

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"**Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria**

Uchendu Onwusoronye Onwurah*, Christopher Chukwutoo Ihueze, Chukwuebuka Martinjoe U-Dominic, Onyekachukwu Godspower Ekwueme.

**Department of Industrial and Production Engineering,
Nnamdi Azikiwe University,
Awka, Nigeria**

The Corresponding Author's :- Uchendu Onwusoronye Onwurah

Abstract

The importance of road transportation in Nigeria is on daily basis being challenged by the increasing number of road traffic crashes with their attendant devastating personal, social and economic consequences. This study examined the trends and patterns of road traffic crashes, injuries and fatalities in Anambra State, Nigeria. Road traffic crash data were collected from the Federal Road Safety Corps (FRSC) Anambra State Sector Command, Awka. Descriptive statistical analysis and Pareto analysis were used to analyse crash data in the State. The descriptive analysis of the data showed that 18.84% of the crashes involved minor injury, 57.30% involved serious injury and 23.86% involved fatal injuries. The result revealed that although the trend in the number of road traffic crashes is decreasing, the number of lives being lost in road traffic crashes is still increasing. 76.7% of those killed were males and 23.3% were females; and 64.3% of those injured were males while 35.7% were females. The result also revealed that 76%, 20% and 4% of the crashes were caused by human factors, vehicle factors and environmental factors respectively. The Pareto analysis revealed that over speeding (speed violation), loss of control, dangerous (reckless) driving, route violation, tyre burst and brake failure were the 20% of the contributing factors that contributed to over 80% of the crashes in the State. Improved data collection, availability of accurate data, thorough analysis of such data, and development and implementation of adequate programs would help to reduce injuries and fatalities caused by road traffic crashes in Nigeria. The recommendations given in this study would help to reduce road traffic crashes in Nigeria.

Keywords: Road traffic crashes, road traffic injuries, fatalities, contributing factors, Anambra State, Nigeria

1. Introduction

Road transportation is the primary means of mobility in Nigeria and other part of the world. Its relevance to man's achievement of his economic needs, career, social, religious and other unlimited activities, which often makes him to move from one location to another, is too numerous to be mentioned. However, the relevance of road transportation in Nigeria is on daily basis being challenged by the increasing number of road traffic crashes occurring on the roads with their attendant devastating personal, social and economic consequences.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Road traffic injuries are currently ranked the ninth leading cause of death across all age groups globally and are projected to rank seventh in the year 2030 (WHO, 2014). According to WHO (2015), more than 1.2 million people die each year on the world's roads, making road traffic crashes a leading cause of death globally, and up to 50 million other people incur non-fatal injuries each year because of road traffic crashes; and ninety percent of these deaths occur in low- and middle-income countries. About 65% of the deaths involved pedestrians and 35% of the pedestrians were children (Aderinola, 2020). According to FRSC (2016), road traffic crashes cost countries approximately 3% of their gross national products, and this rises to 5% in some low- and middle-income countries.

Despite the Decade (2011 - 2020) of Action on Road Safety established by United Nations to stabilize and reduce predicted levels of road traffic fatalities around the world to the barest minimum (WHO, 2015); Nigeria still remains one of the worst hit countries. Road traffic crashes' statistics in Nigeria still reveal a serious and growing problem with absolute fatality rate rising rapidly (Atubi and Gbadamosi, 2015). Oladepo and Brieger (2006) argued that three-quarters of all crashes on Nigerian roads involve fatalities. The WHO (2015) estimate of 35,641 fatal crashes and FRSC (2013) report of 6,450 fatal road crashes in 2013 in Nigeria, leave no doubt about the dangerous situation on Nigeria roads. In comparison with the developed countries of the world, Nigeria had 20.5 deaths per 100,000 population, Australia 5.4, Canada 6, France 5.1, Germany 4.3, UK 2.9 and USA 10.6 deaths per 100000 population in the same year (WHO, 2015).

In terms of economic, social and other losses, Nigeria loses about 80 billion naira annually to road traffic crashes (Osowole et al., 2019). The factors that are contributing to road traffic crashes in Nigeria could be categorized into human factor, vehicle factor and environmental factor (Aworemi et al., 2010; Afolabi and Gbadamosi, 2017; Ihueze and Onwurah, 2018a; Onwurah and Ihueze, 2022). Human error is estimated to account for between 64% and 95% of all the factors that are contributing to road traffic crashes in the developing countries including Nigeria (Aworemi et al., 2010; Afolabi and Gbadamosi, 2017).

