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CONSEQUENCES AND CAUSES OF MOTORCYCLE TRAFFIC ACCIDENTS- A CASE STUDY IN WOLAITA SODO TOWN, ETHIOPIA

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Abstract

Ethiopia has the highest rate of traffic fatalities per vehicle in the world as per the World Health Organization(WHO). The reason behind is due to various factors such as poor maintenance of roads, inadequate marking, poor street lighting, un licensed drivers, traffic violation, over speed and overtaking. The lack of public transport in many parts of Ethiopia is encouraging the private transportation thus increasing the fatalities. Lack of monitoring and enforcement measures are some of the major causes for the occurrence of various accidents in different parts of the country. Wolaita Sodo is one of the well connected town, from Addis Ababa to various parts of Ethiopia. The traffic in the town is uncontrollable with lot of motor cycles and Bajaj especially near market places. The present study is aimed to evaluate the consequences and causes of motor cycle accidents in the town. The accident data collected from the respective traffic police stations is sorted out to understand the trend of accidents. It is observed from the collected data that more number of accidents is occurring due to minor drivers and motor cycle drivers followed by various traffic violations. An attempt is made in the study to analyze the impact of various influencing factors for the occurrence of fatalities by using multiple regression model. The study may provide alternative measures to reduce various consequences involved in accidents and to search the possible measures to reduce the rate of accidents.

Abbreviations: - *os= overspeed ; ot= overtaking ; vio= traffic violation ; rd = road defect ; ROA= Rate of Accidents*

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1. INTRODUCTION

Automobiles in the towns and cities are increasing day to day due to various means of transportation. The presence of industries, business centers, educational institutes and recreation centers will lead a major role in the requirement of number of automobiles on the road. The increase in the automobiles result for various traffic congestions, delays, frustrations and accidents on the roads. Traffic accidents are the huge losses for the society in general and for the individual human being in particular. The social and economic problems will multiplicate due to increase in number of accidents. The use of motor cycles is observed to be more common in Wolaita Sodo and in Ethiopia for the past few years. The occurrence of any accident on the road depends upon the various parameters such as driver behavior and experience, road condition, traffic condition, vehicle condition and other environmental factors. Prevention of accidents is an impossible task, but the rate of accidents and its severity can be reduced by taking care of the above parameters.

Wolaita Sodo is one of the major town in Ethiopia with a population of around 145100 as per census 2015 and vehicles are around , out of which % of vehicles are of motor cycle type. The town is administrative center of Wolaita Zone of Southern nationalities and peoples region. The town is located at a distance of 390 Kms from Addis Ababa, the capital city of Ethiopia. The town has longitude and latitude of 6^0 45"N 37^0 45"E/6.9^0 N 37.75" E and an elevation of 1600 m. The town has three vegetable market centers and a bus station in addition to other essential amenities. The pedestrian crossing is observed to be more in the town both in the morning and evening peak hours. The presence of various obstacles on the road and mismanagement of traffic at various mid blocks has become the sources of accidents in the town.

2. LITERATURE REVIEW

Motorcycle is more efficient than other light vehicles from the view point of roadway capacity but this mode is vulnerable to traffic accident due to unsafe driving behavior among motorcyclist, so that traffic accident is an alarming issue for motorcycle users (Kov & Yai, 2010).

Berkessa(2015) used Multinomial Logit model to identify and describe the factors affecting crash severity from the driver related variables such as driver's age, driver's education, and driver's experience associated with injuries severity. It was concluded that among vehicle related variables, only vehicle owner is positively associate with injury severity. Similarly among Road related variables, only road topography is positively associated with injury severity.

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Berecki-Gisolf, et al.(2015)reported that vehicle used at the time of the crash was a motorcycle followed by a car/pickup, bicycle, bus/van/coach and others. As per the study, the motorcycle injury decreased steeply with increasing age and with increasing level of household income. Among motorcycle users, motorcycle injury rates were highest among those who did not have access to a car.

