Assessment of Lane-Sharing Maneuverability and Risk Exposure Effect on Motorcycling in Nigeria

Biliyamin A. Ibitoye, Samson O. Odeyemi, Ash-Shuara Salman, and Mariam Daudu

***Abstract*—Motorcycle is becoming a very important mode of transport in most developing countries like Nigeria because of their easy accessibility to most local communities. However; due to their riding habits, motorcyclists now constitute larger percentage of fatal accidents on roads. This study is aimed at assessing the behaviour of motorcyclists on share lane with other motorized vehicles with the objective of determining the risks due to their exposure to crashes. Ilorin in Kwara State was selected as the study area, as most communities in this town are not accessible to good public transport system, thereby leaving commuters to depend solely on use of motorcycles for their daily trips. Field survey and questionnaires were used to collect necessary data. Three hundred consecutive motorcyclists were interviewed at ten selected locations (parking spots). The responses were analyzed using SPSS v7.5 at the statistical significance p<0.05. The result found that due to motorcyclists' body exposure during crash, lower legs are mostly affected with 38% value, followed by upper legs with 24% and head with 16% with remaining 22% as damaged only. This may warrant the need for government to provide motorcycle lanes either with segregated travel lane or exclusively separated lane by the Federal government of Nigeria to form part of her safe road policy.**

***Index Terms*—Leg Injury; Motorcyclist; Risk Exposure; Share Lane.**

I. Introduction

Generally, in Nigeria, Motorcycle ownership is increasing due to unemployment and high level of poverty in the country. As a result of low income levels, good percentage of working class cannot afford to own car. The implication is that majority of the people result into commuting on motorcycles. Even, many artisans that could not get electricity to work own commercial motorcycle they work with to make ends meet. However, motorcycles accident as reported by Federal Road Safety Corps [1] is due non-adherence to traffic rules and motorcyclists believe that they are kings on the roads as they maneuver between other motorized vehicles. Therefore, motorcycle accidents, among other types of road accidents, form a fatal category of motor traffic accidents [2].

[3] traced the origin of commercial motorcycles to a group of five old men at Alakuko area in Lagos State which started in 1980. These men commercialized their private motorcycles for carrying passengers after returning from their daily work as a means of investment to increase their income. Also, recent mass movement of people from Boko Haram Insurgents States in the Northeast of Nigeria has necessitated further acceptance of the use of motorcycle as a means of road transport in Ilorin. Thus, [4] associated dominant use of motorcycle as mode of transport for the poor.

A study by [5] found that 5% of the motorcycle accidents was due to lane-sharing which were attributed to lane-sharing maneuvers. Although percentage effect of lane sharing appears small, it may cause serious or fatal accident going by what the picture in Fig. 1 depicts.

Fig. 1 was taken at one of the survey locations and it indicates that most accidents involving lane-sharing may be due to car drivers' non-expectation that motorcyclist will pass him when stopped or in slow-moving traffic or when opening his/her vehicle doors indiscriminately on the road. This may result in morbidity and mortality due to predominant sideswipe and turn-into-path accidents related crashes because motorcyclists are more at risk of sustaining injury than motor vehicle drivers. Thus, motorcycle accidents are characterized by factors such as alcoholic consumption, invalid driver's license, inexperience and age of the drivers [6].

Lane sharing maneuverability of motorcyclists has been a major safety concern as motorcyclists are exposed to different threats, such as vehicles suddenly changing lanes or opening doors [7]. However, there are limited data on lane sharing as it has not been evaluated as a potential causation factor for motorcycle accident. Results from this study can be a great assistance to the relevant authorities such as FRSC and the Police and monitor and manage the motorcycle accidents in urban cities of Nigeria.

