

Factors affecting the Severity of Motorcycle Accidents in Sri Lanka

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Abstract

Road traffic accidents have become the first leading cause of death in the young generation. among these road accidents, motorcycle accidents can be identified as the most prominent case of road traffic death. According to the statistics of Sri Lankan police (2017-2020), motorcycles have become the highest responsible vehicle in road accidents. Motorcycle has become a trend among the young generation due to their easy riding style and affordability. Therefore, it caused to increase in the number of accidents occurred in road accidents. This study, therefore, intended to determine the risk factors associated with motorcycle accidents in Sri Lanka in the year 2020. The results were obtained using three analytical methods. To identify the individual impact of factors two-way analytical methods were used. Focusing the main objective is to identify the risk factors both Binary logistic regression and ordinal logistic regression were used. In 2020, 41% of accidents have been reported as minor accidents, and 34% represented as damage-only accidents while grievous accidents have shown as 22% of total accidents. Although, only 3% of fatal accidents have been occurred in 2020. Moreover, it was found that among all the attributes of road characteristics only time of the day, gender, age of license, & human factor, condition is significantly associated with the severity of accidents. Finally, the findings derived through this study would be useful for policymakers to reduce motorcycle accidents.

Keywords: *Motorcycle accidents, Risk factors, Severity of accidents.*

1.Introduction

Road Traffic Accidents (RTA) have become the 8th leading cause of death for all ages and the 1st leading cause of death among the young generation in the world (World Health Organization-WHO, 2018). Deaths and injuries resulting from road traffic crashes remain the main serious problem globally and current trends suggested that this will continue to be the case in the foreseeable future.

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The number of road traffic deaths continues to climb, reaching 1.3 million people. Despite the increase in absolute numbers, road traffic deaths have remained fairly constant at around 18 per 100,000 populations over the last five years (WHO, 2018). More people die annually as a result of road traffic injuries than from HIV/AIDS, tuberculosis, and diarrheal diseases (WHO, 2017). Because of this serious situation WHO has targeted “By 2030, to halve the number of global deaths and injuries from road traffic crashes” under the Sustainable Development Goals (SDG) (WHO, 2018).

Looking at the prevalence of Road accident deaths, Motorcycle deaths have shown a significant contribution to road accidents (WHO, 2018). Motorcycles are popular means of moving humans and materials from place to place. However, they are also well known for the risk they pose to the general public road safety (Luther, 2019). A lot of people use the motorcycle since motorcycles are fast economical and easy to maintain. It is significant to focus on that, in very specific use as a way to deliver objects, documents, and food quickly (Oliviera, 2011). Although recently the number of individuals encountering motorcycle-related injuries has been significantly increasing in several countries (Naci, 2009). Globally, pedestrians and cyclists represent 26% of all deaths, while those using motorcycles and three-wheelers comprise another 28% (WHO, 2018).

In developing countries, motorcyclists are the main victims of Road Accidents. Motorcycle injuries constitute a major but neglected emerging public health problem and contribute dramatically to the overall road traffic injuries (Chalya, 2010). Among these injuries head injuries are the leading issue of death and major trauma for motorcycle users (Macleod, 2010).

As the motorcycle is small in size, the riders tend to over speed and overload their motorcycles for a quick return. Moreover, irresponsibility, unruliness, and lack of respect for other road users cause to increase in the risk of motorcycle injuries (Naddumba, 2004). Motorcycle accident occurrence is affected or influenced by several factors including age, being male or female, education level, and maintenance of the motorcycle (Luther, 2019). Ghana Statistical Service –GSS (2014) further explained that a lot of motorcycle accidents were attributed to the bad nature of the road, the high level of alcohol consumption in the region, and overspeeding on the part of riders.

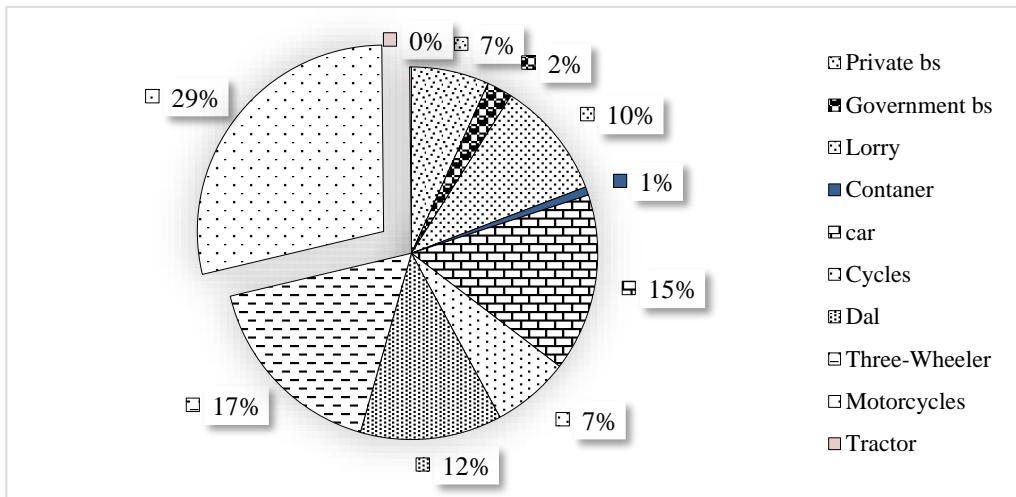
Focusing on factors caused to motorcycle accidents Smit (2021) has identified traffic errors, control errors, stunts, protective equipment, and violations are the riskiest factors for motorcycle accidents. Donnel & Connor (1996) has found that age, vehicle speed, seating position, alcohol level, vehicle type, and collision type cause to increase in the probability of motorcycle accidents. Meanwhile, travel speed, restraint device usage, use of alcohol, gender, weather, and location type have been identified as the risk factors for accidents (Dissanayake 2004 & Lu, 2002). A study conducted by Al Ghamdi (2002) showed that accident location, collision type, accident time, rider age, vehicle type, and license status were significantly associated with accident severity. Moreover, traffic disorganization, failure of inspection, and poor maintenance of riders also have a significant impact when occurring motorcycle accidents.

