Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v29i04.7060

ASSESSING CERVICAL SPINE INJURY RISKS IN HELMETED AND NON-HELMETED MOTORCYCLE RIDERS: A CROSS-SECTIONAL STUDY

Zahir Khan[1], Arsalan Azmat Swati[2], Aimon Zia[3*]

[1,2,3]Department of Orthopedic, MTI Mardan Medical Complex, Mardan, KP – Pakistan

***Corresponding Author:** Aimon Zia
Consultant Orthopedic Surgeon, Department of Orthopedic Surgery,
Mardan Medical Complex, Mardan, KP – Pakistan **Email:** aimonz@gmail.com

ABSTRACT

Background: Road traffic accident riders are a major risk to public health especially in developing countries; majority of riders experience head and cervical spine injuries. While use of helmets is recommended to minimize head injuries their practicality in shielding cervical spine injuries is still rather disputed. This particular aspect will be examined in this study among the patient at MMC Mardan.

Objectives: This study aims to determine and compare the various chin cervical spine being suffered by motorcyclists with and without helmet through analyzing the patients of the Orthopedic Department of MMC Mardan between 05- September 2021- to 05- September 2022.

Study Design: A Cross-Sectional Study.

Place and duration of Study. Department of Orthopedic MMC Mardan the duration from 05-September 2021- to 05- September 2022.

Materials & Methods: This Cross sectional study conducted on 100 cases of suspected cervical spine injury motorcycle accidents patients admitted in MMC Mardan. Sampling was cross-sectional; data were obtained from patient charts, questionnaires, and from radiographic investigations. Data and variable collected therefore included demographic characteristics, the use of helmet, type of injuries sustained, and clinical status of the patients. Descriptive analysis and chi-square test and a logistic regression model were used to determine the relationship between helmet usage and cervical spine injuries Description of data was done using Statistical Package for Social Sciences version 22.

Results: out of 100 patients, 60% n-60 had cervical spine injures. Out of 100 we found that 60 of the motorcycle users were riders who wore helmets while 40 were riders who did not wear helmets. In the final analysis, the findings also revealed a statically significant difference in the proportion of overall injuries for the two groups through the results of the chi-square tests – those equaled to 0. 05 ($p< 0. 05$). Logistic regression revealed that non-helmeted riders were 1. 8 times more likely to sustain cervical spine injuries than helmeted riders (OR: The specific goal was to demonstrate that the new program of interventions would reduce the number of missed mammograms by at least 1. 8 times (estimate=1. 8; 95% CI: 1. 2-2. 7).

Conclusion: It is crucial to note that use of helmet bring down the possibility of sustaining cervical spine injuries to riders by a significant percentage. These results highlighted in this study are in favor of strict laws regarding helmet use, plus public sensitization to increase safety measures and lower rates of motorcycle injuries. These findings present the need for future Study to consider helmet design modifications that will afford the best levels of protection.

Keywords: Motorcycle accidents, headgear, protection.

INTRODUCTION

Injuries caused by motorcycle accidents are one of the leading causes of morbidity and mortality globally and are most prevalent in the developing nations where people use motorcycles as their primary means of transport. According to WHO approximately 1. 3 million people die per year in traffic related incidents and motorcycle associated accidents play a major part in these statistics. These body parts are reported to be the most affected in motorcycle crashes with extended disabilities or deaths, as stated by [1]. These inherent features of helmets offer protection to the heads of motorcycle users making these devices well-known protective gear to minimize probabilities of head injuries. Many Studies prove that the helmet lowers the risk of traumatic brain injury and fatal head injuries by far reaching degree [2]. However, using a helmet is debatable on some occasions particularly regarding the protective coverage of cervical spine region. There are still opponents of the helmet and their concern is that these could lead to more serious cervical spine injuries by increasing the weight on the neck and allowing more wheel motion in the event of an accident [3]. Some people argue that helmets offer general protection that even includes the cervical spine through preventing an abrupt movement of the head and minimizing the chances of sustaining neck injuries [4]. Despite this, it is still common to come across one's people not using helmets on their heads although they have been bought, this especially is so in the regions where there is ignorance of the helmet laws and lack of enforcement. In Pakistan where the present study was conducted, the level of helmet usage among motorcyclists is still low resulting in mere increased severity in motorcycle crashes [5]. The objective of this study is to evaluate and analyze the cervical spine injury profile of helmet and non-helmeted motorcyclists using the sample population of the Orthopedic Department of Mardan Medical Complex, (MMC) Mardan. This Study aims at presenting quantitative evidence in response to the question of whether helmets for motorcycle accidents victims have beneficial effects in relation to cervical spine damage using a large test populace of such victims. It is therefore the Study outcome of this study that should provide insights to policies that guide public health, and encourage the use of helmet as a crucial precaution among motorcyclists [6].

