Visual Profile of Motorcycle-related Ocular Trauma in a Tertiary Hospital

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Disclosure: No financial assistance was received for this study. The authors have no proprietary or financial interest in any product used or cited in this study.

ABSTRACT

Objectives: To provide a representative data on the local profile of motorcycle-related ocular trauma seen in a tertiary hospital over a period of one year.

Methodology: A retrospective case review of all motorcycle-related trauma patients seen at the emergency room of the Philippine General Hospital (PGH) by the Trauma Service of the Department of Surgery and referred to the Department of Ophthalmology and Visual Sciences (DOVS) for eye injuries was conducted. Descriptive statistics were used to determine the prevalence and types of injuries, and the factors affecting these injuries.

Results: Thrity-four charts were reviewed; 9 (26.5%) patients had bilateral ocular involvement and 25 (73.5%) unilateral, a total of 43 eyes. The patients were mostly males in their productive age, belonged to the lower economic bracket, and came from nearby Southern Luzon provinces and the National Capital Region (NCR). Most of the injuries incurred were mild and involved the external surface of the eye. Night motorcycle driving, fair weather, and alcohol use were risks identified for motorcycle-related ocular injuries. Helmet use was the only identifiable risk indirectly correlated with severity of ocular injury.

Conclusion: Although majority of the ophthalmic injuries were classified as mild, and eyes involved had generally good visual potential, helmet use was the only identifiable risk associated with the severity of the ocular injury.

Keywords: Motorcycle, ocular trauma, ocular injuries, contussion hematoma, orbital floor fractures

Philipp J Ophthalmol 2012;37:111-116

As in most parts of Asia and in other third world countries, the motorcycle has become one of the most common modes of transportation in the Philippines. Motorcycles, aside from being comparatively cheaper than automobiles, require less maintenance and provide better mileage per liter of fuel.

There has been an increasing trend of registered motorcycles in the Philippines. In 2008, motorcycles constituted 50.62% of all registered vehicles in the country, increasing to 51.46% in 2009 and 52.48% in 2010. This translated to an average of 8.05% increase in motorcycle registration annually.[1] With this increase in the volume of motorcycles in the country, the number of motorcycle-related injuries also increased considerably from 4,095 in 2005 to 5,271 in 2006, comprising 29.59% of all non-fatal motor-related injuries. This was a near second to car-related injuries, which comprised 30.22% of the percentage share.[2] Under-reporting could result due to the lack of an efficient and unified motor vehicle crash data system in the Philippines as there were discrepancies between hospital and police records.[3]

The Philippines is not lacking in governing policies regarding motorcycle safety in the Philippines. The first is Administrative Order AHS-2008-015, which was enacted by the Land Transportation Office (LTO) in 15 May 2008. This Administrative Order gives rules on speed limit, accessories, passenger and cargo load, and helmet use. The order explicitly bans motorcycle driving under the influence of alcohol. Violators are charged fines ranging from PhP700 to PhP1,000, with some given additional penalty of attending seminars and traffic management courses conducted by the LTO.[4] The second policy on motorcycle safety which was enacted on 23 March 2010 by the Fourteenth Congress of the Philippines is Republic Act 10054, entitled "Motorcycle Helmet Act." Under this law, all motorcycle riders, including drivers and back riders, are required to wear standard protective motorcycle helmets at all times while driving, whether long or short drives, in any type of road and highway. Violators are penalized with a fine of PhP1,500.00 for the first offense, PhP3,000.00 for the second offense, PhP5,000.00 for the third offense, and PhP10,000.00 plus confiscation of the driver's license for the fourth and succeeding offenses.[5]

Available literature on ocular injuries from motorcycle-related trauma is scarce. Enock et al reported on 56 eyes with ocular injuries in which all patients did not wear helmets at the time of injury. Sixteen (28.6%) of the 56 eyes involved were blinded (WHO definition: visual acuity less than 3/60) by the trauma.[6] In the Philippines, there was no representative report on severe motorcycle-related trauma (requiring hospital admission) except for a retrospective study evaluating motorcycle-related trauma in a tertiary hospital from 2004-2007 (Larona AJL, Consunji RJ. Motorcycle-related trauma in the Philippines, 2008; unpublished). This study reported that 80.3% of 310 patients suffered from head and facial injuries, with 60.6% sustaining skull fractures. There was no mention of the incidence of ocular trauma. In charts review of 144 trauma patients from January to December 2009 seen as outpatient or emergency referral by the Plastic and Lacrimal (PL) Section of the Department of Ophthalmology and Visual Sciences (DOVS), University of the Philippines-Philippine General Hospital (UP-PGH), 36% (52/144) were motorcycle-related.