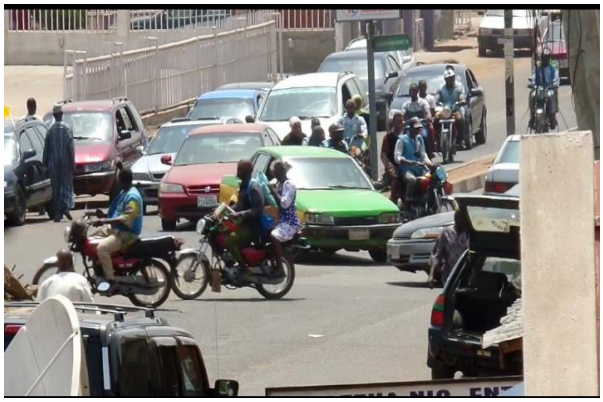

Fig. 1. Typical Motorcyclists Maneuvering in a Lane Sharing Operation

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II. Materials and Method

The study area was located along the major arterials in Ilorin city as shown in Fig. 2. The city lies between longitudes $4^0$2'20 and $4^0$35'45 and between latitude $8^0$25'00 and $8^0$31'30 North. It is also a gateway city between the Northern and South western States of Nigeria. The study involved field survey which was carried out at ten locations and three hundred questionnaires designed and assessed at selected parking lots.

Field survey was used to examine the behavior of motorcyclists on the shared lanes. It involved capturing of motorcyclist's activities on video and its playback revealed how motorcyclists' maneuver within the shared lane and with other motorized vehicles of higher capacity. The video recording covered the 2-peak periods; morning peak hour (8-10am) and afternoon peak hour (2-4pm).

Questionnaires were designed to obtain information on demographic characteristics of the respondents and to affirm the potential conflicts that may result in road accident among the commercial motorcycle riders in Ilorin, Nigeria. The total number of three hundred commercial motorcycle riders in Ilorin was interviewed at the selected locations (parking spots). The responses were analysed using SPSS v7.5 at the statistical significance $p<0.05$.

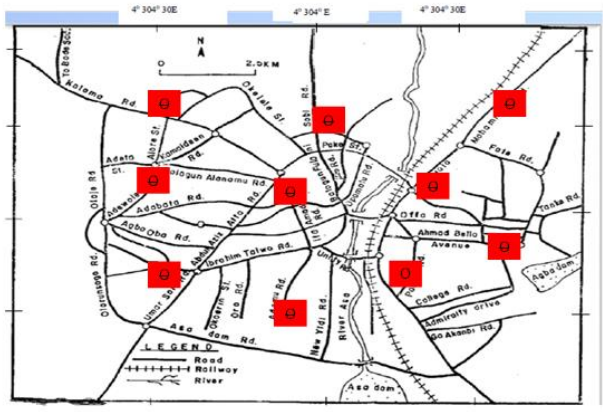

Fig. 2. Map of Ilorin Showing the Selected Study Locations

III. Results and Discussion

A. *Analysis of Field Survey:*

The results of the field survey and the responses of motorcyclists interviewed are presented in this section. The number of motorcyclists observed using the shared lane and those in a splitting condition as well as the number of likely leg interactions during morning and afternoon peak periods are presented in Table I and II respectively.

TABLE I: Number of Observed Morning Peak Motorcyclists and Likely Leg Impact Injury

Days	Total Number of Motorcycles	Numbers of Motorcycle splitting	Number of likely leg injury due to maneuvering
Monday	2166	1872	450
Tuesday	2005	1732	300
Wednesday	1875	1500	650
Thursday	1812	1650	500
Friday	1788	1550	180
Saturday	724	630	100
Sunday	413	322	90

TABLE II: Number of Observed Afternoon Peak Motorcyclists and Likely Leg Impact Injury

Days	Total Number of Motorcycles	Numbers of Motorcycle splitting	Number of likely leg injury due to maneuvering
Monday	1923	1431	240
Tuesday	1719	1412	400
Wednesday	1732	1450	350
Thursday	1629	1426	467
Friday	1894	1785	540
Saturday	935	740	150
Sunday	621	525	200