1.1 The Situation in Sri Lanka

The RTAs in Sri Lanka have surged in the last decade (Amarasinghe, 2021). An average of six people dies each day from RTAs in Sri Lanka where hundreds are severely injured, with lifelong issues and impairments (Renuraj, 2015). Considering the total number of registered motor vehicle population in Sri Lanka, 75% represented by motorcycles in the year 2020 (Police accident database, 2020). Motorcycle users are more vulnerable compared to travelers in fast-moving traffic, because motorcycles are less visible owing to their smaller size, and because they lack protection during a crash. As a result, motorcycle crashes are often reported with severe injuries caused to its users (Amarasinghe, 2015).

When focuses on the figure 1-1it can be identified that motorcycles are the most prominent case for RTA in 2019. By the end of 2019, out of the total number of 8095224 registered vehicles, 4668074 represent motorcycles

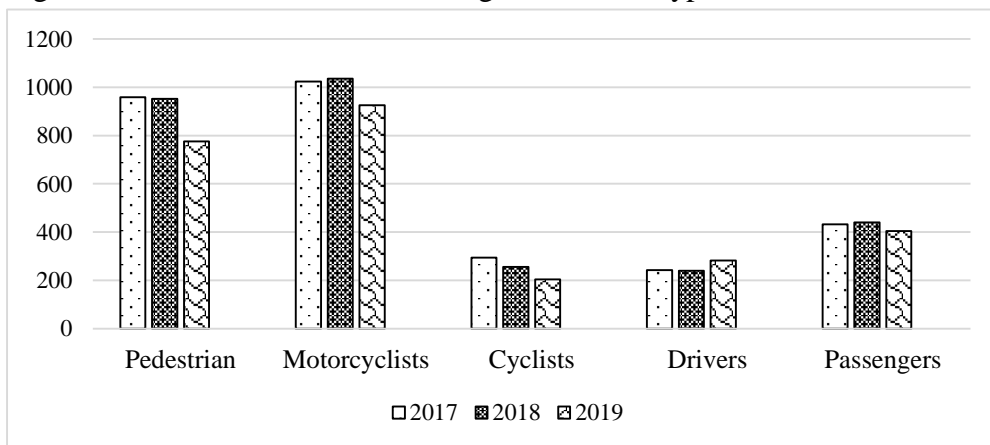
Figure 1: Vehicles responsible for road accidents - 2019



Source: Police accident database, 2019

Figure 2 illustrated the number of deaths according to road user types. In 2019 motorcyclists are the leading cause of death in road accidents. statistically, it has shown a higher value compared to other user types. However, in 2019 motorcyclists' death rate show a slight decrease.

Figure 2: Number of deaths according to road user types - 2019



Source: Police accident database, 2019

Sajith (2018) indicates that from 2012-2016 the number of registered motorcyclists have been increased by 45% with a growth rate of 11% per year, which shows the significant growth of the motorcycle population in the country. He further explained that as the number of motorcycles increases so

does the probability of their being involved in crashes also increases. The involvement of youngsters in motorcycle accidents is a serious issue in RTA. Riders aged 21-25, were involved mostly in motorcycle crashes and a major contributory factor to accidents was aggressive or negligent driving (Devasurendra, 2016). Moreover, he reveals that 9% of youngsters (below 18 years) failed to produce licenses at the time of the crash.

Rapidly increasing number of motorcycle population, and negligent driving, increasing motorcycle-related injuries emphasize that it is time to pay immediate attention to the motorcycle-related accidents. An increasing number of accidents especially related to motorcycles has created a big challenge for the country to meet the Sustainable Development Goals (SDG) launched by the year 2015.

Therefore, this research aims to investigate the prevalence of motorcycle accidents and associated factors in Sri Lanka. This will go a long way in providing information that could policymakers and road users to help curb motorcycle accidents. This will immensely help to reduce the occurrence of Motorcycle accidents and contribute towards saving lives that would have otherwise been lost through this accident.

1.3 Research Objective

Identify the factors affecting for severity of motorcycle accidents in Sri Lanka

2. Literature Review

There is a positive significant relationship between human factors, environmental factors and vehicle factors contributing to motorcycle-related accidents (Elliot, 2003; Mccarthy, 2007; Sajith, 2017). Therefore, these factors have discussed below.

Speeding can consider as bad behavior because its increases the risk of motorcycle accidents (Marizwan, 2017). William, McLaughlin & Atwood, 2016 (2010) indicates that excessive speed is the major factor for 45% of accidents observed in curves. Aslo, according to Marizwan (2017), 22.5% of fatality cases have been reported under the age group 16-22 years and, in terms of gender female motorcycle fatality cases are higher than male cases. Further National Center for Injury Prevention and Control [NCIPC] (2016) disclosed that 28% of motorcycle riders had blood alcohol. In Sri Lanka 99% of the

riders and 87% of the pillion wore helmets (Dharmaratne, Jayatilleke, Abeyrathna, Mabharana & Kumbukgolle, 2013).

Nadunguru's (2016), point of view, 13.5% of motorcycle accidents have been occurred due to the nature of the road environment. Marizwan (2017), presented that 61% of fatality cases have been reported in rural areas, 62% of fatality cases were reported on primary roads, and 20% of cases in residential areas. Behera (2009) disclosed that 34% of accidents have been reported from 6 a.m to 12 noon and 5.00 p.m. to 8.00 p.m. More than 70% of motorcycle accidents were took place while driving on weekdays with clear weather and dry road in heavy traffic (Amarasinghe, 2015). The lighting system causes short Sighted rest to motorcyclists especially at night (Nadunguru, 2016). European Association of Motorcycle Manufacturers (EAMM, 2003) reported that 19% of accidents took place at night in areas where there were street lightning and 37% in areas without street lighting.

Schneider and Savolainen (2011) have shown that inefficient braking system and breaking problems increase the risk of motorcycle accidents. In this same study, they have presented that 36% used a front brake. Amarisnghe (2015) indicates that about 65% of motorcycle accidents in Sri Lanka are reported from bicycles which used for less than 5 years. further, he showed that 23% of motorcycles involved in accidents are new. In Sri Lankan situation there is no such system in practice and issuing licenses (Sajith, 2017). Devasurendra (2016), further explained that 29% of motorcyclists were unable to present a valid driving license, and among these 9% represented under 18 years of age (Sajith, 2017) Engine size also behaves as a responsible factor when occurring motorcycle accidents (Honk, Klootwijk & Ruijs, 1997). Elliott (2003) further explained that the size of the bike affects accidents severity.