Road transportation is a very important means of transportation in Nigeria, hence, there is need to reduce to the barest minimum the high rate of road traffic crashes and severity of such crashes in Nigeria, using adequate traffic safety countermeasures. To achieve this, there is need to thoroughly analyse cases of road traffic crashes in Nigeria in general and Anambra state in particular in order to come up with proactive road safety measures that can reduce to the barest minimum road traffic crashes menace in Nigeria. This study systematically analyses the trends and patterns of road traffic crashes, injuries and fatalities in Anambra State from 2005 to 2019. It presents a thorough descriptive analysis of yearly number of crashes, number of people killed, number of people injured, gender involvement in crashes and the contributing factors of road crashes in the state. This study will help road safety agency in the state to understand the trends and patterns of road traffic crashes in the state

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

and be able to take proper safety measures to curtail crash occurrences and their severity in the state.

2. Methodology

The road traffic crashes Data used in this study were obtained from Anambra State Sector Command of the Federal Road Safety Corps (FRSC). The Federal Road Safety Corps is a lead agency saddled with the responsibility of ensuring safety on Nigerian highways. Among the various roles of FRSC are giving prompt attention and care to victims of crashes, carrying out thorough investigation on the remote and immediate contributing factors to road traffic crashes and filing their reports (Ihueze and Onwurah, 2018b). They gather the crash information through on the spot assessment of crash scenes, vehicle, environmental conditions, and thorough interviews of the crash victims (drivers, passengers or pedestrians) and the onlookers. The records contain information on the types of road crashes, crash severity (fatal, serious and minor), categories of road users involved, vehicle type, number of vehicles involved, number injured, number killed, causes of crashes, date and time of occurrence, location among other things. The reports record crashes that accounted for at least one minor injury.

For this study, FRSC Anambra State Sector Command supplied data about road traffic crashes in the State for the period 1st January 2005 to 31st December 2019 (a total of 180 months). During this period, 2489 crashes were recorded; 18.84% involved minor injury, 57.30% involved serious injury and 23.86% involved fatal crashes.

A thorough descriptive analysis of yearly distribution of number of crashes, number of people killed, number of people injured, severity index, gender involvement in the crashes and the contributing factors were made. Pareto Analysis, which is a method of looking at all the root causes of a problem and trying to determine which ones have the greatest frequency, was used to classify the crash contributing factors into those that seldom cause crashes and those that cause crashes on a more frequent basis.

3. Results and Discussion

3.1 Yearly Trends and Patterns of Road Traffic Crashes in Anambra State, Nigeria from 2005 to 2019

Table 1 shows the number of road traffic crashes, crash injuries and crash fatalities that occurred in Anambra State, Nigeria from 2005 to 2019; the percentage contribution in each case for each year and the percentage change over the previous year in each case were also shown in the table. Analysis of the crash data, showed that 2489 crashes were recorded; 18.84% involved minor injury, 57.30% involved serious injury and 23.86% involved fatal crashes. Table 1 shows that in those 2489 crashes, 1031 persons lost their lives and 6234 persons were injured. This shows that on average 166 crashes occurred every year and, 69 lives and 416 persons were lost and injured respectively.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Figure1 shows an increasing trend and pattern of road traffic crashes from year 2005, which contributed 1.73% (43 crashes) of the total number, to year 2012, which contributed 12.58% (313 crashes). The year 2012 was the peak year; it has the highest number of crashes. From 313 cases in 2012 to 160 cases in 2019, shows a decreasing pattern. A 36.3% reduction in the number of crashes was recorded between year 2017 and 2018 crash statistics, and 3% reduction in the number of crashes was recorded between 2018 and 2019. FRSC (2017) strategic goal of reducing the number of road traffic crashes by 15% every year was achieved between 2017 and 2018 crashes, but the yearly improvement was only 3% between the years 2018 and 2019. The decreasing trend in the number of crashes from 2012 to 2019 could be attributed to the massive rehabilitation of the road networks in the State and construction of new ones. This has helped to reduce overdependence on few major road networks in the State as the motorists have options to use alternative routes or roads instead of depending on the major routes. These rehabilitated and newly constructed roads have helped in reducing congestion and number of crashes in the State. Also, increase in road safety campaign by Federal Road Safety Commission, Governmental and Non-Governmental Agencies could also have contributed to the decline. This result confirms the submission of Atubi(2009), that found based on the result obtained from similar research in Lagos State, that there is a decreasing trend in traffic crashes in Nigeria.