There are no standardized classification of ocular injuries. Available schemes included that of Odebode wherein ocular injuries were classified as mild, moderate, or severe;[7] and the Ocular Trauma Score (OTS), which was formulated using information from the United States Eye Injury Registry (USEIR) and the Hungarian Eye Injury Registry (HEIR).[8] Compared to the classification of Odebode which was solely based on ocular injuries incurred, the OTS was based on both the visual acuity and the presence of ocular injuries. The OTS, with grades of 1 to 5, provided a single percentage probability estimate of the visual potential of traumatized eyes after six months of injury. The lower the OTS score, the higher the probability of non-functional vision. The OTS gives the ophthalmologist a 77% chance of predicting the final functional visual outcome and can serve as a guide in counseling and management of patients with eye injuries. It is also able to direct attention toward resource needs and rehabilitation during the treatment process.[8]

This study provided local data on the types and severity of ocular injuries in motorcycle-related ocular trauma.

METHODOLOGY

All motorcycle-related trauma patients, seen at the Philippine General Hospital Emergency Room by the Trauma Service of the Department of Surgery and referred to the DOVS from April 2010 to March 2011 were included. A data sheet based on the Eye Trauma Registry Form, formulated by DOVS in 1998, was used. Data retrieved included: (1) patient information; (2) complete trauma history; (3) alcohol and helmet use; (4) number of riders; (5) whether the patient was the driver or the passenger;

(6) routine ophthalmologic exam, including gross examination, visual acuity (VA) using Snellen chart or its equivalent, extraocular muscle movements, slit lamp examination, and indirect ophthalmoscopy; (7) sensorium; (8) other associated physical examination findings; (9) therapeutic interventions; (10) subspecialty referrals; and (11) diagnostic exams, such as routine skull x-ray to document skull fracture. The OTS (Table 1) and the visual potential (Table 2) of the eyes involved were derived. The estimated probability of potential visual outcome after six months was obtained using the OTS. If a patient has an OTS score of 1, there was a 73% probability of having VA of no light perception after 6 months and only a 1% probability of regaining VA of 20/40 or better. Severity of trauma was assigned as mild, moderate, or severe based on the classification of Odebode (Table 3).[7] Mild ocular complications were restricted to soft-tissue injury to the eye and adnexae, the moderate type predominantly neuroophthalmic, while severe complications involved globe and orbital fractures.

Data were encoded, collated, and analyzed using spreadsheet software.

RESULTS

Thirty-four (34) motorcycle-related ocular trauma cases were seen during the period of April 2010 to March 2011, comprising 7.1% of the total 479 eye trauma consults seen at the DOVS emergency room. Nine (26.5%) of the 34 patients had bilateral ocular involvement and 25 (73.5%) unilateral. A total of 43 eyes were included in the study.

Thirty (88.2%) were males and 4 (11.8%) females, with a male to female ratio of 7.5:1. The mean age was 27.1 years, age ranging from 17 to 54 years. Most of the patients were male belonging to the productive age group.

Majority of the cases came from Cavite (35.3%), National Capital Region (26.5%), and Laguna (20.6%) (Figure 1).

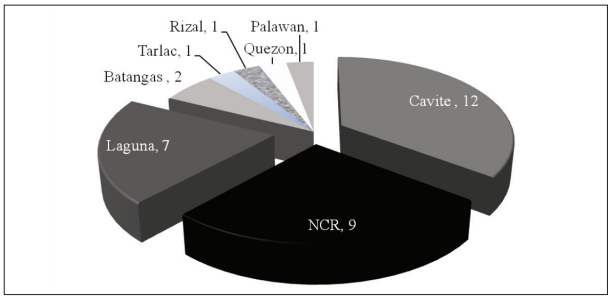

Figure 1. Distribution of motorcycle-related ocular trauma cases per province.