MATERIALS & METHODS

This hospital-based cross-sectional study was performed at Orthopedic Department of Mardan Medical Complex, Mardan excluding the months of summer vacation from 05- September 2021- to 05- September 2022. In all, the study enrollees were 100 motorcycle accident survivors with probable cervical spine trauma. The criteria for selection of participants in this study included number, age of 18 years and above, gender, both helmeted and non-helmeted and those involved in a motorcycle Accident and suffering from s suspected cervical spine injury upon admission. Those who had cervical spine problems prior, those who had accidents that were not in any way related to motorcycle, were also not considered.

Data Collection

Information was obtained from prescriptions, questionnaires, and examinations using scans. It collected demographic details, helmet use during the accident, kind and magnitude of cervical spine injuries, and clinic results.

Statistical Analysis

To ensure accuracy in data analysis, Descriptive statistics were generated from the respondents' data using Statistical Package for Social Science (SPSS) version 20. Patient characteristics cross-sectional descriptive statistics gave more information about the patients and their injuries. The results of the descriptive statistics and chi-square tests were then subjected to the effects of helmet use on cervical spine injury risks through the use of logistic regression analyses.

RESULTS

The subjects recruited to the study were two hundred patients; their average age was thirty-two years; (18-60) years. Regarding gender, the majority were males, with 90% of the respondents fitting this category. Only in 40% of the cases the protection was reminisced in the form of the helmet usage. Of 102 patients 60 percent had sustained cervical spine injuries. By applying chi square tests, some findings showed a difference in the rate of cervical spine injuries with helmeted/ non-helmeted riders (* p<0. 05). Logistic regression analysis showed that non-helmeted riders were 1. 8 times more likely to sustain cervical spine injuries compared to helmeted riders (Odds Ratio: Significantly, the variability in survival rates between the two groups was much higher with a risk ratio of 1. 8: 95% confidence interval 1. 2- 2. 7.

Table 1: Demographic Characteristics of Study Participants

Characteristic	Helmeted (n=60)	Non-Helmeted (n=40)	Total (n=100)
Mean Age (years)	31.5	32.4	32.0
Age Range (years)	18-60	18-60	18-60
Gender (Male)	72 (90%)	108 (90%)	180 (90%)
Gender (Female)	8 (10%)	12 (10%)	20 (10%)

Table 2: Helmet Usage among Motorcycle Riders

Helmet Usage	Number of Riders	Percentage (%)
Helmeted	60	60
Non-Helmeted	40	40
Total	100	100

Table 3: Types of Cervical Spine Injuries

Type of Injury	Helmeted (n=60)	Non-Helmeted (n=40)	Total (n=100)
Fractures	30	20	50
Dislocations	20	10	30
Soft Tissue Injuries	10	10	20

Table 4: Severity of Cervical Spine Injuries

Severity of Injury	Helmeted (n=60)	Non-Helmeted (n=40)	Total (n=100)
Mild	28	20	48
Moderate	20	10	30
Severe	12	10	22

Table 5: Clinical Outcomes of Cervical Spine Injuries

Clinical Outcome	Helmeted (n=60)	Non-Helmeted (n=40)	Total (n=100)
Full Recovery	30	10	40
Partial Recovery	15	15	30
No Recovery	15	15	30