3. Methodology

3.1 Method of Data Collecting

The data relating to motorcycle accidents was retrieved from the Police Accidents Database (1st of January 2020 to 31st of December 2020). Western province of Sri Lanka was selected as the study area.

3.2 Method of Data Analysis

Logistic regression is a method that is commonly used to identify the relationship between independent and binary-dependent variables. This method has been commonly used in many previous kinds of research related to accident severity analysis (sajith 2017; Devasurendra 2016; Kodithuwakku 2019; Wilson, Fang, Wiggings, & Cooper, 2003). In Sri Lanka, this method is used to figure out factors related to the severity of accidents in heavy vehicle crashes (Devasurendra, 2016). In this research, binary logistic regression was used to reach the main objective.

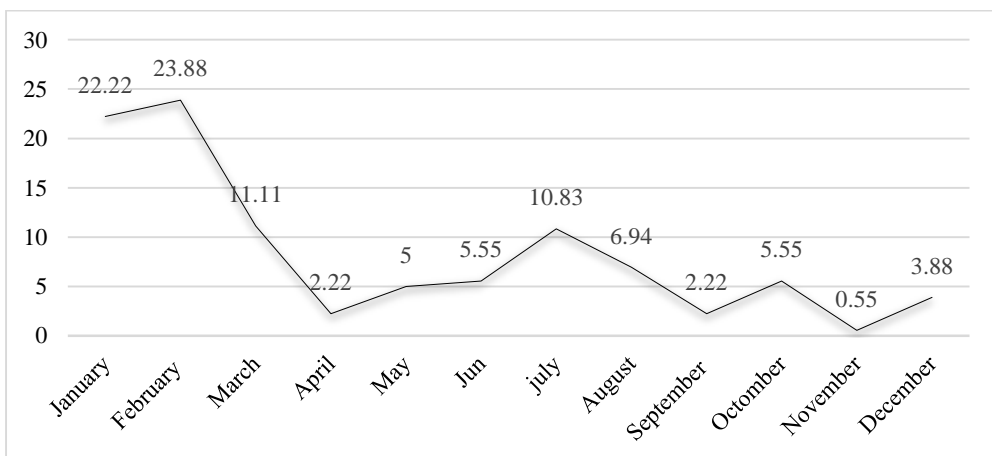
Accident severity considers as the dependent variable while Human, Environment & Vehicle factors consider as independent variables. Binary data is numerically shown by zero (0) and one (1). Here, '0' represents fatality and grievous accidents and '1' represents' minor and damage only accidents.

4. Results and Discussion

4.1. Overview of Motorcycle Accidents in Sri Lanka

Looking at figure 1, it appears that the first two months of January and February have shown the highest number of accidents when compared to other months of the year.

Figure 3: Monthly motorcycle accidents - 2020



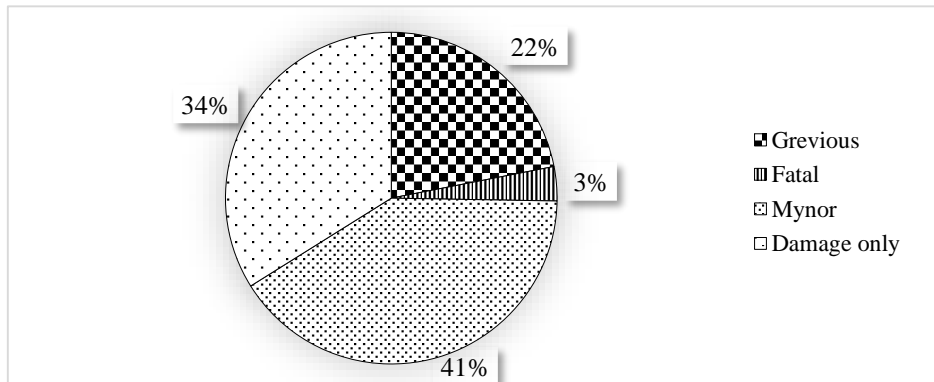
Source: Sri Lanka police, 2020

Accordingly, By March, it has reduced 12% and by April it has declined by 9%. In March of 2020, Sri Lanka had to face the covid - 19 pandemic and started the lockdown period. It has fallen again p to 2.2%. Accordingly, it can be concluded that the lockdown situation was the main reason for these fluctuations in motorcycle accidents throughout the year.

4.2 Type of Motorcycle Accidents occur in 2020

When considering the types of motorcycle accidents in 2020, 41% represented as minor accidents while 34% presented as damage-only accidents. Although only 3% of fatal accidents have occurred in 2020, grievous accidents account for 22% of all accidents. When compared with the figures published by the WHO, Global Status Report on Road Safety 2015, motorcyclists in Sri Lanka face approximately 1.60 times more fatal risk compared to motorcyclists all over the world. Likewise, other vulnerable road users such as pedestrians and cyclists face 1.32 times and 2.25 times more risks respectively.

Figure 4: Types of motorcycle accidents - 2020

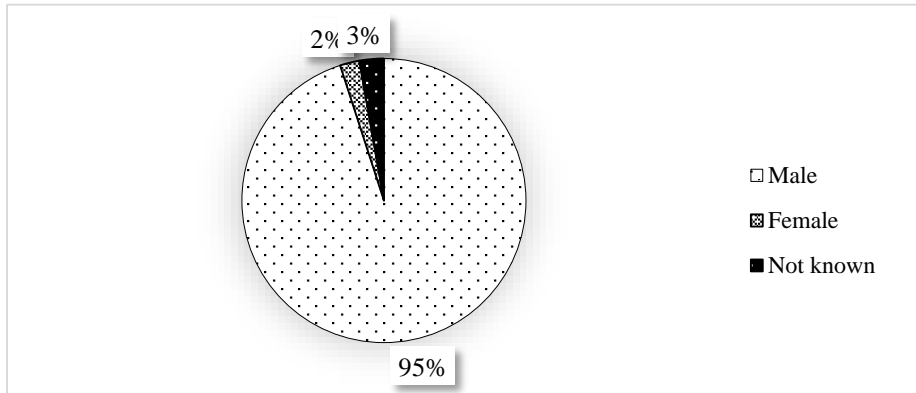


Source: Sri Lanka police, 2020

4.3 Gender of the Motorcycle Riders - 2020

Figure 3 illustrate the gender of riders. It appears in the consideration, that about 95% of motorcycle accidents are caused by male motorcyclists. Also, 3% do not mention gender and only 2% are female motorcyclists. Since motorcycles are mostly used by men, they are more likely to contribute to accidents.

