based and may not necessarily represent the prevalence of road traffic-related ocular injuries in the general population of Nigeria. Therefore, it is advised that future epidemiological studies be conducted to investigate the occurrence of road traffic-associated ocular injuries more comprehensively.

## CONCLUSION(S)

The road traffic injuries primarily affected individuals in their third and fourth decades of life, particularly those whose occupations involved frequent travel. Ocular injuries were more commonly associated with motorcycle accidents. Despite early presentation, open globe injuries resulted in poor visual outcomes. Increasing public awareness of safety measures and enforcing the use of helmets and seatbelts are crucial in preventing ocular injuries.

**Conflict of interest:** The patients only paid for procedures considered part of the routine care for their condition. The remaining costs were covered by the researchers. Therefore, there was no financial burden on the subjects of the study.

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### PARTICULARS OF CONTRIBUTORS:

1. Consultant Ophthalmologist, Department of Ophthalmology, Lautech Teaching Hospital, Ogbomoso, Oyo State, Nigeria.
2. Senior Lecturer, Department of Ophthalmology, University of Ilorin Teaching Hospital, Ilorin, Kwara, Nigeria.
3. Lecturer, Department of Medical Microbiology and Parasitology, University of Ilorin, Ilorin, Kwara, Nigeria.
4. Professor, Department of Ophthalmology, University of Ilorin Teaching Hospital, Ilorin, Kwara, Nigeria.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Olawale Job Oladejo,  
Consultant Ophthalmologist, Department of Ophthalmology, Lautech Teaching Hospital,  
PMB-4004, Ogbomoso, Oyo State, Nigeria.  
E-mail: olawale333@yahoo.com

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