Zewude & Ashine(2016) has conducted an ordinary logistic analysis and stated that the significant indicator of fatal studies and serious injuries are the age of drivers, driving experience, educational background of drivers, type of vehicle, weather condition and road condtion. As per human factors the researchers found that accident rates of young drivers are more than the rest of the examinees.

Singoro, et al.(2016) stated that the cause of accident includes technical and human errors. Mechanical fault on the motorcycle, lack of training, negligence, inexperience in riding and drunken driving, passenger sitting position, carrying excess passengers and poor or muddy roads with potholes, itself were the causes of motorcycle accidents.

3. STATEMENT OF THE PROBLEM

Motorcycle accident is one of the highest risks and is resulting many deaths and injuries in Ethiopia. Many youth has been jobless a few years ago and now most are being self-employed and others being employed as motorcycle drivers in wolaita sodo town. Some of the motorcycle employees work for few years and later buy the vehicle for themselves and become self-drivers. By this activity, some of the youth find income for their daily needs and to care their families. Majority of public in Wolaita Sodo are using motor cycle as their daily transportation due to its cheaper rate. The increase in motor cycles in the town increases the density of traffic and reduces the safety of traffic on the roads. It is hence essential to focus more on the motor cycle accidents in the town and its influencing parameters. The economic development will also decline in view of more number of accidents in the town as a particular and in the country as a whole.

4. DISCUSSION

As per Wolaita Sodo Road and Transport office annual report, at the end of 2009 Ethiopian calendar/2017 GC, the total numbers of two wheeler drivers are 1707. Among them 1368 are private, 152 are governmental organization and 187 are non-governmental organization. Even though it was illegal to drive without driver registration number and also to rent the motor cycle, as per the report among the total number of two wheeler drivers, around 8% of the drivers were driving without registration number and 40% of the motor cycle drivers were licensed and remaining 60% were unlicensed. Many jobless youths are being self-employed and others being employed as motorcycle drivers in the town. In view of this factor, the controlling of drivers has become a political issue in the country. However, as per the South Ethiopia Road and Transport office rule, the un-registered vehicle driver will be punishable for a penalty of 300 ETB and the driver without license will be penalized up to 5000 ETB.

5. DATA COLLECTION

The data collection was done by using both primary and a secondary source of data. The primary source of data collection was done by interviewing motorcycle drivers and motorcycle users. The secondary source of data related to injury and mortality was obtained from the respective Traffic police offices. The following is the accident data collected for a period of 6 years (2011-12 to 2016-17) from the respective traffic police stations in the town.

Table 1: Traffic Accident data in Wolaita Sodo town as per the records of Traffic Police

Year	Death	Major	Minor	Property damage	Total
2011/12	11	23	53	16	103
2012/13	12	35	40	25	112
2013/14	8	50	66	20	144
2014/15	11	42	26	23	102
2015/16	18	25	18	23	84
2016/17	16	22	17	21	76

The above table indicates that the minor accidents are more in every year which can be reduced by proper planning and control measures. The presence of more number of minor drivers in the traffic flow will affect the characteristics and will route to the accident. The property damage and death is a huge loss for the individual and also for the society that requires a lot of changes in the design of roads in the town. The occurrence of all category of accidents in the town are not daily reported to road and transport office. Some of the accidents in the town were negotiated by relatives or traffic police by several ways so that the issue and data remains not reported. This creates a large problem in data accuracy in quantifying the rate of accidents. The researcher hence collected some more data by conducting some oral interviews with relative bodies. The following are the details collected from the accident reports of respective traffic police stations.