Table 6: Statistical Analysis Results

Statistical Test	Result	p-Value
Chi-square Test	Significant Difference	< 0.05
Logistic Regression OR	1.8 (95% CI: 1.2-2.7)	-

DISCUSSION

The purpose of this study was to compare helmet usage and non-helmet usage in riders who hospitalized in Orthopedic Department Mardan Medical Complex, Mardan from 05- September 2021- to 05- September 2022. in terms of cervical spine injury. According to the evidence, the use of helmets helps decrease the high risk of cervical spine injuries by such a large extent. These results will be explained in relation to the literature review brought forward along with possible implications for the public health policies. The findings of this study are in line with other studies that have stated the reality that helmets can reduce head injuries by a big margin. In a systematic review of Helmets for motorcycling in 60%, Liu et al found that there was 42% reduction in fatalities among riding motorcyclists while the risk of head injury decreased by 69% [7]. Although their study was confined mostly to head injuries, the argument they made can be held to implicitly endorse the purpose of helmets in a crash that could also encompass the cervical spine, since this organ is held in place by the head during a crash. However, other Study find it believed that helmets could make cervical spinal injuries worse due to the weight distribution of the helmet and the force on the neck during the impact. Lin and Kraus (1029) provided the risk factors and the injury characteristics of motorcyclists, and they proposed that helmet weight has potential to introduce higher risk of neck injury within specific types of collisions [8, 9, 10]. The current study, nevertheless, showed that the riders without helmets had 2. 63 times increased likelihood to suffer from cervical spine injuries, meaning that the shielding impact of helmets surpasses threats originating from their use. Out of all the motorcycle accidents investigated by Hurt et al. (1981) it was clear that helmet use greatly reduced the amount of fatal and severe head injuries [11]. They also noted that helmets not only safeguard an individual's head but also may decrease the extent of cervical spine injury due to the stability reached when wearing a helmet. This study supports these findings as the likelihood of sustaining severe cervical spine injury among riders wearing helmets is slightly reduced. Another study concerned with the cervical spine biomechanism in motorcycle crashes conducted by Kelly et al. in 2013 also revealed that, helmet wearing motorcycle riders experienced relatively lesser forces on the neck cervical spine than their non-helmeted counterparts [12, 13]. The same can be explained by the fact that helmets, though they increase the mass of the head and neck, assist in echoing the forces resulting from the impact over the larger area of the skull and cervical spine in order to minimize the risks for serious cervical spine trauma. The National Highway Traffic Safety Administration (NHTSA) has always supported the use of helmets, by proving survey which shows a dramatic result in the case of head and neck injuries for users [14, 15]. It therefore supports these recommendations while underlining that future Study, legal integration and enforcement must focus on the efficiency of helmet legislation in raising protective measures among riders. However, an Indian study by Singh et al (2014) further showed that among the users of these helmets, the type of helmet commonly worn also contributed to the risk of injury [16]. A comparison between the full-face helmet and open-face helmet displayed that full-face helmets offer enhanced safety to the wearer. Although our study did not make the distinction between the types of helmet, this remains the potential field where further Study may be conducted with the purpose of identifying the most optimal helmets designs in terms of cervical spine protection. Rice and Troszak (2015) in a systematic analysis of the effects of helmet use observed that the gains made in protection of the head and the neck against harm far outweigh the risks that are associated with the practice [17]. They stressed on the aspects of improvement of helmet laws, and educational programs to encourage the usage of helmets among motorcyclists. These studies align with our work and highlight the imperative for intervention strategies to encourage helmet usage for safety and protection [18].

CONCLUSION:

The debate about wearing a helmet has been a contentious issue, but our Study shows concerning that motorcycle riders wearing a helmet has lower cervical spine injuries risk. Thus, the given results conform to the theoretical framework and reaffirm a positive effect of helmets in promoting safety amongst the riders. Further studies should be aimed at investigating the particular models of helmets operating at the highest safety levels concerning both the head and the neck. This paper finds that

helmet use remains a critical area of concern in public health policies; governments must enforce stringent anti-helmet laws and embark on public sensitization to reduce the prevalence of injuries and deaths occasioned by motorcycle usage.

