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ANALYSIS OF ROAD TRAFFIC ACCIDENTS TREND IN GHANA: CAUSING FACTORS AND PREVENTIVE MEASURES

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ABSTRACT

Road traffic accidents (RTA) in developing countries such as Ghana have been identified as one of the major causes of death. It has been classified as the second major cause of death apart from malaria and hence urgent attention is needed to curb this menace. This study was carried out to analyze RTA trends, identify causing factors and propose preventive measures. In the study, primary data was obtained from a survey conducted by randomly administering structured questionnaires to 150 drivers and pedestrians. While secondary data was gathered from RTA records for the past 10 years (2005-2014) obtained from the National Road Safety Commission of Ghana. The key findings from the study show that there is an increase in RTA cases for the past 10 years with population growth through the correlation and regression analyses. The regression model indicates clear positive faster increase in RTA trend with population growth in Ghana. In addition, the regional distribution also shows significant differences in RTA cases. The results from the survey indicated that over speeding, over loading and disregard to road signs or regulations are the first-three main RTA causing factors in Ghana with emphasis on safety education as the main preventive measure.

INTRODUCTION

Transportation is an essential part of daily life in both developed and developing countries. This is because it provides movement of people, goods and services from one place to another. In addition, it is a source of livelihood to a lot of people and employs some percentage of people in this sector. In most countries, the transportation sector contributes significant proportion to their Gross Domestic Product (GDP) and government allocates annual development budget to this sector (Banik et al., 2011). However, road transportation which is the commonest means of transportation has a challenge of Road Traffic Accidents (RTA) which is the 9th leading cause of mortality globally (WHO, 1998). It was estimated that RTA will be the 3rd leading cause of death worldwide by the year 2020 if preventive actions are not taken to curb it (WHO, 2010). It was estimated that globally, 1.2 million people died through RTA each year and as many as 50 million people were injured (WHO, 2004; WHO, 2013; Gitelman et al., 2012). Projections are that, these numbers may double by 2030 if the status quo continues (Esmael et al., 2012). According to reports, over 80% of the world RTA was recorded in developing countries, even though these countries have only about one-third of the total world's motor vehicles (WHO, 2009; Banik et al., 2011).

RTA involves collision of vehicle with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole (Bun, 2012). These results in fatalities and injuries which have cost implication to both the victims and the economy involved. RTA involves drivers, passengers, pedestrians, properties and objects. According to studies, RTA which results in morbidity, mortality and disability have adverse effects on families especially if individuals' livelihoods depend on the victims of the RTA. For instance the death of husband or wife can result in difficulty in taking care of their children and dependents. In addition, some survivors and families of RTA go through series of challenges which push them into abject poverty (Tarimo, 2012; Amo and Meirmanov 2014; Jha 2004).

In developing countries such as Ghana, RTA is a major concern and of great importance in public health. Among the causes enumerated are human or driver errors, vehicle characteristics, traffic infrastructures including engineering design, road maintenance and traffic regulation. In addition, human recognized factors causing RTA mentioned are driver attitude including road courtesy and behaviour, driving under the influence of drugs especially alcohol, male sex, use of seat belts, driver age (teenage drivers and elderly drivers (Haadi, 2014; Coleman, 2014; Bjerre et al., 2006; Smart and Mann, 2002). RTAs are also preventable if right steps or safety measures are enforced. To prevent RTAs, there is a need to understand the trends and the nature of various RTA to design specific interventions for their prevention. In Ghana, much research was not carried out on RTA which results in information gap. Thus, this study was carried out to analyze RTA trends, assess drivers and pedestrians' opinions on RTA causing factors and prevention measures in Ghana.



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METHODOLOGY

Sources of Data

Data collected from two main sources were used in this study. Primary data was obtained from a survey carried out by administering questionnaires randomly to pedestrians and drivers on their views concerning RTA causing factors. In all, 150 questionnaires were collected from both pedestrians and drivers who constituted the sample size for this study. This was due to unwillingness of people to participate in the study. The respondents were asked to tick the extent to which they agree (i.e. Strongly agree (SA), Agree (A), Neutral (N), Disagree (DA), Strongly Disagree (SD) on the factors enumerated as RTA causing factors. In addition, open ended questions were provided for then to enumerate RTA prevention measures. The questionnaire was pre-tested to determine its reliability and remove any ambiguous question.

Secondary data was obtained from the National Road Safety Commission of Ghana. The data comprised specifically of road traffic accidents cases, corresponding population, number of mortality, fatality etc. for Ghana covering the period of 2005 to 2014. These parameters were relevant for computation of accident trends and other relevant analysis to the study.

