

ORIGINAL ARTICLE

EFFECT OF HELMET WEARING ON MOTORCYCLE AND BICYCLE ACCIDENTS (PROSPECTIVE STUDY)

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ABSTRACT

Keywords: helmet use, motorcyclists, pedal cyclists.

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Background: Helmet use is one of the most crucial factors that influence the degree of severity of injuries in motorcyclists and pedal cyclists. **Purpose:** This study aims to determine incidence of Road Traffic Injuries (RTIs) among a sample of motorcyclists and pedal cyclists, giving insight on the negligence of helmet use as a predisposing factor for disagreeable injuries. **Patients and Methods:** The population of this descriptive study were motorcyclists and pedal cyclists involved in crash injuries in two governorates of Upper Egypt, Aswan and Sohag and admitted to emergency department in university hospitals from January 2020 to January 2021. After obtaining demographic information, types of injuries. Chi-square test and Fisher exact test were performed using IBM SPSS version 20. **Results:** The statistics showed that 66 victims of motorcycles and 15 victims of pedal cycles were involved in current study all of them were males (100.0%), mostly in the age group (26-35 years). only half of motor cyclists (50.0%) used helmet whereas no one of pedal cyclists used it. **Conclusion:** The present study shows that negligence of helmet use represents risk for traffic safety and There is a need for interventional programs to reduce the burden of motorcycle fatalities.

INTRODUCTION

Motorcycles are a common means of transportation in low and middle-income countries unlike in the developed countries, where motorcycles are often used for recreational purposes. Despite the role that motorcycles play in improving mobility, motorcycle riders are faced with multiple safety challenges (1). According to the World Health Organization (2015), approximately 312.500 people die each year in motorcycle crashes which constitute over 25% of all traffic crashes. The situation is even more serious in developing countries (2). Factors such as helmet wearing, use of alcohol and other drugs, inexperience of riders and poor driver training, conspicuity of the motorcycle and rider, issues of licensure and ownership, riding speed, and risk taking behavior of riders have been identified as major contributory factors to the increased risk of the fatal motorcycle crashes (3). Head injury is the leading cause of death in fatal motorcycle crashes (4), (5).

In a study made in California USA in 2002, *Kraus et al.* reported that among fatally injured motorcycle accident victims, head injury constituted 56%. In another autopsy study in Scotland in 1999, Wyatt reported that skull fracture with brain stem laceration accounted for 16.6% of un-

survivable head injuries seen in motorcycle crash victims. The most common head injuries are concussions, followed by brain contusions or hemorrhages, facial fractures, and skull fractures (3).

Motorcyclists' fracture; a ring fracture that is classically caused by an impact either to the top of the head or a fall from a height landing foot first, and involves the petrous temporal bones bilaterally, the clivus and the posterior part of the foramen magnum. However, the pattern described here also bears resemblance to a hinge (or 'motorcyclist's') fracture in which a transverse crack extends the width of middle cranial fossa through the pituitary fossa (6).

Helmet use is one of the most crucial factors that influence the degree of severity of crash injuries (7). Motorcyclists with helmets are less likely to have serious injuries compared to those without helmets (1). However, heavy helmets are more likely to result in a partial or complete ring fracture of the base of the skull when subjected to axial loading (6).

Chest and abdominal injuries are also commonly seen in fatal motorcycle accidents (5). Some studies have also reported a high frequency of lower extremity injuries which commonly includes long bone fractures as well as soft tissue and vascular injuries (4). Injuries to the spine and the pelvis have also been reported in fatally injured victims of motorcycle crashes (8).

A unique injury is seen wherein the motorcyclist drives under the rear of the truck causing head injuries and even decapitation which is known as under- running or "tail-gating" (9).

Pedal cyclist injuries form a less severe counterpart of motorcycle lesions due to lower speeds. Once again, head injuries figure largely in accidents as the height above the ground is considerable and the rider suffers from the passive fall added to by any forward motion or projection from impact by a motor vehicle. Helmets are now worn by many cyclists and naturally afford considerable protection (10).