Figure 5: Gender of motorcycle riders - 2020

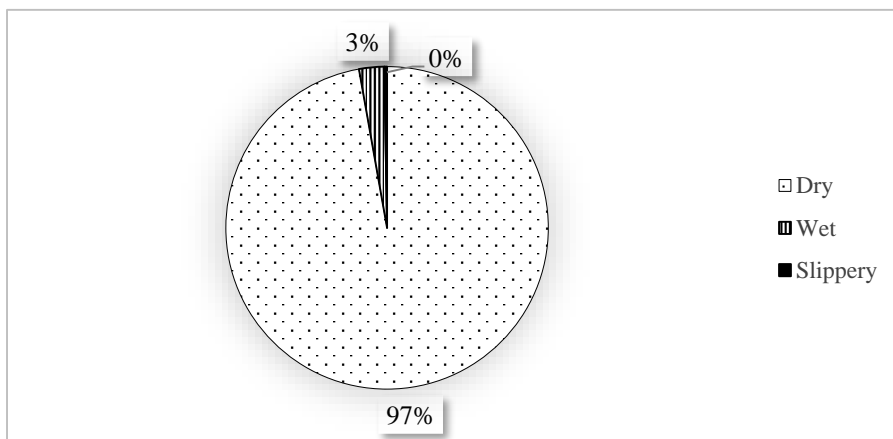


Source: Sri Lanka police, 2020

4.4 Road Surface related to Motorcycle Accidents - 2020

Figure 4 have shown the road surface condition when occurring motorcycle accidents. It indicates that 94% of motorcycle accidents have occurred in dry surface conditions. Since Sri Lanka has a dry climate for many months of the year, it is possible to increase the percentage of motorcycle accidents under dry surface conditions. Only 3% of accidents have been recorded in wet surface conditions.

Figure 6: Weather conditions related to motorcycle accidents - 2020

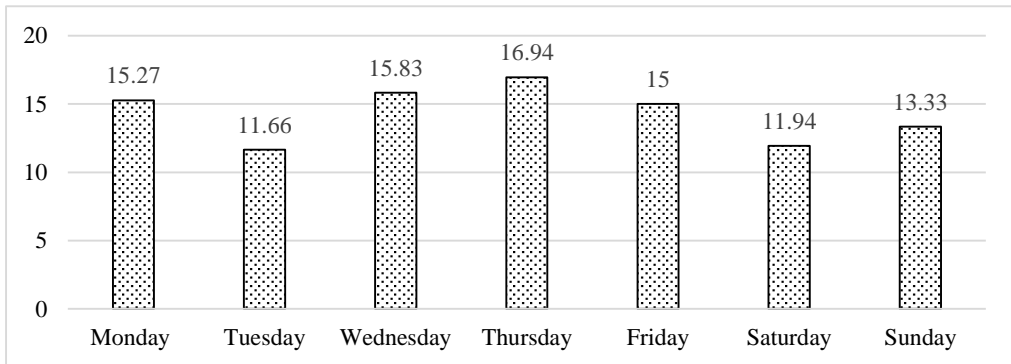


Source: Sri Lanka police, 2020

4.5 Weekly Performance of Motorcycle Accidents - 2020

Figure 5 appears that accidents occur with slight fluctuations throughout the week. Thursdays have shown the highest accident rate at 17% and Tuesdays and Saturdays can be identified as the least accident dates. On Monday, the first day of the week, 15% of all accidents were reported. The number of accidents on weekends is lower than on weekdays.

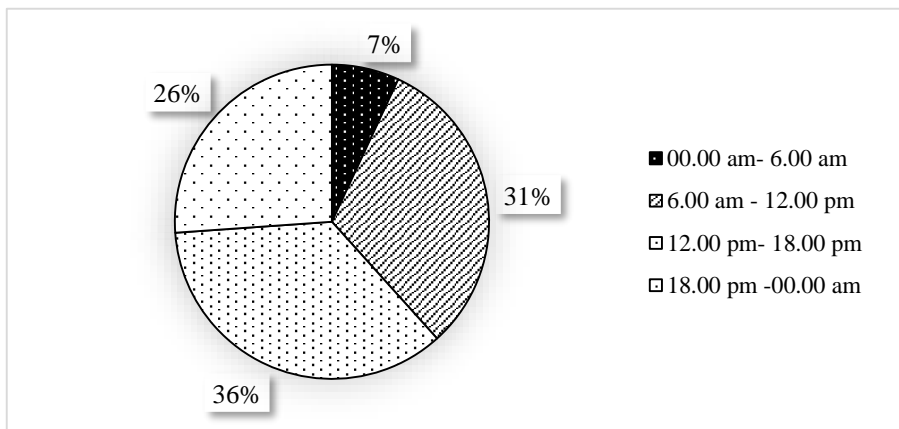
Figure 7: Motorcycle accidents according to the day - 2020