Table I and II show that number of motorcyclists sharing lane and splitting in-between other vehicles are more during the morning peak than afternoon peak from Monday to Friday, but opposite is the case on Saturday and Sunday. This is as a result of many workers using motorcycle during the week days so as to avoid traffic congestion and delay to work. In contrary, the likely leg impact injury is highest in the afternoon peak on Fridays being the day most workers travel out of the town. Likely leg injury on weekends appears to be more than the week days because of usual celebration everywhere in the town on Saturdays and Sundays. Religious activities on Friday afternoon and Sundays may be the cause of higher number of likely leg injuries. Percentage of likely leg injury per daily trip is presented in Fig. 3.

Fig. 3 illustrates that the likely leg injury varies per trip with highest value of 43% on Wednesday morning trip followed by 38% on Sunday afternoon while the morning peak on Friday has the lowest value of only 12% out of the number of motorcyclists' maneuvering in between other vehicles. The causes of such accidents are attributed to speed limit violation, wrong overtaking and dangerous driving as shown in Table III from 2014 Motorcycle fatal accident record as reported by the Federal Road Safety Corps on a shared lane road in Ilorin.

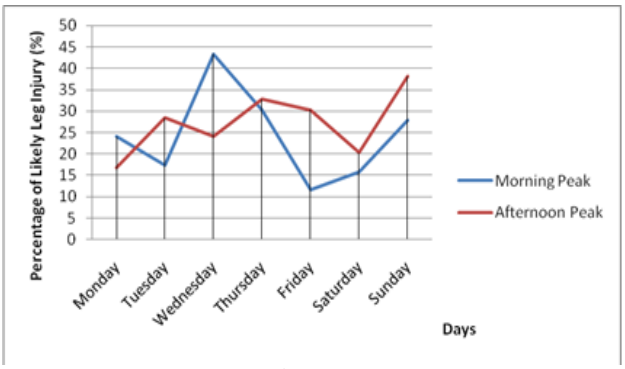

Fig. 3. Percentage of Likely Leg Injury Per Day

TABLE III: 2014 MOTORCYCLE FATAL ACCIDENT RECORDS BY FEDERAL ROAD SAFETY CORPS

Months	Number of accident	Cause of accident
January	2	Route violation
February	2	Overloading and route violation
March	1	Speed limit violation
April	2	Wrongful overtaking and speed limit violation
May	2	Dangerous driving and speed limit violation
June	2	Mechanical deficient and speed limit violation
July	3	Speed limit violation, dangerous driving and wrongful overtaking
August	3	Dangerous driving and speed limit violation
September	3	Speed limit violation and wrongful overtaking
October	6	Speed limit violation, dangerous driving and Mechanical deficient
November	0	Nil
December	1	Dangerous driving

B. Analysis of Questionnaire Responses

The questionnaires were designed to obtain information on demographic characteristics of the respondents and to examine the likely causes of road accident among commercial motorcycle riders in Ilorin. The responses obtained enable the assessment of likely part of motorcyclists' body that are often involve in collision due to body exposure during crash.

Majority of the commercial motorcycle operators (78%) are youths between the age of 20 and 35 years. The youthful exuberance may be additional factor for their reckless driving. The study also found that sixty-three (63%) of these motorcyclists are married which indicates possible desperate move to make ends meet since seventy-three (73%) percent of these motorcycle riders have no formal job.

Most of these youth are forced into commercial motorcycling due to the economic downturn of the country. About sixty-eight (68%) percent has less than three years riding experience with only three (3%) percent passed through a formal training (driving school). This implies that ninety-seven (97%) percent neither have a driver's license nor vehicle particulars, and as such try all means to either avoid arrest by Police or bribe their way out.