Primary injuries may occur from impact by striking vehicles which may hit the rider around thigh, hip or chest level. Secondary damage to the shoulder, chest and arm may occur from striking the ground when friction grazes are common. (A unique injury though not fatal was entrapment of the leg between wheel spokes with compression of the soft tissues of the calf when the leg penetrated the wheel (11).

Materials and methods:

This research is a cross-sectional descriptive study over a sample of motorcyclists and pedal cyclists involved in RTAs, admitted to emergency trauma in university hospitals unit of two governorates of Upper Egypt, (Aswan and Sohag) during the period starting from the 1st January, 2020 to the 1st of January, 2021 .

All data of the drivers were taken from the questionnaire filled by the drivers / relatives moreover, Full detailed history was obtained (either from the patient "after stabilization of his condition" or from his relatives). Demographic profile including age, sex, residence "either urban or rural" were recorded, the usage of helmet was investigated and its impact on the anatomical distribution of these injuries. Information regarding trauma, surgical procedure, period patient stayed in hospital, clinical outcome (complete recovery, presence or absence of disability, death).

The signed informed consent form patient or from responsible person has been a permanent part of the participant's study records and maintained in the same manner as other records.

All ethical aspects related to research on patients in Aswan University were implicated in this study.

Statistical analysis of the data:

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non-parametric distribution. Chi-square test was used in the comparison between two groups with qualitative data and Fisher exact test was used instead of the Chi-square test when the expected count in any cell found less than 5. The confidence interval was set to 95% and the margin of error accepted was set

to 5%. So, the p-value was considered significant as ($P > 0.05$ is non-significant, $P < 0.05$ is considered Significant and $P < 0.001$ is highly significant).

Results:

From the total of 81 victims of road traffic accidents in this study, all of them were males (100.0%), 38.7% of them in the age group (26-35 years). Highlighting the element of helmet use, only half of motor cyclists (50.0%) used helmet whereas no one of pedal cyclists used it (**Table 1**). A significant relationship was found between helmet use and different anatomical sites of injuries sustained by motorcyclists and pedal cyclists of RTAs, the usage of the helmet decreased the incidence of head & neck injuries among motorcyclists and pedal cyclists (18.2 % when used versus 31.2% when not used) and multiple injuries (9.1% when used versus 50.0% when not used). Controversies the injuries of the extremities, abdomen & pelvis (54.5%, 18.2% respectively) when used, (18.8%, 0.0% respectively) when not used (**Table 2**).

Also, a significant relationship was found between helmet use and clinical outcome of injuries sustained by motorcyclists and pedal cyclists of RTAs, most of them were discharged free. Disabilities or death weren't recorded (**Figure 1**).

Table 1: Relation between helmet use and incidence of RTAs among motorcyclists and pedal cyclists admitted to Upper Egypt university hospitals (Aswan & Sohag) in the period from 1st of January, 2020 to 1st of January, 2021.

		Motorcycle		Pedal cycle		Chi square test	
		No	%	No	%	x ²	P value
Helmet use	Used	33	50.0%	0	0.0%	441.516	<0.001**
	Not used	33	50.0%	15	100.0%		
Total		66	81.5%	15	18.5%		

** Highly statistically significant difference ($P \text{ value} \leq 0.001$).

Table 2: Classification of injuries of the motorcyclists and pedal cyclists of RTAs admitted to Upper Egypt university hospitals (Aswan & Sohag) in the period from 1st of January, 2020 to 1st of January, 2021 in relation to helmet use.

		Helmet use					
		Used		Not used		Chi square test	
		No	%	No	%	X ²	P value
Major anatomical sites	Extremities	18	54.5%	9	18.8%	16.25	0.003*
	Head & neck	6	18.2%	15	31.2%	12.657	0.001**
	Thorax	0	0.0%	0	0.0%	NA	NA
	Abdomen & pelvis	6	18.2%	0	0.0%	25.654	0.001**
	Multiple injuries	3	9.1%	24	50.0%	32.154	0.001**

*Statistically significant difference ($P \text{ value} < 0.05$).