Source: Sri Lanka police, 2020

4.6 Prevalence of the Motorcycle Accidents according to the Time - 2020

Figure 8: Prevalence of the motorcycle accidents according to the time - 2020



Source: Sri Lanka police, 2020

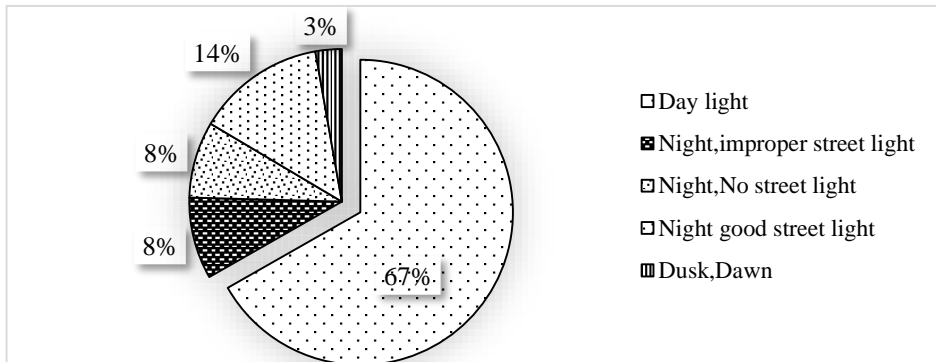
According to the figure 6, motorcycle accidents are more likely to happen between 12 noon and 6.00 pm. It is also clear that 31% of all accidents occur between 6 am and 12 noon. The period from 6.00 am to 6.00 pm is the busiest

time of the day. Therefore, the probability of an accident occurring during that time period will also be high. Only 7% of accidents have been reported between 6.00 pm and 6.00 am. According to the charts, it can be concluded that the number of accidents is relatively high during the period when most people are engaged in daily activities when compared to other time periods of the day.

4.7 Light Condition related to Motorcycle Accidents - 2020

As per figure 7 highest number of motorcycle accidents occur under the daylight condition. It accounts for 67% of all accidents. 30% occurred in the nighttime and 3% in dusk or dawn. 16% occurred on roads where no streetlights or improper streetlights were available.

Figure 9: Light conditions related to motorcycle accidents - 2020

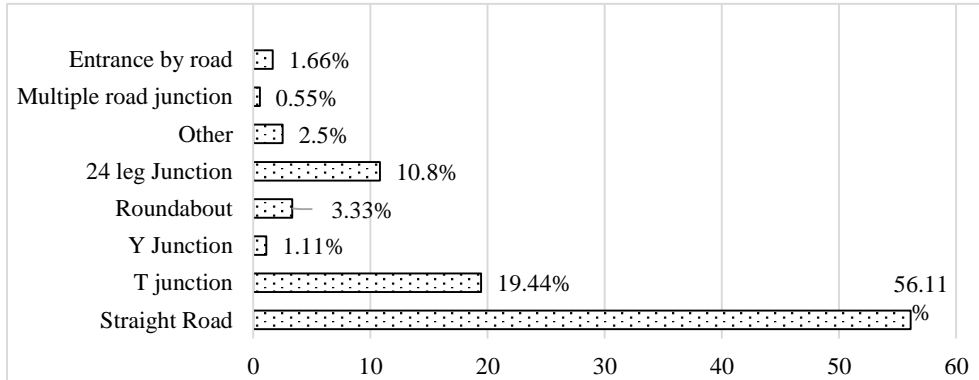


Source: Sri Lanka police, 2020

4.8 Motorcycle Accidents according to the Location Type – 2020

Figure 8 illustrates the motorcycle accidents with its location type. When considering the location type, it can be seen that 56% of motorcycle accidents have been reported in straight lines. Although the risk of accidents is higher in Y Junction T junction and round, these places accounted for 23% of all accidents. Accidents in X and Y places are as small as 1%. Accidents in multiple road junctions and entrances by road places are as small as 2%.

Figure 10: Motorcycle accident according to the location type-2020

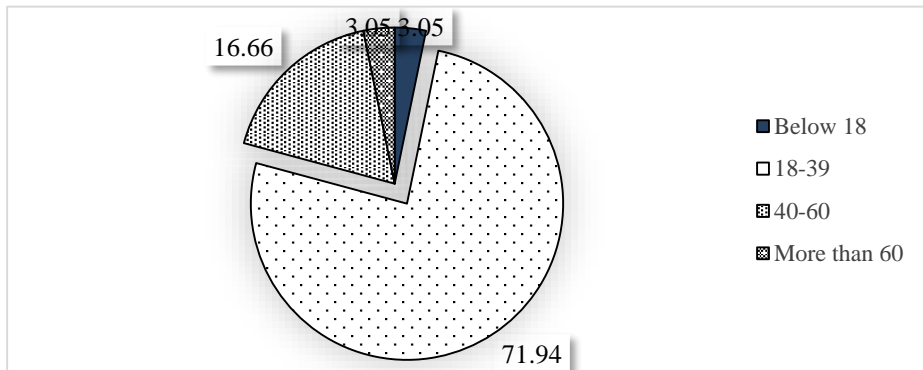


Source: Sri Lanka police, 2020

4.9 Age of the Motorcycle Riders - 2020

According to figure 9, about 72% of motorcyclists involved in motorcycle accidents are young people between the ages of 18 - 39. The popularity of motorcycles, especially among the youth who are productive forces of this country, may have contributed to the increase in accidents. Furthermore, crash risk is higher for young motorcycle riders due to the lack of experience, for instance, uncomprehending, assessing, and responding to hazards. After that, the highest number of accidents occur in the age group of 40 - 60. About 3% of all accidents are reported in children under 18 years of age. However, in 5% of accidents, the age of victims is not reported. The number of accidents reported by the adult population (over the age of 40) is 20%. Hence, their experience of less speed and low usage of motorcycles has led to a reduction in accidents.

Figure 11: Age of Motorcycle riders - 2020

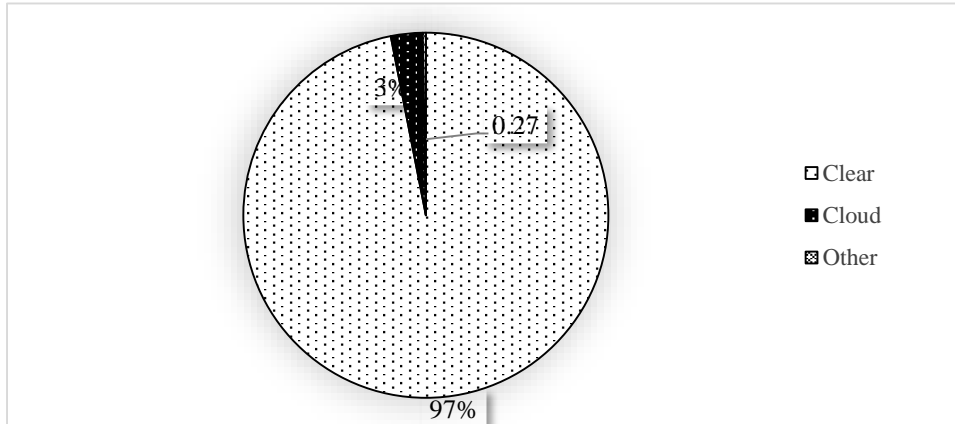


Source: Sri Lanka police, 2020

4.10 Weather Condition related to Motorcycle Accidents in Sri Lanka

Figure 10 present the weather condition related to motorcycle accidents. As mentioned before due to the dry weather in Sri Lanka, 97% of accidents have occurred during clear weather periods. As well as only 3% of accidents have been reported under cloud weather conditions.