Data analysis

The questionnaires were coded and entered in SPSS version 16 where percentages were computed. In addition, trend analyses and patterns using the RTA data were also carried out in SPSS. Linear regression model was carried out to model the relationship between total number of RTA and population by fitting a linear equation using ORIGIN 6 software.

RESULTS AND DISCUSSION

Table 1 shows the RTA incidence from 2005-2014. A total of 130,895 cases of RTA were recorded involving 198,634 vehicles. From 2005 to 2014, there were changes in the number of cases showing the magnitude of RTA incidence within the past 10 years. Within the past 10 years, 19% was reported as the number of increase for the total number of cases (n=12093 to n=14390). Road traffic fatality, serious injuries, minor injuries, persons killed and persons injured also recorded 18%, 38%, 26%, 2.1%, 4.7% and 25% increment in cases respectively. This clearly shows that there is an increase in the magnitude of RTA incidence in Ghana for the past 10 years.

Table 1: Extent of RTA case from 2005-2015 in Ghana

| Year | Total Number Of Cases | Vehicles Involved | Fatal | Serious | Minor | Persons Killed | Persons Injured |
|--------------|-----------------------|-------------------|--------------|--------------|--------------|----------------|-----------------|
| 2005 | 12093 | 19122 | 1191 | 3248 | 8464 | 1403 | 10136 |
| 2006 | 11648 | 17765 | 1113 | 2962 | 7573 | 1346 | 11450 |
| 2007 | 11209 | 17608 | 1193 | 2896 | 7120 | 1520 | 7433 |
| 2008 | 12565 | 17409 | 1298 | 3562 | 7705 | 1587 | 9767 |
| 2009 | 12981 | 18589 | 1409 | 3464 | 8108 | 1760 | 11147 |
| 2010 | 13572 | 19245 | 1729 | 3470 | 8103 | 1346 | 13272 |
| 2011 | 14914 | 24602 | 1790 | 4224 | 8900 | 2249 | 14181 |
| 2012 | 14390 | 22508 | 1645 | 4100 | 8645 | 2058 | 12655 |
| 2013 | 13133 | 19278 | 1459 | 3741 | 7933 | 1899 | 11328 |
| 2014 | 14390 | 22508 | 1645 | 4100 | 8645 | 2058 | 12655 |
| Total | 130895 | 198634 | 14472 | 35767 | 81196 | 17226 | 114024 |

Table 2 shows the regional average number distribution of RTA incidence in Ghana. It can be seen that Greater Accra region recorded the highest number of cases relative to the other regions. This is because of the population of people living in Greater Accra region which is the capital city of Ghana. Furthermore, most inhabitants in Ghana have vehicles for easy movement. The result agrees with similar study carried by Afukaar et al. (2003) about 12 years ago. Ashanti region recorded the highest fatality cases with an average of 228. This is the second economic region in Ghana which is linked to Accra with express highways. There is always flow of economic activities from Accra to the Ashanti region with a vehicular traffic. The three regions in the

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northern part of Ghana (Northern, Upper East and Upper West) recorded the lowest number of RTA cases. This could be attributed to their remote location relative to Accra where most economic activities occur and low number of vehicles in these regions.

Figure 1 show the RTA trend in Ghana for the past 10 years (2005 to 2014). There is an increase trend in RTA with highest number of accident cases recorded in 2011. A moderate coefficient value ($R^2=0.653$ or 65%) was obtained from the trend analysis. This indicates that there exists a relationship between the number of accident cases and year. Based on this, accident incidence may increase as the year progress. This is because with increasing year, ownership of vehicles may increase and therefore preventive measures need to be put in place to minimize RTA incidence.

Table 2: Regional average number distribution of RTA incidence from 2005-2014 in Ghana

| Region | Total Number Of Cases | Vehicles Involved | Fatal | Serious | Minor | Persons Killed | Persons Injured |
|---------------|-----------------------|-------------------|--------|---------|---------|----------------|-----------------|
| Greater Accra | 3262.45 | 5258.95 | 168.35 | 771.05 | 2323.05 | 176.6 | 1608.3 |
| Eastern | 1350.4 | 1829.4 | 193.1 | 458.9 | 698.4 | 230.9 | 1992.3 |
| Central | 1003.5 | 1370.2 | 137.1 | 272.2 | 594.2 | 191.3 | 1077.8 |
| Western | 828.4 | 1459.9 | 139.9 | 239.5 | 449.1 | 155.3 | 902.5 |
| Ashanti | 1629 | 2255.3 | 228.5 | 504.2 | 896.3 | 273.5 | 1715.8 |
| Volta | 635.7 | 895.4 | 104.5 | 215.5 | 288.7 | 135.2 | 716.6 |
| Northern | 205.6 | 295.8 | 62.7 | 59.5 | 83.4 | 101 | 300.7 |
| Upper East | 119.8 | 160.9 | 48.2 | 41.3 | 35.3 | 48.3 | 99.6 |
| Upper West | 131.5 | 171.2 | 44.3 | 40.9 | 41.3 | 46.2 | 152.8 |
| Brong Ahafo | 621.2 | 782.9 | 145.2 | 159.3 | 316.7 | 185.2 | 794.6 |