Table 1: Yearly Trend of Road Traffic Crashes, Fatality and Injuries in Anambra State from 2005 – 2019

Year	Crashes			Fatality			Injuries		
	No. of Crashes	% of Each Year	% Change over the Previous Year	Number of People Killed	% of the No. of People Killed	% Change over the Previous Year (%)	Number of People Injured	% of the No. of People Injured	% Change over the Previous Year (%)
2005	43	1.73	-	11	1.07	-	166	2.66	-
2006	58	2.33	34.9	17	1.65	54.5	111	1.78	-33.1
2007	69	2.77	19.0	14	1.36	-17.6	169	2.71	52.3
2008	58	2.33	-15.9	9	0.87	-35.7	125	2.01	-26.0
2009	59	2.37	1.7	17	1.65	88.9	106	1.70	-15.2
2010	137	5.50	132.2	58	5.63	241.2	325	5.21	206.6
2011	141	5.66	2.9	64	6.21	10.3	464	7.44	42.8
2012	313	12.58	122	96	9.31	50.0	682	10.94	47.0
2013	295	11.85	-5.8	129	12.51	34.4	842	13.51	23.5
2014	273	10.97	-7.5	121	11.74	-6.2	611	9.80	-27.4
2015	229	9.20	-16.1	175	16.97	44.6	628	10.07	2.8
2016	230	9.24	0.4	77	7.47	-56.0	578	9.27	-8.0
2017	259	10.41	12.6	79	7.66	2.6	498	7.99	-13.8

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"									
2018	165	6.63	-36.3	70	6.79	-11.4	532	8.53	6.8
2019	160	6.43	-3.0	94	9.12	34.3	397	6.37	-25.4
Total	2489	100		1031	100		6234	100	