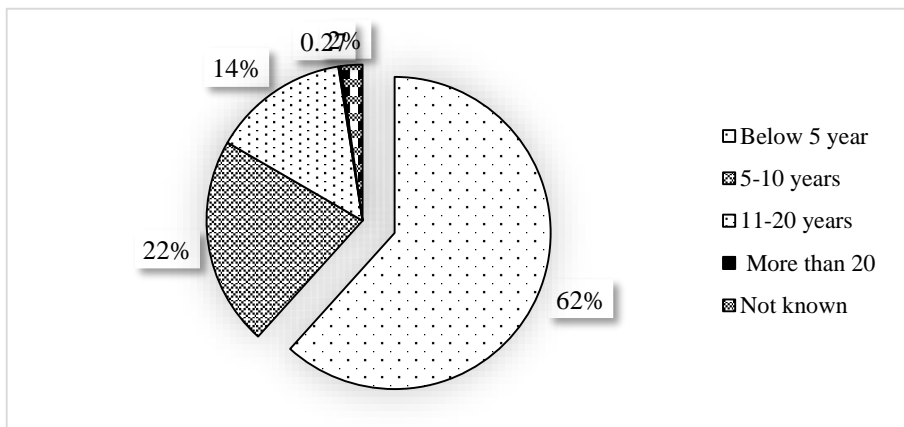
Figure 12: Weather conditions related to motorcycle accidents - 2020



Source: Sri Lanka police, 2020

4.11 Age of Motorcycle related to Motorcycle Accidents - 2020

Figure 13: Age of motorcycle related to accidents - 2020



Source: Sri Lanka police, 2020

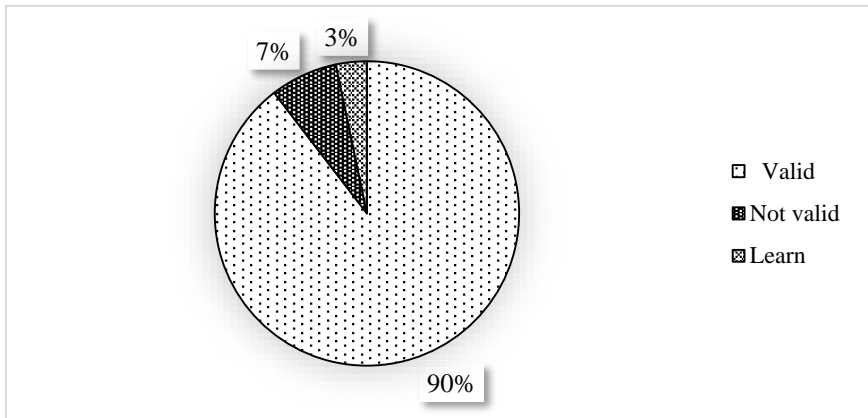
As per the figure 11, it can be identified that 62% of all crashes are caused by motorcycles that have been used for less than 5 years. Both newness of the vehicle and inexperienced drivers may have contributed to increasing that

percentage. 22% of accidents have been reported by used motorcycles between a period of 5-10 years. The special feature of this diagram is that the number of accidents has gradually decreased when the age of motorcycles has been used increases.

4.12 Validity of the License related to Motorcycle Accidents - 2020

Looking at the figure 12 it appears that 90% of all accidents are caused by valid licenses. As well as 7% of accidents have been reported by unlicensed motorcyclists and 3% by learning licenses. This 7% of the victims contains of riders not having a license, have the license but forgot to bring, lost license and police failed to get the record by mistake or not possible for them to get that data due to accident severity of motorcyclist at the scene.

Figure 14: Validity of the license contributes to motorcycle accidents - 2020



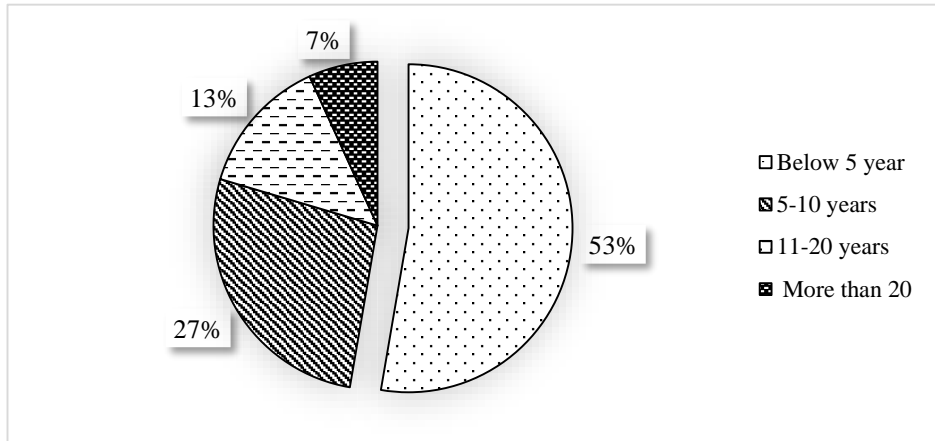
Source: Sri Lanka police, 2020

4.13 Age of License related to Motorcycle Accidents Riders - 2020

Figure 13 illustrate the duration of the license and the percentage of accidents, the ‘Number of years’ license issued indicates the experience of a rider at the time of the accident. In all reported accidents it is clear that 53% of motorcycle accidents are caused by license holders under 5 years of age. They are new to motorcycles and less experience has increased the likelihood of accidents. Further, it indicates that the involvement of new riders in accidents is high. Therefore, it is recommended to implement more training programs for riders before issuing the license. But, in Sri Lanka, riders receive less formal training before getting a license and most of them are self-learned. Also, 27% have been done by license holders between the ages of 5-10. According to the chart,

it is clear that when the license period increases, the contribution to accidents also gradually decreases as before.