Assessment of the motorcyclists willing speed revealed that only twenty (20%) ride on speed less than 40 km/hr. In accordance with Nigerian Highway Codes driving on highway and in built up areas with speeds above fifty (50) km/hr is regarded as over speeding [1]. This indicates that majority of the motorcycle riders do not observe the speed limit and as such they may be involved in possible collision with other vehicles within the shared lanes. This finding was in support of [8], that over-speeding is a principal factor that causes accidents among motorcyclist riders in Nigeria. The response of the motorcyclists on if they have been involved in accidents as a result of over speeding confirm [8] findings with forty-seven (47%) percent of respondents being involved in accidents.

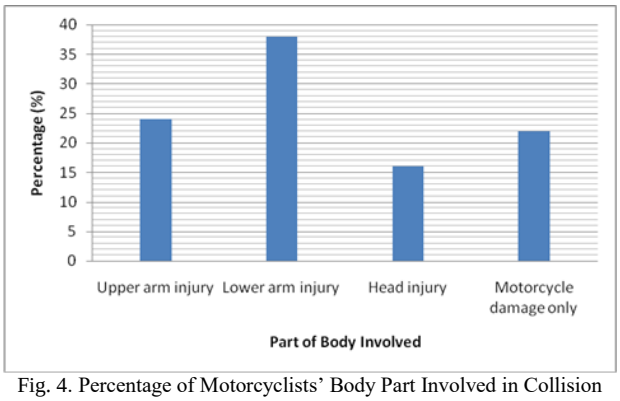

Fig. 4. Percentage of Motorcyclists' Body Part Involved in Collision

Fig. 4 present the responses on the part of motorcyclists' body that were involved in collision due to body exposure during crash. It shows that lower legs are mostly affected with 38% value followed by upper legs with 24% and head with 16% with remaining 22% as motorcycle damaged only.

Factors influencing the occurrence of motorcycle accidents were examined to include: over-speeding, wrong overtaking, bad roads, mechanical defect, and alcoholic intake. The most significant of these factors is over speeding, followed by wrong overtaking and alcoholic intake as shown in Fig. 5.

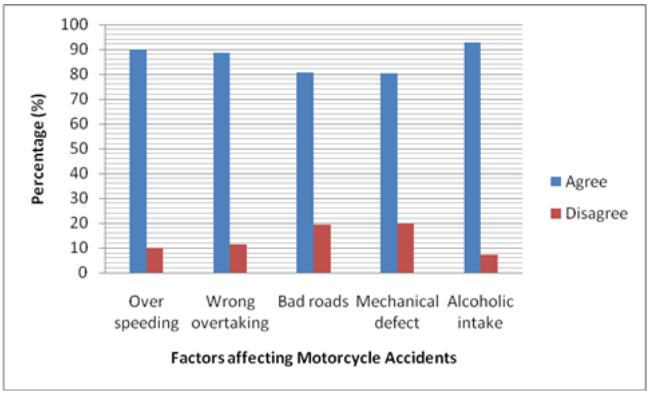

Fig. 5. Factors Influencing Rate of Motorcycle Accidents

IV. CONCLUSION

The survey on motorcycle maneuvering within other motorized vehicle in a shared lane was conducted for the purpose of obtaining a better understanding of the safety effect on motorcyclists. Factors contributing to motorcycle accidents such as over speeding, wrong overtaking, bad road, mechanical defects and alcohol intake by motorcyclists were examined. These factors are related to trip characteristics. The results suggest that alcohol intake, over speeding and wrong overtaking are highly significant to motorcycle crashes. This finding supports fatal Accident records from FRSC where speed violation, wrong overtaking and dangerous driving are paramount causes of accident for the year 2014 (Table III).

To promote safety among the motorcyclists the results of this study indicate that there is need to provide segregated or complete exclusive motorcycle lanes. Alternatively, improving public transport will have the greatest success in influencing the mode preference of motorcycle riders. Thus, a planned public transport within the road network with reduction in total travel time for the bus mode will emerge

as the most important element to attract motorcycle riders towards public transport and away from the motorcycle mode. However, the authors would like to suggest for future possible research programme that will incorporate motorcycles in the country city road network in Nigeria.

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