** Highly statistically significant difference ($P \text{ value} \leq 0.001$).

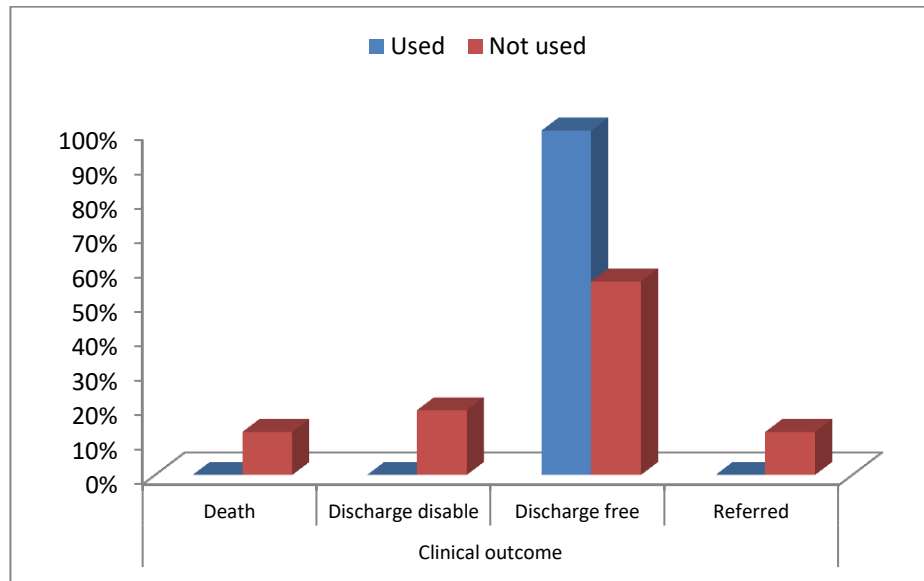


Figure (1): Relation between helmet use and clinical outcome of the motorcyclists and pedal cyclists of RTAs.

Discussion:

This study was conducted in two governorates of Upper Egypt (Aswan, Sohag) university hospitals over 81 drivers of motorcycles and pedal cycles presenting to emergency trauma unit with RTAs during the period from 1st of January, 2020 to 1st of January, 2021 that included a pre-designed questionnaire and clinical examination.

Current study indicated that the age group which was the most included in the RTAs was ranged between 26-35 years old (38.7%) followed by the age group ranged between 36-45 years old (33.1%), while the least included age group in the RTAs was above 55 years old (2.4%). Such findings were in agreement with *Jørgenrud et al., 2018* in their study in Norwegian which indicated that older age groups were found to have a significant, negative association with RTAs involvement while, young men aged 16–25, posed the highest risk of causing fatal crashes.

In current study, gender in the RTAs cases was dominated by males (100%). Such finding was in agreement with *Ngo et al., 2012* in their study in Vietnam which illustrated a remarkable difference in the gender variation denoting male dominance in the cases of road traffic accidents.

In current study, helmet use decreased the incidence of head & neck injuries among motorcyclists and pedal cyclists (18.2 % when used versus 31.2% when not used)

A previous study by *Fouda et al., 2017* in Mansoura governorate of Egypt indicated that motorcycle accidents was occurring mainly in males aged 20–40 years and none of the victims wore protective clothing or helmets at the time of accident. *Gupta et al., 2018* in their study in Cambodia indicated that helmets demonstrate a protective effect and may be an effective public health intervention to significantly reduce the burden of traumatic brain injury. *Tana and Delima., 2021* in their study in Oman indicated that helmet use behavior is connected with the reduction of head injuries due to traffic accidents.

Although no specific robust study has been published to clearly define and magnify the factors and reasons for decreasing trend of traffic fatalities as a whole or specifically for motorcycle fatalities, the following general assumptions could be considered:

- 1) Intensified road safety legislations.
- 2) Intensified law enforcement.

- 3) Improved road infrastructure.
- 4) Improved road user knowledge, attitudes, and behaviors towards traffic safety.
- 5) Improved vehicle production safety.

Additional data collection and research in this area are needed. In addition to that, continuous and systemic follow-up studies must be done to monitor the problem and to better estimate the extent of it to assist the responsible authorities in planning and evaluating preventive measures.

Conclusion:

This study revealed that helmet use by motorcyclists and pedal cyclists provides protection to those involved in traffic accidents and is associated with a decrease in mortality rates, disabilities and the risk of head and neck injuries and multiple injuries.

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