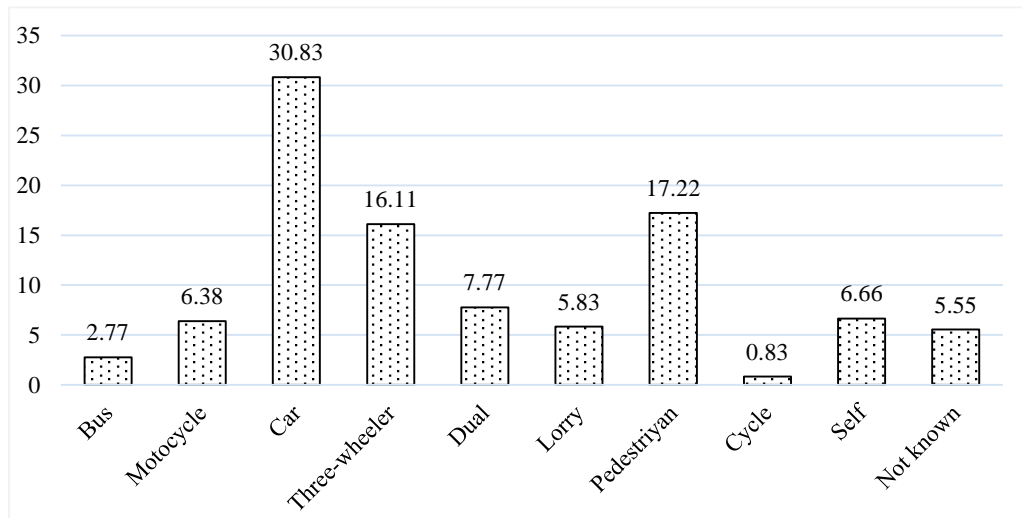
Figure 15: Age of licenses of riders - 2020



Source: Sri Lanka police, 2020

4.14 Types of Vehicles involved in Motorcycle Accidents - 2020

Figure 16: Types of vehicles involved in accidents - 2020



Source: Sri Lanka police, 2020

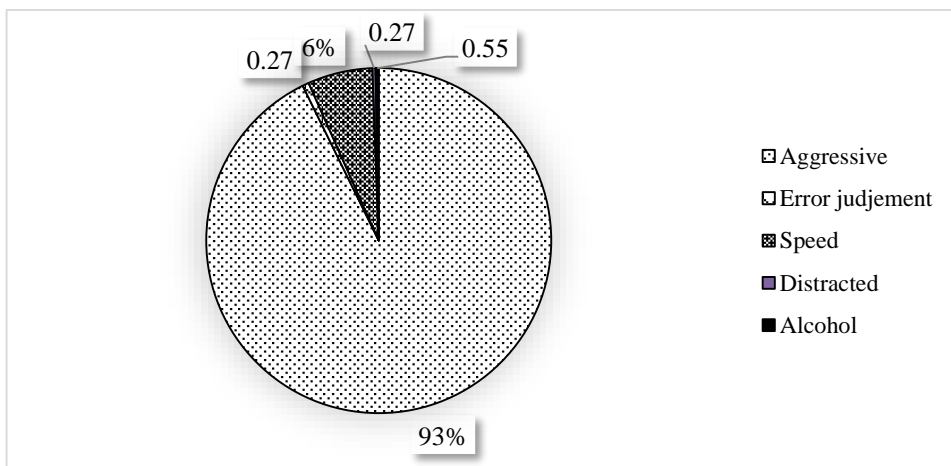
According to the figure 14 About 31% of motorcycle accidents are caused by a collision with cars. After that, it was mostly due to three wheels and pedestrians. When considering the usage of vehicles, motorcycles and cars are widely used in Sri Lanka. Because of that, the number of accidents happened

by such vehicles is also have taken high percentage. further, the lowest number of accidents (0.83%) were caused by cycles. Because the population that uses cycles is very low in Sri Lanka. Further, motorcyclists are at great risk of MCL-related accidents, and they create a significant risk to other vulnerable road users such as pedestrians.

4.15 Human Factors responsible for Motorcycle Accidents - 2020

As per figure 15, aggressive can be identified as the prominent cause of 93% of all motorcycle accidents. Further, only 6% of accidents are due to speeding and 1% due to distractions. The distinctive feature of motorcycle accidents in Sri Lanka is that the number of accidents caused by drunkenness is around 1%. Analyzing the data on accidents, some of the human pre-crash factors that contributed to accident severity are unknown. It can be identified as the weak point of the police accident recording method. Therefore, necessary steps should take to identify other human factors that contribute to accidents and accommodate them in the accident record sheet. Hence, the human factor is one of the major causes of road accidents.

Figure 17: Human factor responsible for motorcycle accidents - 2020



Source: Sri Lanka police, 2020

4.16 Factors affecting Motorcycle Accidents in Sri Lanka

Hypothesis testing was conducted to identify the impact of risk factors for Motorcycle accidents as individual variables. In this test, both fatal and grievous accidents are included under the fatal category.

Table 1: Hypothesis testing

Hypothesis	Chi-Squared value	Sig value	Decision
H1-There is a significant relationship between accident severity and the Day of the week	16.044	.094	Rejected
H2-There is a significant relationship between accident severity and the Time of the Day	9.724	.025	Accepted
H3-There is a significant relationship between accident severity and the Age of the rider	4.449	.981	Rejected
H4-There is a significant relationship between accident severity and the Age of the vehicle	7.612	.541	Rejected
H5-There is a significant relationship between accident severity and the Age of the license	17.03	.001	Accepted
H6-There is a significant relationship between accident severity and the Road surface	36.77	.107	Rejected
H7-There is a significant relationship between accident severity and the weather condition	8.291	.981	Rejected
H8-There is a significant relationship between accident severity and the Light condition	11.287	.000	Accepted
H9-There is a significant relationship between accident severity and the Validity of license	1.244	.742	Rejected
H10-There is a significant relationship between accident severity and the location type	6.711	.450	Rejected
H11-There is a significant relationship between accident severity and the Human factor	6.305	.005	Accepted
H12-There is a significant relationship between accident severity and the Gender	17.325	.000	Accepted

Source: Survey data, 2022

All the Hypotheses mentioned in table 1 were made to test the factors that affecting for motorcycle accidents in Sri Lanka. As per the chi-square value time of the day, age of the driver, light condition, human factor, and gender have shown a significant relationship with the accident severity that is fatal and non-fatal. Accordingly, when considering the individual impact, these factors can be identified as the most influential factors for motorcycle accidents in Sri Lanka.

