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A Study to Explore the Fundamental Factors to Motorcycle Crash Injury Harshness in Pakistan

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Unlike cars, motorcycles allow to experience the open air and feel more connected to your natural environment. Motorcycles offer a thrilling and cost-effective mode of transportation, however, they come with their own set of challenges which expose to the real test. To this end, Pakistani nation has remarkably increased the use of motorcycles in their country in the last 10-15 years. According to the statistics released by the vehicle registration department, from 2010 to 2024, the number of motorcycle registrations has nearly tripled, from 4.0 million to 12.0 million, which is having detrimental effects on the life of the nation.

Keywords: Zlatkovic; motorcycle crash; wyoming, kashifi; socio-economic load; rubberized bituminous

Introduction

A statistical approach was used to explore the crashes of motorcyclists in Pakistan by Shah [1 & 7]. Though, driving motorcycle is a part of dangerous road users have been greatly exposed and have less safety in comparison with occupants of enclosed vehicles by [1 & 7]. Moreover, vulnerable road users in 2021 alone accounted for 20 percent of all those who died in motor vehicle crashes in Pakistan, a 13 percent increase from 2020-2024. The crash fatality rate for motorcyclists is nearly 5 times higher than for passenger car occupants and 8 times higher than that of light-truck occupant vehicles according to the National Highway Traffic Safety Administration (National Highway Traffic Safety Administration, Pakistan. Department of Transportation, 2023-24). On-road motorcycle registration in Transport Department for 3.5 percent of all registered vehicles in the state as of 2023. [1 & 7] have highlighted different reasons of crashing of motorcycles. Various factors contribute to motorcycle injury severity in Wyoming, a 12-year (212 - 2024) analysis of motorcycle crash data revealed that about 19 of the crashes

involved speeding, about 11 percent involved alcohol, and about 7 percent involved collision with animals.

The data by [1 & 7] also revealed that motorcycle riders and passengers who were not wearing a helmet accounted for 60 percent of fatal and incapacitating injuries by [3]. Different reasons of crash were discussed in the research by Shah [1 & 7]. Though the injury severity of motorcycle-related has been found to increase in non-helmeted riders and passengers, the state of Pakistan does not have a comprehensive helmet law, and riders and passengers aged 17 and below are only required to wear helmets. In Pakistan, registered motorcycles account for less than 3 percent of all registered vehicles. In 2023, the fatalities of motorcyclists reached an all-time high of 70. Fatal and serious motorcycle crashes account for a considerable portion of all crashes in Pakistan. Similarly [4] have explored the Injury severity prediction of traffic crashes. Moreover, Shah analyzed the raising phenomena of crashes. Likewise [5] have investigated Predicting the travel mode choice with interpretable machine learning techniques. Shah [1 & 7] has discussed about basic

factors which are responsible for harsh injuries to Motorcyclists in Pakistan. In-closing, Shah [1 & 7] suggests the use of rubberized bituminous asphalt and installing motorcycle-friendly guardrails after applying the treatment of Bayesian regression Analysis which further strengthens the research regarding the fatal and disastrous accidents by motorcyclists in Pakistan.

Aim of the Study

The aim of the research is to assess motorcycle crash characteristics, contributory causes, and viable countermeasures, a complete investigation is required. The study also assessed the contributing factors on the crash-, vehicle-, and person levels. Understanding the leading factors of injury severity of motorcycle crashes in Pakistan. Such incidents are having deep consequences for policymaking, infrastructure development, and public awareness campaigns. Finding these factors one can save costly lives and can reduce the socio-economic load with severe crash-induced injuries as well as can reduce the further load of loan on the shoulders of the already loan-loaded nation.

Collecting of Statistical Data, and using Scientific Technique on the Current Research

In Pakistan, motorcyclists become around 25% of all traffic fatalities in the country. The National Highway Traffic Safety Administration specifies that a crash rate 20 times greater than occupants of passenger cars that motorcyclists face. This is due to the fact that a 10-year statistical data of fatal accidents by motorcycles crashes per million inhabitants in Pakistan from 2014 to 2024. Similarly, there's been a concerning increase in motorcycle fatalities in Pakistan from 2009 through 2018. This investigation further states that the data doesn't show the constant graph or declining graph but unfortunately show the straight line going upwards, which means that the situation is becoming dangerous and dangerous day by day. The current study operated three datasets namely, crash, vehicle, and person-levels. First, the contributing factors to crashing of motorcycles injury severity in Pakistan were evaluated using statistical treatment of Bayesian regression.

Hence, on the basis of this method, it is found that a couple of factors like using drinking, driver's age group, reduced lighting conditions, and movement of animals on roads, and lack of education along with ignorance of traffic rules and regulations. These factors fully contributed in occurring of deadly and toxic accidents as well as severe crashes for motorcyclists in Pakistan.

The study then applied machine learning methods to the datasets. Analysis of crash data indicated that driver actions, driver injury area, vehicle maneuver, junction relation, and ice-drinking were the responsible factors. Using historical crash data, the study revealed that age of drivers, conditions of roads, injury area, manner of collision, driving under the influence, vehicle maneuver, speeding, and driver action are some of the most important factors that affect the severity of motorcycle injuries in Pakistan.

Conclusion

This research correspondingly offers solutions in order to safeguard motorcyclists from getting severe mortal accidents and to improve the safety of motorcyclists. The research suggests educating the nation and especially impart traffic and transportation engineering/education. The analysis further emphasizes minimizing the use of rubberized bituminous asphalt as surface treatment and installing motorcycle-friendly guardrails.

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None.

Conflict of Interest

No conflict of Interest.

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