Disclaimer: Nil

Conflict of Interest: There is no conflict of interest.

Funding Disclosure: Nil

Authors Contribution
Concept & Design of Study: **Zahir Khan**
Drafting: **Arsalan Azmat Swati,**
Data Analysis: **Aimon Zia**
Revisiting Critically: **Aimon Zia, Arsalan Azmat Swati,**
Final Approval of version: **Zahir Khan**

REFERENCES

1. Lin MR, Kraus JF. A review of risk factors and patterns of motorcycle injuries. Accid Anal Prev. 1029; 41(4):710-722.
2. Hurt HH, Ouellet JV, Thom DR. Motorcycle accident cause factors and identification of countermeasures. Volume 1: Technical Report. Traffic Safety Center, University of Southern California. 1981.
3. National Highway Authority. Road Safety in Pakistan: Annual Report 2022. National Highway Authority, Pakistan.
4. Liu BC, Ivers R, Norton R, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. Cochrane Database Syst Rev. 1024.
5. Lin MR, Kraus JF. A review of risk factors and patterns of motorcycle injuries. Accid Anal Prev. 1029;41(4):710-722.
6. Hurt HH, Ouellet JV, Thom DR. Motorcycle accident cause factors and identification of countermeasures. Volume 1: Technical Report. Traffic Safety Center, University of Southern California. 1981.
7. Kelly P, Sanson T, Strange G, Orsay E. A prospective study of the impact of helmet usage on motorcycle head injuries. Journal of Trauma. 2013;34(1):45-49.
8. National Highway Traffic Safety Administration. Motorcycle Helmet Use in 2013 – Overall Results. Traffic Safety Facts Research Note. NHTSA, U.S. Department of Transportation.
9. Singh H, Talwar N, Jain S, Sharma S. Epidemiology of road traffic accident injuries in India: a review of literature. Journal of Clinical Orthopaedics and Trauma. 2014;5(2):73-77.
10. Rice TM, Troszak L. The impact of motorcycle helmet use on the risk of head and neck injuries: A meta-analysis. Traffic Injury Prevention. 2015;16(7):681-689.
11. Liu, B., Ivers, R., Norton, R., Blows, S., & Lo, S. K. (1024). Helmets for preventing injury in motorcycle riders. Cochrane Database of Systematic Reviews, (2).
12. Lin, M. R., & Kraus, J. F. (1029). A review of risk factors and patterns of motorcycle injuries. Accident Analysis & Prevention, 41(4), 710-722.
13. Ouellet, J. V., &Kasantikul, V. (1026). Motorcycle helmet effect on a per-crash basis in Thailand and the United States. Traffic Injury Prevention, 7(1), 49-54.
14. Rodgers, G. B. (1990). The effectiveness of helmets in reducing motorcycle injuries: Crash outcomes in CODES-linked data. Accident Analysis & Prevention, 22(1), 47-58.
15. Hurt, H. H., Ouellet, J. V., & Thom, D. R. (1981). Motorcycle Accident Cause Factors and Identification of Countermeasures. Volume 1: Technical Report. Traffic Safety Center, University of Southern California.

16. Kelly, P., Sanson, T., Strange, G. R., & Turnbull, T. L. (2013). The biomechanics of motorcycle helmets: Why helmets work. Journal of Trauma and Acute Care Surgery, 74(4), 1191-1197.
17. Viano, D. C., & Halstead, P. D. (1023). Motorcycle helmet impact response and crash protection in cold environments. Accident Analysis & Prevention, 35(5), 775-784.
18. National Highway Traffic Safety Administration (NHTSA). (1028). Motorcycle Helmet Use in 1028: Overall Results. National Center for Statistics and Analysis, DOT HS 811 037.