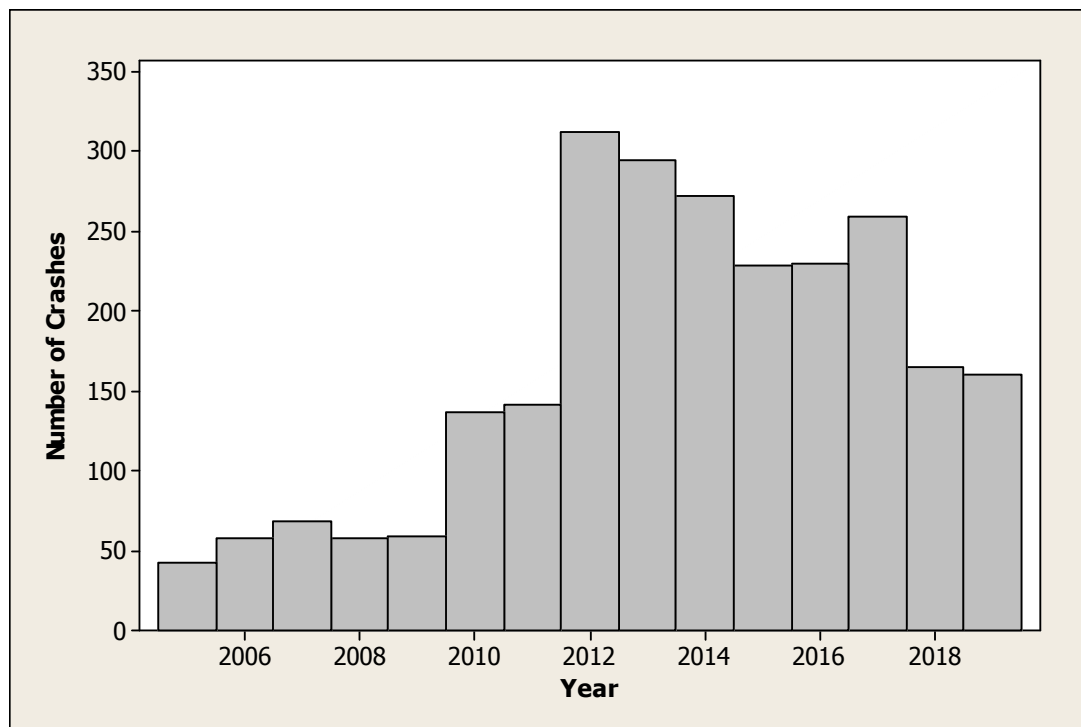


Figure 1: Number of Crashes from 2005 to 2019

3.2 Yearly Trends of Road Traffic Crash Injuries and Fatalities in Anambra State

The red line with square marker in figure 2 shows the trend and pattern of road traffic injuries in Anambra State from 2005 to 2019. There were increasing trends in the number of people injured from year 2005, which contributed 2.66% (166 injuries) of the total number of injuries to year 2013, which contributed 13.51% (842 Injuries). The year 2013 was the peak year; the highest number of injuries as result of road traffic crashes was sustained in that year. From 842 cases of injuries in 2013 to 397 cases in 2019, shows a decreasing trend. A 25.4% reduction in the number of people injured (see Table 1) was recorded between year 2018 and year 2019 crash statistics. This was indeed a significant improvement over the previous year.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

On the number of people killed in road traffic crashes, the black line with circular marker in figure 2 shows the trend and pattern of road traffic deaths in Anambra State from 2005 to 2019. In 2005, only 11 deaths (1.07%) were recorded and this rose to 175 deaths (16.97%) in 2015. The year 2015 had the highest number of deaths recorded within the period under study. There was an increasing trend in the number of death from 2005 to 2015, then followed by a sharp decrease in year 2016 (77 deaths) and increase in the number of deaths from 77 in year 2016 to 94 death in year 2019. A 34.3% increase in the fatalities was recorded between the 2018 and 2019 crash statistics (see Table 1). FRSC (2017) strategic plan of reducing road traffic fatality by 25% every year, was not achieved in Anambra State between the years 2018 and 2019. It could be deduced from figures 1 and 2 that although, the number of crashes is decreasing in the State, the number of people being killed because of road traffic crashes is still increasing.

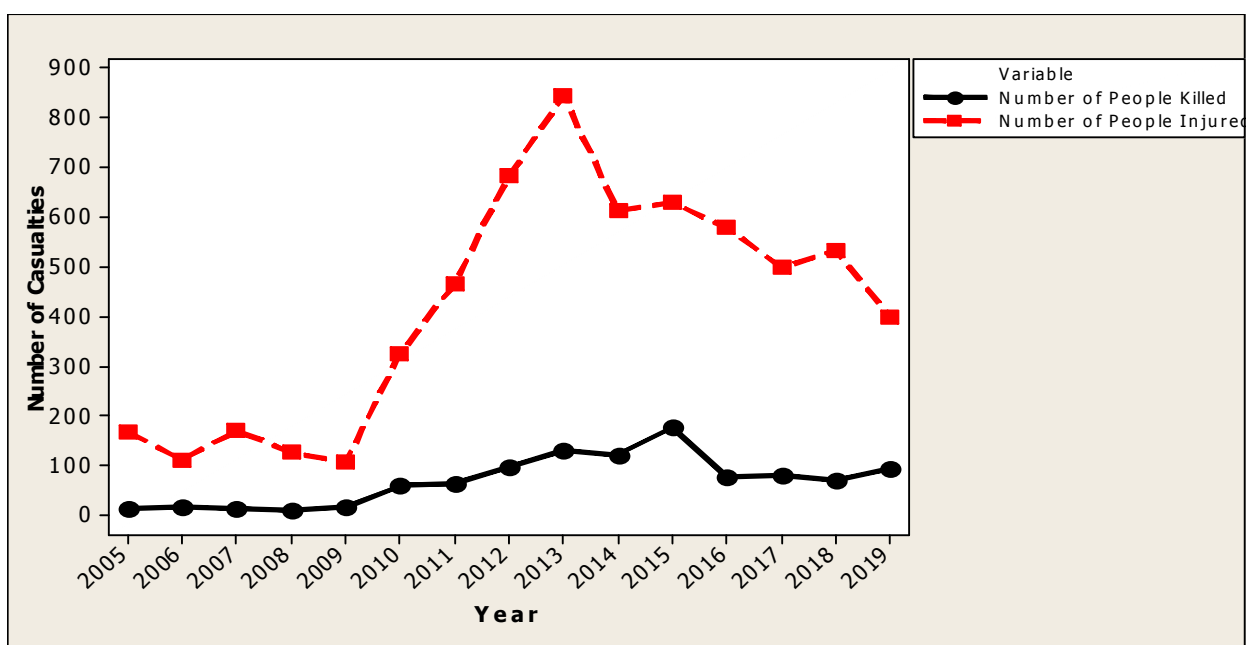


Figure 2: Number of Casualties (2005 – 2019)