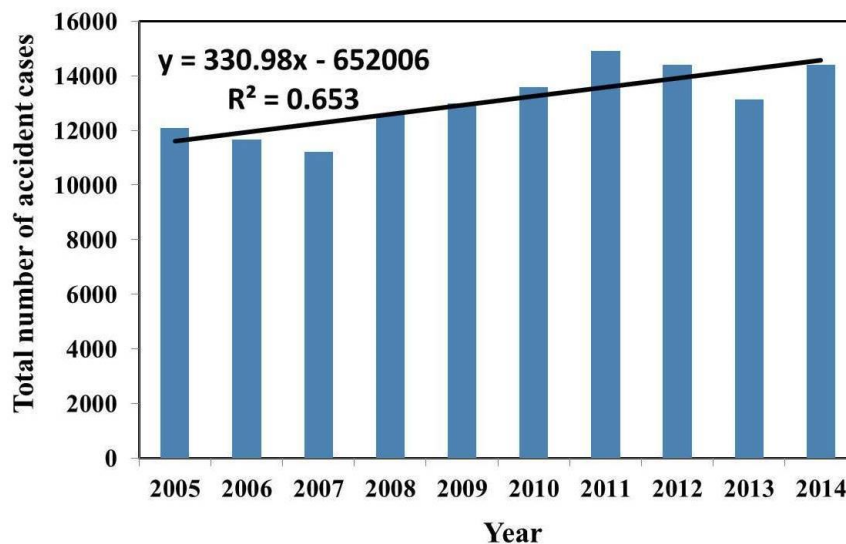


Figure 1: RTA trend for the past 10 years in Ghana

RTA Model Development

The data for this regression analysis is a 10 year annual data on number of RTA cases and its corresponding population in Ghana. Figure 2 shows the scatter plot for the variables. It can be seen that there is a fluctuation in the pattern of RTA as the population increases. However, the pattern exhibited a clear positive relationship between increasing RTA cases with growing population.

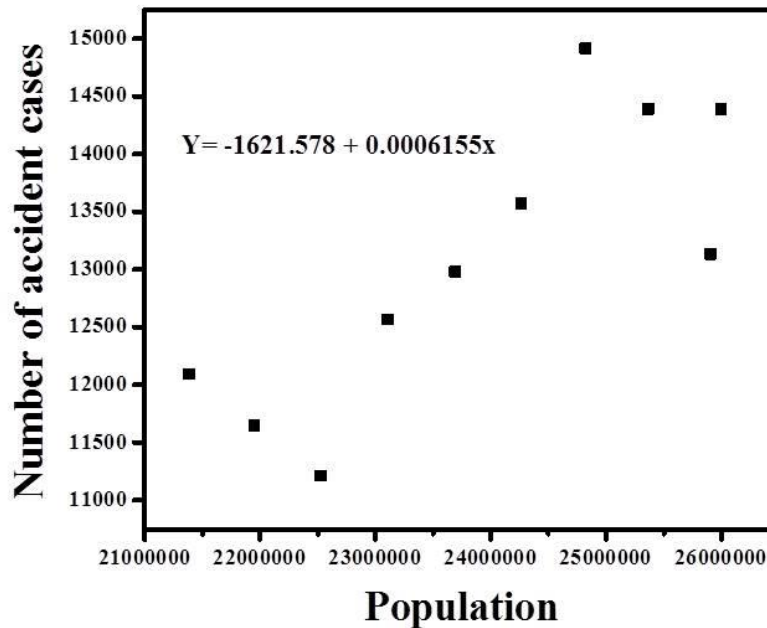


Figure 2: Scatter plot of number of road accidents and population

Table 2 indicates the summary of the regression coefficients for the model. The regression model which establishes the relationship between the total yearly accident cases and yearly population is given as $Y = -1621.578 + 0.0006155X$. Y is the total number of accident cases in the year and X is the yearly population. The -1621.578 in the model is an absolute term of the total yearly accident cases when the total population is set to zero and all other factors are held constant. The 0.0006155 value which is the coefficient of X is the magnitude or rate of change in the number of accident cases as a result of population change (or growth). There is positive relationship between total yearly RTA cases and the population as depicts by the positive sign in the model.