Table 2: Rate of Accidents in Wolaita Sodo town with respect to category of vehicles

Year	2W	3W	Truck	Bus	Total
2011/12	37	33	17	16	103
2012/13	38	34	18	22	112
2013/14	45	44	21	34	144
2014/15	40	30	14	18	102
2015/16	31	28	11	14	84
2016/17	26	23	14	13	76
Total	97	81	39	45	262

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The above table indicates that the percentage of accidents is more in case of two wheeler driving followed by three wheeler driving. This clearly shows that the two wheeler drivers are more reluctant in making road accidents because of their incapability, negligence or minority in driving. Table 3 indicates the number of accidents occurring in the town and their corresponding influencing parameters.

Table 3: Rate of Motor Cycle Accidents vs Influencing Parameters in Wolaita Sodo town – quarterly base

Year	os	ot	vio	rd	ROA
2011-12	7	6	11	6	8
2011-12	3	3	2	3	3
2011-12	2	2	2	2	2
2011-12	5	2	6	4	6
2012-13	6	9	10	8	12
2012-13	4	3	3	3	4
2012-13	3	3	3	2	3
2012-13	5	3	5	4	5
2013-14	9	6	10	3	6
2013-14	5	4	4	3	4
2013-14	2	3	4	3	3
2013-14	2	3	6	4	5
2014-15	9	4	9	6	8
2014-15	3	4	5	5	5
2014-15	3	3	4	4	4
2014-15	5	5	6	5	6
2015-16	7	3	8	5	7
2015-16	3	2	4	2	3
2015-16	2	2	3	2	2
2015-16	3	3	4	3	4
2016-17	7	4	5	5	6
2016-17	2	4	5	3	5
2016-17	1	3	4	2	3
2016-17	3	2	3	2	2

The data in the above table indicates the influence of each parameter on the motor cycle crashes. The data reveals that 60% of all motorcycles in town and almost 91% of private motorcycle in sodo town are driving by unlicensed drivers and at the age of 18-30. These young drivers are employed as motor cycle driver and running their daily work. These drivers are lacking knowledge of road traffic rules. Majority of them are running for their daily work to find the money for their daily needs and to survive for their family and hence they have no care about road traffic rule because they are driving fast to get more users. Illegal drivers are driving at night time and are causing lot of traffic problems by other motor cycle drivers. Road condition is also another major parameter in the town causing lot of road crashes that includes road surface failures and the problems geometric design elements such as sight distance, short horizontal curve, narrow vertical curve and steep grade and so on.

6. DATA ANALYSIS USING MULTIPLE REGRESSION MODEL

In the present study, the collected data is analyzed by using Multiple Non Linear Regression model. The rate of motor cycle accidents are considered as dependent variable and the other influencing parameters such as over speed, overtaking, violation and road defects are considered as independent variables as represented in table 3. A multiple non linear regression model was developed to study the variation of rate of motor cycle accidents for various influencing parameters. The following Multiple Non Linear Regression Model was developed for the purpose of analysis.