3.3 Gender of People Involved Road Traffic Crashes in Anambra State, Nigeria

Gender involvements in crashes in Anambra State from 2011 to 2017 were also descriptively analysed. From the analysis, 64.30% of those injured were males while only 35.70% were females. In addition, 76.70% of deaths recorded within this period were males while only 23.30% were females. The findings are in line with earlier studies in different countries that males are mostly involved in road crashes than females (Valent et al., 2002; Zeleke, 2017). The reason for greater involvement of males in crashes could be attributed to their greater exposure to road traffic and other associated factors.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Also, as can be seen in Figure 3, there is a decreasing trend in the number of males and females injured in road traffic crashes in the State after the year 2013. Figure 4 shows an increasing trend in the number of deaths that occurred for both males and females from 2011 to 2015. From 2015 to 2017, there was a sharp decrease in the number of males killed in road crashes while the number females killed was still increasing up to the year 2017.

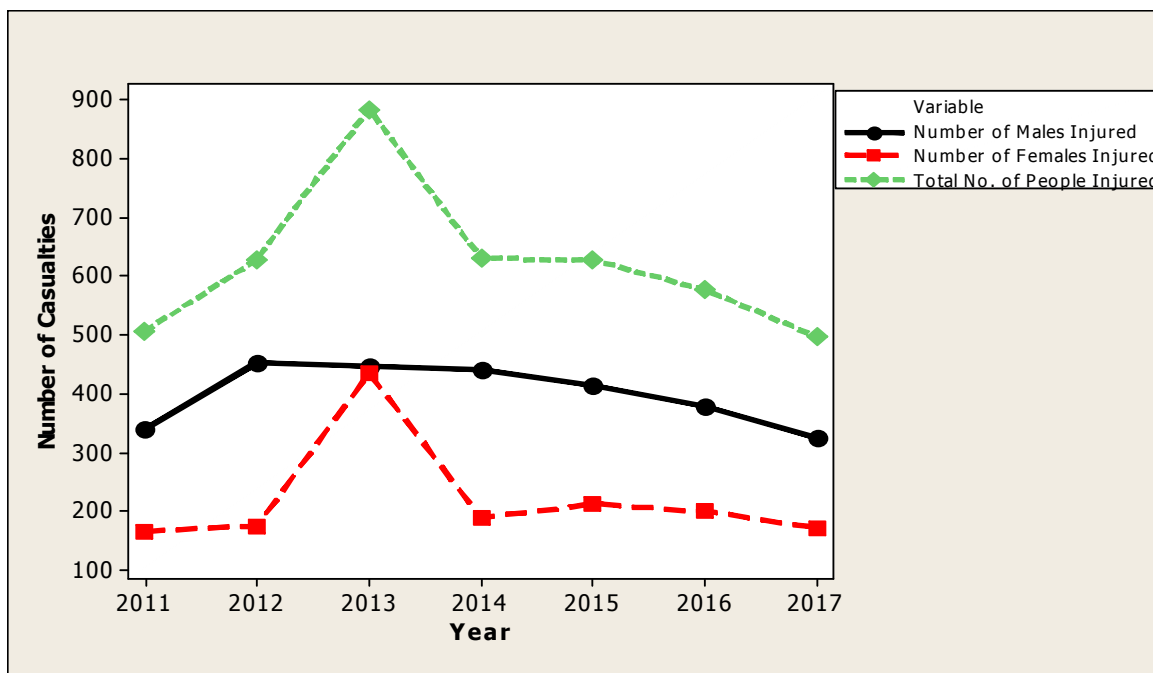


Figure 3: Gender of People Injured in Road Traffic crashes

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

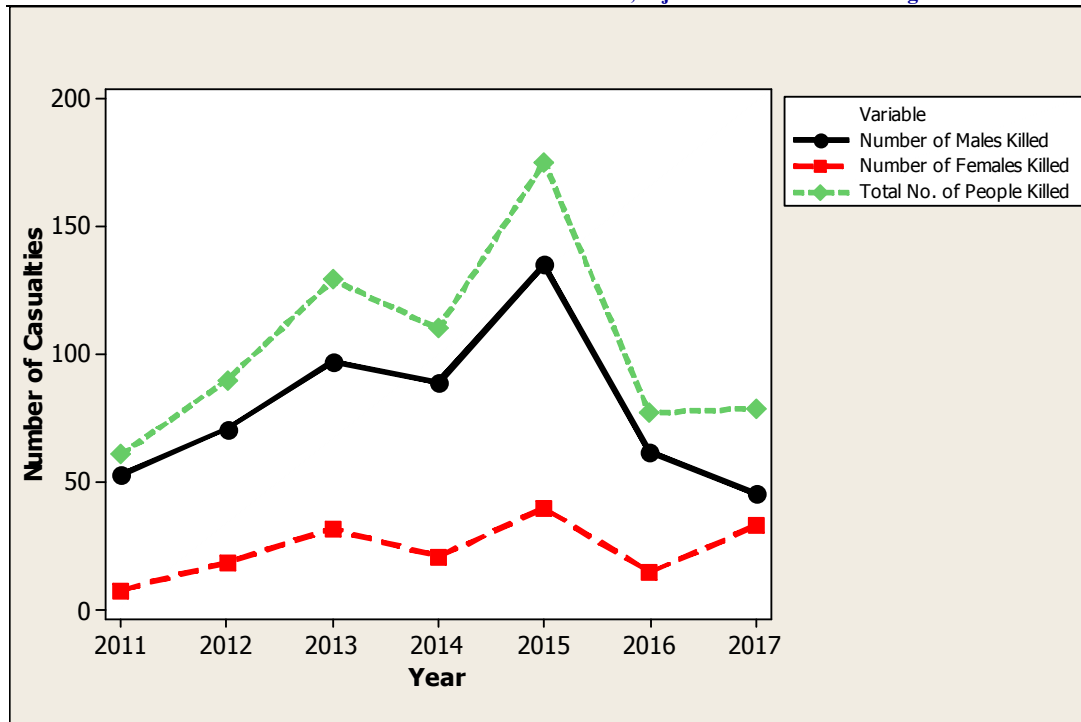


Figure 4: Gender of People Killed on Road Traffic Crashes

3.4 Contributing Factors to Road Traffic Crashes in Anambra State (2005-2017)

Table 2 shows the contributing factors to RTC and the total number of crashes each contributed from 2005 to 2017. The factors that contribute to road crashes in Anambra State are over speeding, loss of Control, dangerous driving, tyre bust, brake failure, wrongful overtaking, route violation, mechanical deficient vehicle, bad road, road obstruction violation, dangerous overtaking, overloading, sleeping on steering, driving under alcohol/drug influence, use of mobile phone while driving, fatigue, poor weather (heavy and moderate rainfall), sign light violation and others. In descending order of magnitude, speed violation which contributed 28.68% of all the crashes among the eighteen factors being considered was the highest contributing factor to road traffic crashes within the years under study; followed by loss of control, which contributed 15.72%; dangerous driving that contributed 15.01% of the crashes came third; and the least contributing factor was sleeping on steering, which contributed 0.31% of the total number of crashes within the years under review.

Table 2: Contributing Factors and Number of Crashes

Factor	Year													Total	% Contribution of each Factor
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
	20	200	200	200	20	20	20	201	20	201	20	20	201		
	05	6	7	8	09	10	11	2	13	4	15	16	7		