Table 3: Summary of the regression coefficients for the model

| Predictor | Coefficient | Standard error of coefficients | P -value | Adjusted R-square |
|-------------------|-------------|--------------------------------|----------|-------------------|
| Constant | -1621.578 | 3713 | 0.00412 | 0.62128 |
| Population | 0.0006155 | 0.00001.550 | 0.0000 | |

Both the constant term and predictor variable (X) show significance since the calculated p-values are less than the chosen alpha level of 0.05. This clearly shows that the increment in the yearly accident cases with yearly population is marked and thus safety measures must ensure to reduce the accident incidence in Ghana. The adjusted R-square is 0.621 (62.1%) based on the data used for this study for the past 10 years. It shows that the yearly population growth is able to account for 62.1% of the changes in Ghana’s accident cases and the 37% explained by other variables which were not included in the study. Furthermore, the adjusted R-square shows that the model explanatory power is 62.1% based on the yearly population of Ghana.

Road traffic accident causing factors

The result from the survey regarding causes of RTA is shown in Table 4. It can be seen that most of the respondents strongly agree or disagree that the factors enumerated are the causes of RTA. Fatigue driving, over speeding, disregard to road signs or regulations and mobile phone usage while driving were the factors respondents strongly agreed to as the main causes of the RTA. However, among them, over speeding, over loading and disregard to road signs / regulations were ranked as the first-three causes of RTA in Ghana. It is not surprising that over speeding was ranked as the first cause of RTA. This is because most drivers drive beyond the stipulated speed limits on roads and have a high chance of colliding with other vehicles or stationary objects. According to Akongbota (2011), statistics indicated that about 30% of RTA are caused because by over speeding which agree well with findings from this study. Other studies also show that over speeding is among main factors causing RTA in Ghana (Siaw et al. 2013; Coleman, 2014; Enu, 2015). The first-three RTA causing



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factors look attitudinal in nature. They are closely related to the driver's behaviour of negligence and indiscipline. Thus drivers must be disciplined when driving to prevent RTA.

Table 4: Ranking of RTA causing factors by respondents

| RTA causing factors | Responses (Percentages) | | | | | Mean Ranking |
|---|-------------------------|----|----|----|----|--------------|
| | SA | A | N | DA | SD | |
| Fatigue driving | 46 | 29 | 6 | 10 | 9 | 4 |
| Over speeding | 89 | 8 | 2 | 1 | 0 | 1 |
| Wrongful overtaking | 34 | 43 | 9 | 8 | 6 | 5 |
| Over loading | 15 | 77 | 4 | 2 | 2 | 2 |
| Poor maintenance of vehicles | 19 | 56 | 22 | 3 | 0 | 6 |
| Poor nature of road | 13 | 33 | 45 | 2 | 7 | 10 |
| Disregard to road signs / regulations | 65 | 12 | 9 | 7 | 7 | 3 |
| Non-use of reflective triangle when vehicles break down | 27 | 55 | 8 | 7 | 3 | 8 |
| Poor driving skills (Inexperienced drivers) | 29 | 35 | 18 | 7 | 1 | 9 |
| Mobile phone usage while driving | 67 | 29 | 0 | 2 | 2 | 7 |

RTA prevention measures

The result from the survey shows that respondents were aware that certain measures would prevent and reduce RTA cases. Various preventive measures mentioned were in two main categories namely driver's behaviour and attitude and enforcement of road laws. According to them, driver's behaviour and attitude includes driving within the speed limit, no over loading of vehicles, proper vehicle maintenance, abiding by road signs and focused driving. These preventive measures must not be neglected by drivers. Drivers need to be disciplined and abide by good road safety measures to prevent or reduce RTA. Another key preventive measure mentioned is adequate enforcement of road laws and traffic regulation by appropriate bodies. Most of the drivers flout road safety laws which could easily aid in preventing RTA. Therefore, all the authorities must enforce the laws so that drivers would abide by them. For instance drivers not wearing seat belts, vehicles which are not road worthy and over loading of passengers in commercial vehicles must be arrested and fined. These could serve as deterrent to other drivers. Some respondents also mentioned that road safety education must be carried out by vehicle owners organized affiliations such as Ghana Private Road Transport Union of the Trade Union Congress (GPRTU of TUC), Progressive Transport Owners Association (PROTOA) and Ghana Road Safety Authority. This would also educate most drivers on good safety practices. One key preventive measure mentioned was thorough examination for new drivers before licenses are issued to them. These would also help in equipping the new drivers on road education and safety practices to curb some of the preventable accidents. A study carried out in New Zealand shows that to reduce highest crash risk of all drivers on the road, a comprehensive graduated driver licensing system was introduced. This was done as education/training course for new young drivers before licenses are issued (Begg and Brookland, 2015). Therefore, road safety education is essential in preventing road traffic accidents.