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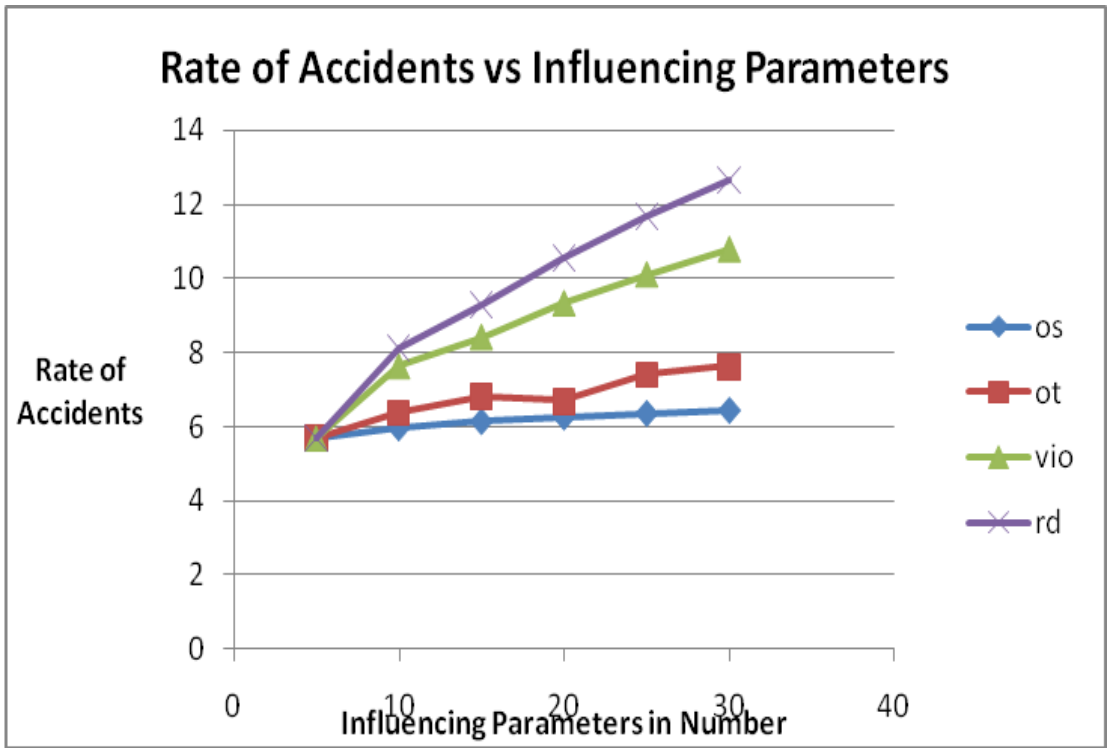
Rate of Motor Cycle Accidents = 0.033146 + 0.067777 * e^{os} + 0.163728 * e^{ot} + 0.357022 * e^{vio} + 0.445229 * e^{rd}

R^2 = 0.9641 ; F = 168.10

By using the above model, the analysis is carried out to observe the variation of motor cycle accidents for various specified influencing parameters. Figure 1 indicates the impact of each influencing parameter for the occurrence of motor cycle accidents.



The above figure clearly indicates that more number of motor cycle accidents are due to road defects followed by the traffic violations. Meanwhile, major accidents are also occurring due to over taking of the vehicles.

7. SUMMARY AND CONCLUSION

The present study is conducted to analyze the causes of various motor cycle accidents in Wolaita Sodo town. Traffic accident data was collected by approaching the respective traffic police stations and in some places by interviewing the drivers. The collected data is sorted out to know the intensity of each variable on the occurrence of an accident. A Multiple Non Linear Regression Model was developed from the collected data to carry out the analysis. It was concluded from the analysis that the rate of motor cycle accidents is more influenced by the road defects and traffic violations in Wolaita Sodo town. Hence the planner has to concentrate to rectify the defects of road and traffic violations so as to reduce the rate of motor cycle accidents in the town.

REFERENCES

[1] Berecki- Gisolf, J. et al., 2015, "The Impact of the Thai Motorcycle Trasition on Road Traffic Injury" : Thai Cohort Study Results. Thai Cohort Study Results PLOS ONE, 10(3)

[2] Berkessa, Z.A., 2015, " Statistical Analysis of Traffic Injury Severity : The case study of Addis Ababa, Ethiopia", International Journal of Novel Research in Interdisciplinary Studies, 2(5), PP. 23-31

[3] KOV, M. & Yai, T., 2010, " Traffic characteristic of Motorcycle Dominated urban street considering the effect of light vehicle", Journal of Eastern Asia Society for Transportation Studies, Volume 8, PP. 1806-1821

[4] Singoro, B.W., Wakhungu, J., Obiri, J & Were, E., 2016, " Causes and trends of public transport Motor cycle Accident in Bungoma Country, Kenya", International Journal of Multidisciplinary Academic Research, 4(1), PP. 37-42

[5] Zewude, B.T., & Ashine, K.M., 2016, " Statistical Modeling on Determinants of traffic fatalities and injuries in Wolaita Zone, Ethiopia", Global Journal of Human Social Science (H), 16(4).