

# Risk Factors of Motorcycle Crashes in Sri Lanka

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## 1. Introduction

The use of motorcycles has become a passion or even a way of life in many South Asian countries including Sri Lanka, for commuting to work or transporting goods, as they are easy to use and to cover short distances. In these countries, ownership and use of motorcycles and other two-wheelers are generally relatively high. Compared to drivers of other vehicles, motorcyclists are vulnerable road users as they often share the traffic space with fast-moving vehicles, they are less visible, and also they lack protection in the case of a crash.

All Sri Lankan regulations for motor vehicles are applicable to motorcycles. The owners are required to register their vehicles and also obtain driving licences to operate motorcycles. They also are required to obtain annual revenue licenses. Motorcycles are popular among middle income and low income people in Sri Lanka and mainly used to commute to work and also used to transport goods, as well as for recreational purposes. The most common vehicles on Sri Lankan roads are motorcycles and the number of motorcycles is more than three times the number of the second most popular vehicle, namely the three-wheeler. The percentage of increase of registered motorcycles in Sri Lanka from year 2003 to 2012, was 152% [1]. As the number of motorcycles increase, so does the probability of their being involved in motor vehicle crashes.

Despite their popularity, little research has been conducted to study the impact of motorcycles on road safety in Sri Lanka. The present research investigates the risk factors of crashes involving motorcycles and contributory causes using data from Sri Lanka.

## 2. Data and Methodology

Data were obtained from police crash records which contain details of police-reported crashes, at all severity levels. Data pertaining to crashes involving motorcycles in Sri Lanka which occurred between 2009 and 2013 were considered for this study. The number of motorcycle-involved crashes has increased during the last five years with the highest being observed in 2012. Data were used to investigate motorcycle crashes calculating their frequencies and percentages. Then a crash severity model was developed to investigate the severity of the motorcycle crashes. Crash severity, which is the dependent variable in this model, is

dichotomous, taking a value of zero for a crash with non-grievous injury and a value of one for a grievous injury or fatal injury. All other available variables were considered in the model development. These variables were checked for multicollinearity using Pearson's correlation matrix to confirm that they were significantly independent candidate variables [2]. Among these independent variables, a total of two correlated pairs achieved a significance level of  $p \leq 0.5$ , which was the cut-off criteria selected for the analysis. One variable from each pair was discarded, so that the variable providing the stronger model, i.e. the variable with the higher-magnitude of Pearson's statistic was retained.

To measure the association between crash severity and characteristics of crashes involving motorcycles, Odds-Ratios (ORs) and 95% Confidence Intervals (CIs) were estimated using severity models. An odds ratio greater than 1.000 indicates that the concerned characteristic would lead to a higher crash risk, and vice versa.

### **3. Results and Discussion**

The total number of motorcycle crashes during the five-year period was 209,381 including 21,996 fatal crashes and 63,228 grievous injury crashes. Age of the motorcycle driver was one of the factors useful for understanding the characteristics of crashes involving motorcycles. While there were some younger and older drivers, 65.6 percent of motorcycle drivers involved in crashes were between 20 and 40 years old. Only 58.8 percent of motorcycle crashes involve riders holding valid licenses. Safety helmet usage in crashes involving motorcycle riders was 62.5 percent. More frequent crash conditions for motorcycle crashes were those occurring while driving on rural roadways, driving during week days, and driving newer motorcycles. Dry road surfaces, clear weather conditions predominantly characterised motorcycle-crashes, which may simply be owing to majority of motorcycles being driven under these conditions.

The variable 'male', which has the highest magnitude of odds ratio among all the variables, showed that motorcycle-involved crashes were likely to be more severe when the driver was male, as compared to female drivers. The odds ratio of alcohol-impaired drivers was higher than 1.000, which indicated alcohol had increased crash risk. Similarly, motor cyclists holding a valid licence were less likely to be involved in a more severe crash than those having no valid licence. When investigating odds of driver-related variables, usage of safety helmets appeared significantly lowering the risk. The odds ratios of environmental-related variables showed that the motorcycle crash severity increased when light condition was 'dark'. Motorcycle crash severity on urban roads was lower compared to rural roads. Also, at intersections and dry road surface conditions independently showed low crash severity risks. Two vehicle crashes had lower odds of causing more severe crashes

as compared to single or multiple vehicle crashes. This analysis provided a good measure to identify factors contributing to increasing severities of crashes involving motorcycles.

Many factors combine to produce circumstances that may lead to a traffic crash; there is rarely a single cause of such an event. The contributory causes could be mainly divided into three categories; driver-related cause, roadway-related causes, and vehicle-related causes. Aggressive/negligent driving and speeding were the most frequent driver contributory factors in the motorcycle crashes. It was interesting to note that when the contributory cause was one of those, the helmet usage was comparatively low. There were occasions when the driver had to react to unexpected events. Hence, road conditions, as well as surrounding conditions, needed to be considered as important factors when riding motorcycles. Defective road surface, or defective road sign, emerged as main roadway contributory causes. Safety helmet use was lower when defective road sign was the contributory cause. Crashes due to failure in the breaks were more frequent when considering vehicle-related causes.

### **3. Conclusions**

The results of this study could be used for the targeting of future intervention programs aimed at reducing motorcycle crashes and reducing their severities. Incorporating these findings into existing training and education programs for both motorcyclists and drivers may improve their awareness of problems and help reduce the frequency of crash occurrence.

### **References**

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