Table 1. Ocular Trauma Score.[8]

Step 1: Take raw points based on visual acuity.	Visual Acuity	Raw Points
	NLP	60
	LP to HM	70
	1/200 to 19/200	80
	20/200 to 20/50	90
	>20/40	100
Step 2: Take raw points based on associated ocular injuries.	Ocular Injuries	Raw Points
	Globe Rupture	-23
	Endophthalmitis	-17
	Perforating Injury	-14
	Retinal Detachment	-11
	Afferent pupillary defect	-10
Step 3: A raw score is obtained by adding the raw points in steps 1 and 2. An OTS is given based on the derived raw score.	Raw Score	OTS
	0 - 44	1
	45 - 65	2
	66 - 80	3
	81 - 91	4
	92 - 100	5

Table 2. Visual Potential Assessment.

OTS	NLP	LP to HM	1/200 to 19/200	20/200 to 20/50	>20/40
1	73%	17%	7%	2%	1%
2	28%	26%	18%	13%	15%
3	2%	11%	15%	28%	44%
4	1%	2%	2%	21%	74%
5	0%	1%	2%	5%	92%

Table 3. Severity Assessment.

	Mild	Moderate	Severe
Soft tissue injury	+	+/-	+/-
Ruptured globe	-	-	+
Orbital fracture	+/-	+/-	+
Neuroophthalmic	-	+	+/-

All patients were of the lower income group (Figure 2). Fifteen (44.1%) were unemployed at the time of the injury, 5 (14.7%) were students with no income, and 14 (41.1%) were minimum wage earners. The data confirmed that PGH primarily catered to patients from the lower socioeconomic group living in close proximity to the hospital. Of the 34 patients, 25 (73.5%) were drivers and 9 (26.4%) passengers.

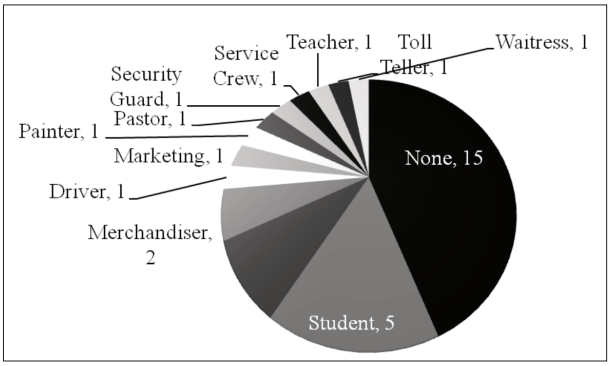

Figure 2. Occupation of patients.

Ocular Injuries

Lesions involving the periorbita, lids, and conjunctiva comprised the majority of the findings. The leading ocular injuries were: (1) contusion hematoma (88.4%), (2) subconjunctival hemorrhage (53.5%), (3) lid laceration (32.6%), and (4) commotio retinae (32.6%). Commotio retinae was the leading cause of slight decrease in visual acuity and the leading injury of the internal eye.

Fifteen (44.1%) suffered orbital fractures and the orbital floor (66.6%) was the most common fracture of the bony orbit. Three (20%) warranted open reduction and internal fixation and 12 (80%) were observed.

Severity grading

Mild ocular injuries were seen in 38 (88.3%) of the 43 eyes, moderate in 4 (9.3%), and severe in 1 (2.3%).

Ocular Trauma Score and Visual Potential

A total of 33 (76.74%) out of the 43 eyes examined had good functional vision upon presentation (best corrected VA of 20/40 or better), of which 25 (75.75%) had initial best corrected VA of 20/20. Two (4.7%) had best corrected VA of 20/50, 4 (9.3%) counting fingers, 1 (2.3%) hand movement, 1 (2.3%) light perception, and 2 (4.7%) no light perception.