CONCLUSIONS

RTA and its fatalities and injuries continue to be a menace in developing countries such as Ghana. Thus immediate attention is needed to address this threat and related issues. This study carried out concludes that RTA is on the increase with progression in the year and population growth. In addition, significant accident cases have been recorded in the regions in Ghana over the past 10 years which is alarming. The correlation and regression analyses carried out show a clear positive faster increase in RTA trend with population growth in Ghana. There is no indication of a decrease which calls for adequate safety practices. The study shows that three main RTA causing factors in Ghana are over speeding, over loading and disregard to road signs / regulations. These factors are closely related to driver's behaviour such as negligence and indiscipline. Thus, respondents mentioned road safety education should be carried out by organized driving authorities to prevent or reduce RTA incidence in Ghana.

REFERENCES

1. Afukaar, F. Antwi, P. Ofosu-Amaah, S. Pattern of road traffic injuries in Ghana: implications for control. Injury control and safety promotion (2003) Vol. 10 No 1-2 pp 69-76
2. Amo T. Meirmanov, S. (2014) The epidemiology of Road Traffic Accident (RTA) in Ghana from 2001-2011. Life Science Journal Vol.11 No.9
3. Banik, B. K. Chowdhury, M. A. I. Hossain, E. Mojumdar B. (2011) Road Accident and Safety Study in Sylhet Region of Bangladesh Journal of Engineering Science and Technology Vol. 6, No. 4 pp. 493 – 505.
4. Begg, D. and Brookland R. (2015) Participation in driver education/training courses during graduated driver licensing, and the effect of a time-discount on subsequent traffic offenses: Findings from the New Zealand Drivers Study. Journal of Safety Research 55, 13–20.
5. Bjerre, J., Kirkebjerg, P.G. Larsen, L.B. (2006) Prevention of Traffic Deaths Involving Motor Vehicles. *Ugeskrift for Læger*, Vol. 168, pp. 1764-1768.
6. Bun E. (2012) Road Traffic Accidents in Nigeria: A Public Health Problem. AFRIMEDIC Journal, Vol. 3, No. 2
7. Coleman, A. (2014) Road Traffic Accidents in Ghana: A Public Health Concern, and a Call for Action in Ghana, (and the Sub-Region). Open Journal of Preventive Medicine, 4, 822-828
8. Enu, P. (2015) Road Traffic Accidents and Macroeconomic Conditions in Ghana. Vol. 2, No. 9 pp. 374-393.
9. Esmael, M. O. Sasaki, K. Nishii, K. (2012) Road Traffic Accident Trend in Developing Countries- The Policy Implications. 13th WCTR, Rio de Janeiro, Brazil
10. Gitelman, V. Balasha, D. Carmel, R. Hendel, L. Pesahov, F. (2012) Characterization of pedestrian accidents and an examination of infrastructure measures to improve pedestrian safety in Israel. Accident Analysis and Prevention 44, 63–73
11. Haadi, A-R. (2014) Identification of Factors that Cause Severity of Road Accidents in Ghana: a Case Study of the Northern Region, International Journal of Applied Science and Technology Vol. 4, No. 3
12. Jha N. (2004) Epidemiological study of road traffic accident cases: A study from eastern Nepal: Regional health forum WHO South-East Asia region, Vol. 8
13. Siaw, N. A., Duodu, E. Sarkodie, K. S. (2013) Trends in Road Traffic Accidents in Ghana; Implications for Improving Road User Safety, International Journal of Humanities and Social Science Vol. 2 No.11 PP.31-35
14. Smart, R.G., Mann, R.E. (2002) Death and Injuries from Road Rage: Cases in Canadian Newspapers. Canadian Medical Association Journal, Vol. 167, 761-762.
15. Tarimo, H.T. (2012). Motor Traffic injuries in sub Saharan Africa, Kilimanjaro Christian Medical College – Tanzania, <http://dx.doi.org/10.4314/dmsj.v19i1.3>
16. World Health Organization (1998) Road Accidents: A Major cause of mortality. World Report, United Nations, Geneva. Pp. 23-30.
17. World Health Organization (2004) World report on road traffic injury prevention, Geneva
18. World Health Organization (2009) Global Status Report on Road safety, Time for Action. 2009.
19. World Health Organization (2013) World health report: Research for universal health coverage