4.17. Factors affecting the Severity of Motorcycle Accidents

Table 2 represents the pseudo R square value related to the analysis. This study shows that at the Final Stage R-square value is between 0.1070 and 1.5. Accordingly, it can be seen that the value of the R square has shown a lower value. But in this logistics regression model, the dependent variable takes a binary value, even if the value of the R square is lower it can be ignored.

Table 2: Model summary

Step	-2 Log-likelihood	Cox & Snell R Square	Nagelkerke R Square
4	455.062 ^a	.107	.157

Source: Survey data, 2022

Table 3: Hosmer and Lemeshow test

Step	Chi-square	Sig.
4	14.166	.778

Source: Survey data, 2022

Hosmer and Lemeshow test was used to determine the goodness of fit in the overall model. If the value obtained for the Hosmer and Lamshew test is greater than 0.05, the null hypothesis will not be rejected. In this case, the value received for the final model is greater than 0.05. Therefore, it can be concluded that the model has a good fit.

Table 4: Classification table

	Non-fatal	Fatal	Percentage correct
Non-fatal	326	8	97.6
Fatal	96	17	15.0
Overall percentage			76.7

Source: Survey data, 2022

Table 4 shows the overall percentage of the data predicted by the model. Since the overall percentage is 76% it can be concluded that 76% of data is predicted by this model.

Table 5: Properties of the parameters for the best fitted binary logistic model

Variable Coding	Beta value	Sig.	Exp (B)
Time of the Day		.003	
(TD) 12pm-6pm	1.633	.013	5.119
(TD) 6am12pm	1.272	.050	3.568
(TD) 12pm-6am	1.634	.014	5.127
Age of license		.016	
(AL)Below 5 years	.994	.021	.370
(AL)5-10 years	.245	.007	.783
(AL)11-20 years	.657	.012	.518
Human factor		.001	
(HF)Aggressive	-2.276	.011	.103
(HF)Speed	.556	.010	.573
(HF)Error Judgment	20.183	.000	8.667
Gender		.004	
(G)Male	20.056	.008	21.886
Constant	19.677	.008	.000

Source: Survey data, 2022

The odds of happening fatal accidents from in 12 pm to 6 pm are 5.119 times higher than that it's occurring from 12 am to 6 am when all other variables on the model are fixed. The odds of happening fatal accidents from 6 am to 12 pm are 3.56 times higher than that it's occurring from 12 am to 6 am when all other variables on the model are fixed. The odds of happening fatal accidents from 6 pm to 12 am are 5.127 times higher than that it's occurring from 12 am to 6 am when all other variables on the model are fixed.

After analyzing the values obtained from the model, can be concluded that the risk of fatal accidents is higher between 6 am to midnight. It is because of the higher number of vehicles present on roads at that time. Not only that high levels of traffic congestion and impatience of the people also have influenced to increase the risk of fatal accidents.

The odds of happening fatal accidents in males are 21.886 times higher than that it occurs in female riders when all other variables on the model are fixed. That is because Motorcycles are more popular among men, especially in the young generation. There for, male riders are more likely to be involved in fatal accidents than female riders

The odds of happening fatal accidents due to aggression are 0.103 times less than that it occurs due to other reasons (Influenced by alcohol, Distracted/In

attentiveness) when all other variables on the model are fixed. The odds of happening fatal accidents due to Speed are 0.573 times higher than that it occurs due to other reasons (Influenced by alcohol, Distracted/Inattentiveness) when all other variables on the model are fixed. The odds of happening fatal accidents due to Error-Judgment are 8.667 times higher than that it occurs due to other reasons (Influenced by alcohol, Distracted/Inattentiveness) when all other variables on the model are fixed.

When considering the odds values motorcycle accidents due to error judgment are more probable to become fatal though a number of accidents are less than aggressive.

The odds of fatal accidents in licenses aged below 5 years are 0.370 times higher than in licenses aged over 20 years. The odds of fatal accidents in licenses aged between 5-10 years is 0.7830 times higher than in licenses aged over 20 years. The odds of fatal accidents in license aged between 11-20 years is 0.518 times higher than in license aged over 20 years.

A comparison of fatal risk for motorcycle accidents in terms of riders' license age shows that both 5-10 and 11-20 years of license holders have a higher probability to become fatal accidents than older license holders.

5. Conclusion and Recommendations

The highest number of accidents have been occurred in January, February, and August of 2020, also it can be seen that accidents have spreads equally every day as the days of the week. Also, 36% of accidents were reported between 12 noon and 6 pm. Out of the total 522 motorcycle accidents, 41% were reported as minor injuries and 34% were reported as damage-only cases. Fatal accidents are reported as low as 3%. About 95% of motorcycle accidents are caused by men and 71% are committed by young people between the ages of 18-39. 62% percent of all reported motorcycle accidents are caused by motorcycles with less than 5 years of use. Also, valid licensees are responsible for 83% of motorcycle accidents. A special feature of motorcycle accidents in 2021 is that 97% of accidents occur in clear weather conditions and another 97% occur on dry roads.

Through the hypothesis testing, it could be identified the factors time of the day, age of the driver, light condition, human factor, and gender are more influential for accident severity. According to the binary logistic regression

analysis license age, gender of rider, Human factor, weather condition, and time of the day can be identified as major risk factors influencing fatal accidents.

Some recommendations to reduce motorcycle accidents: proper training, education, and rigorous awareness of law enforcement for further enhancement of the riders' safety, proper medical examination, special motorcycle training program for older riders, design of new license for the and should avoid long-distance high travel, separate lanes for motorcycles. To make sure the pillion's safety, design a comfortable and safe seat, not allow infants and children under the age of 10 on motorcycles as pillion, prohibited overload by pillion, and mandatory enforcement of rules in pillion helmets and protective gear when being carried on motorcycles.

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