The OTS and visual potential were assigned per eye. The mean OTS score was 4.46, with the highest OTS of 5 seen in 33 (76.74%) of 43 eyes. This carried a 92% probability of having functional vision (VA >20/40) on the affected eye 6 months after injury. An OTS of 4 was seen in 2 (4.7%), translating to a 74% probability of regaining functional vision; OTS of 3 in 4 (9.3%) eyes, translating to a 44% chance of having functional vision; OTS of 2 or 15% probability of functional vision in 3 (7.0%); and OTS of 1 with 1% probability of regaining functional vision in 1 (2.3%) eye.

There were 9 patients who suffered bilateral eye involvement; 7 (77.8%) had OTS of 5, one with decreased sensorium had OTS of 3 for both eyes, and one had OTS of 1 for one eye that was eventually enucleated and OTS of 3 for the other eye.

DISCUSSION

Results of this study showed that most motorcycle-related ocular injuries involved the external structures of the eye and were usually mild with good visual potential. Severe ocular injuries did occur and some necessitated surgical intervention. We looked at several factors that could be associated with the occurrence and severity of these injuries.

Previous history of motorcycle trauma. Only 2 (5.8%) out of the 34 patients had previous incidents of motorcycle-related trauma. Of these 2 patients, 1 had severe ocular injury while the other had mild injury. No correlation between previous history of motorcycle-related trauma and the severity of current ocular injury was seen as most of those who consulted had no previous history of motorcycle accidents.

Previous history of ophthalmic complaints. No association between previous ophthalmic history and the occurence and severity of ocular injury was seen. Error of refraction, seen in 5 (14.7%) of 34 cases, was the only ophthalmic complaint elicited on past history. None of these patients incurred severe ocular injury.

Number of passengers at the time of injury. In 6 (17.6%) of the 34 patients in this study, there was only a driver with no passenger at the time of

injury; in 20 (58.8%), the driver had 1 passenger; in 6 (17.6%), there were 2 passengers; and in 2 (5.9%), there were 3 passengers. There was no association between the number of passengers and the incidence of motorcycle-related ocular injuries. There was also no correlation between the number of passengers and the severity of eye injuries. Of note, however, were the 6 patients with just the driver alone at the time of injury to have only mild injuries, while moderate to severe injuries were seen when there were passengers with the driver (Table 4).

Area of accident. Five (14.7%) of the 34 reported cases happened on major highways, of which 4 (80%) incurred mild and 1 (20%) moderate ocular injuries. Twenty-nine (85.3%) occurred on secondary roads, of which 25 (86.2%) were mild, 3 (10.3%) moderate, and 1 (3.4%) severe. Our results showed that most motorcycle trauma happened on secondary roads. There was no correlation between severity of ocular injury and area of occurrence.

Incidence of motorcycle-related ocular trauma according to season. Majority (26/34) happened between March and July while 8 cases (23.5%) occurred between August and February (Figure 3). The rainy season started late for the year 2010 because of the El Niño phenomenon. The first typhoon to affect parts of the Philippines that year entered in mid-July. The La Niña phenomenon which brought about beyond-normal rainfall conditions came about thereafter.[9] From this data, motorcycle accidents happened mostly during fair weather, consistent with the study on motorcycle crashes by Wells.[10] Possible reasons explaining the increased incidence of motorcycle-related ocular injuries during fair weather and a decrease in the number of motorcycles on the road during bad weather have been given. Drivers were noted to drive at faster speeds during fair weather.

Table 4. Number of passengers and severity of ocular trauma.

Number of passengers	Mild	Moderate	Severe
0	6 (100%)	0	0
1	16 (80%)	3 (15%)	1 (5%)
2	6 (100%)	0	0
3	1 (50%)	1 (50%)	0

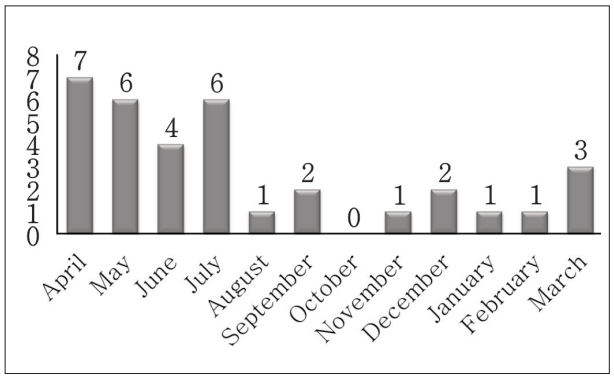

Figure 3. Incidence of motorcycle-related ocular trauma per month (2010).

Time of injury. Of the 34 cases, 7 (20.5%) happened between 6:00 am - 5:59 pm (daytime) and 27 (79.5%) between 6:00 pm - 5:59 am (nighttime). Occurrence of motorcycle injuries at night could be attributed to several factors; namely, light traffic flow at midnight to dawn allowing for faster driving, poor illumination of roads at night, sleepy state of drivers, and post-alcohol binges that could impair driver judgment.[11]

Helmet use. Failure to wear protective head gears or helmet was highly associated with incidence of motorcycle-related ophthalmic injuries. All 8 patients who wore helmets incurred mild injuries. Of the 26 patients who did not wear helmets, 21 (80.8%) had mild injuries, 4 (15.4%) had moderate injuries, and 1 (2.9%) had severe injuries. Wearing a helmet decreased the chance of having debilitating eye injuries during a motorcycle crash.

Alcohol use. Alcohol intake was highly associated with incidence of motorcycle-related ocular injuries. Twenty-five (73.5%) patients had alcohol intake immediately prior to the motorcycle accident, while 9 (26.5%) had none. The severity of injury, however, was not associated with alcohol intake; moderate to severe injuries occurred in those with and without alcohol intake. Of the 25 patients who took alcohol, 5 (20%) wore helmets. Of the 9 patients without alcohol intake, only 3 (33.3%) wore helmets. Despite motorcycle safety laws in the country, many patients involved in this study were intoxicated and did not wear protective helmets.

Of the 34 patients in this study, 15 (44.1%) warranted hospital admission while 19 (55.9%) were discharged on the same day as the consult. Management necessitating hospital admission included repair of

lacerations in the eyelid and periorbita in 14 (41.2%) patients, intravenous administration of steroids for posttraumatic optic neuropathy in 4 (11.8%), repair of lid margin laceration with canalicular transection in 1 (2.9%), repair of lid laceration and cicatricial ectropion in 1 (2.9%), and enucleation with orbital implant in 1 (2.9%). Three of the 15 patients with orbital fractures were first discharged from the emergency room and were re-admitted for open reduction and internal fixation at a later date.

Motorcycle accidents usually resulted in multiple injuries, making management multi-disciplinary. Seventeen patients were co-managed with other departments: 11 with otorhinolaryngology for co-existing facial fractures, 4 with neurosurgery for head concussions, 2 with orthopedics for fractures of the extremities, and 1 (5.9%) with psychiatry for counseling due to facial fractures and a ruptured globe.

In the ophthalmology department, trauma management was also multi-subspecialty. Seventeen patients were referred to one or more subspecialties: 16 were seen by the plastic-lacrimal service for orbital fractures and lacerations, 4 by neuroophthalmology for posttraumatic optic neuropathy, 3 by medical retina for retinal hemorrhage and edema, 1 by external disease for ruptured globe, and 1 by surgical retina for corneo-scleral perforating injury with vitreous prolapse.

In summary, night motorcycle driving, fair weather, driving with passengers, failure to wear helmet, and alcohol use were the risk factors associated with motorcycle-related ocular injuries. Failure to wear helmet was the only identifiable risk correlated with severity of ophthalmic injury. Thus, law enforcers should be more vigilant in implementing rules on motorcycle safety, especially the use of helmet and avoiding alcohol intake while driving. Although majority of the ocular injuries were classified as minor and eyes involved had good visual potential, some had debilitating outcomes that left patients permanently handicapped. Taking into consideration the wide range of injuries that can result from motorcycle crashes, motorcycle safety must remain a public health concern.

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