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Over speeding	21	30	7	17	19	37	55	67	90	119	82	71	115	730	28.68
Loss of Control	3	3	1	1	2	22	27	100	68	57	46	31	39	400	15.72
Dangerous Driving	6	5	34	29	12	36	33	64	31	35	34	28	35	382	15.01
Brake Failure	7	4	3	6	4	18	10	40	48	27	27	42	31	267	10.49
Route Violation	0	5	1	4	4	2	5	12	30	14	21	16	17	131	5.15
Tyre Burst	8	4	8	3	4	7	9	19	18	13	5	21	11	130	5.11
Wrongful overtaking	0	0	0	0	0	16	8	7	9	11	11	20	32	114	4.48
Dangerous overtaking	2	3	4	1	4	2	4	11	24	13	9	13	6	96	3.77
Obstruction	1	0	0	0	3	2	4	3	5	7	9	4	12	50	1.96
Driving under alcohol/Drug	0	0	0	1	10	7	4	3	6	4	4	4	5	48	1.89
Mechanical deficient vehicle	1	2	0	0	2	2	2	6	3	5	7	10	4	44	1.73
Sign light violation	0	0	13	4	2	1	2	7	3	3	2	0	2	39	1.53
Poor weather	0	0	1	0	2	0	3	7	3	5	1	7	8	37	1.45
Bad road	0	1	0	1	3	9	3	0	3	2	0	3	1	26	1.02
Overloading	0	0	0	2	1	0	2	2	0	2	2	6	2	19	0.75
Use of phone while driving	0	0	1	0	1	0	0	0	3	1	3	3	1	13	0.51
Fatigue	0	0	3	0	0	0	1	0	1	0	1	2	3	11	0.43
Sleeping on steering	0	0	0	0	0	0	0	0	0	0	1	5	2	8	0.31

Classifying the above eighteen factors into three categories – human related factors, vehicle related factors and environmental factors, shows that driver factors contributed 76% of the crashes, vehicle factors 20% and environmental factors 4% as shown in Figure 5. It means that human related factors alone contributed more than half of the crashes that took place each year. This is in line with the submission Afolabi and Gbadamosi Kolawole (2017) that human factors contribute to 80% of road traffic crashes. The implication of this is that human is the most liable requiring the focus of safety management approaches and strategies.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

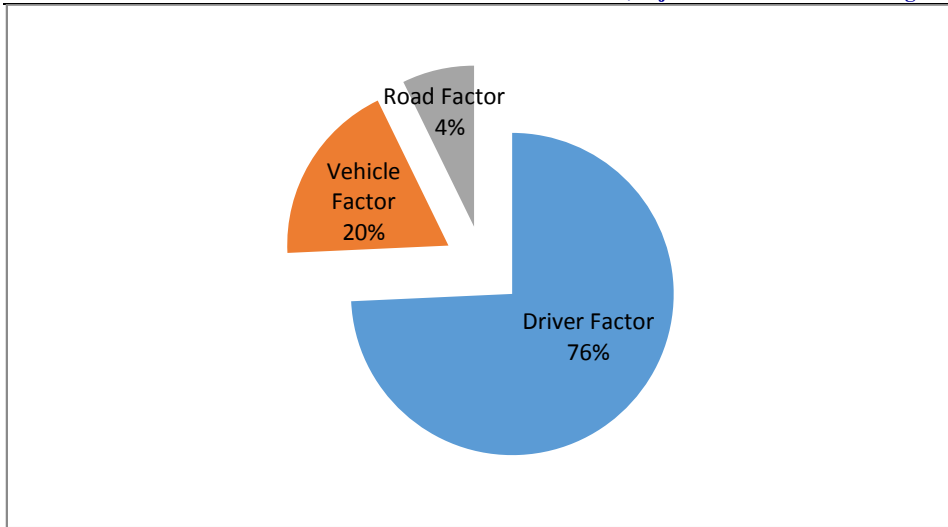


Figure 5: Percentage Contributions of Driver, Vehicle and Road Factors

3.5 Pareto Analysis of the Contributing Factors

Figure 6 shows the Pareto Chart for crash contributing factors in Anambra State, Nigeria. It could be seen from the chart that about 80% of the crashes were caused by only six factors (only 20% of the factors) – over speeding (SPV), loss of control (LOC), dangerous driving (DGD), brake failure (BFL), route violation (RTV) and tyre burst/failure (TBT). This analysis agrees with previous studies that found over speeding to be a leading contributing factor to crashes (Taylor et al., 2002; Ojo, 2014; Onwurah et al., 2021). Loss of control, brake failure (Oduro, 2012; Oluwole et al., 2015) and tyre burst (Ogunmodede et al., 2012) have also be found by previous studies to be among the leading contributing factors to road traffic crashes in the developing countries. This implies that more attention should be given to these factors in terms of policy formulation and implementation in order to reduce the incessant crashes that are occurring because of the contributing factors.

Other factors that made a little bit significant contributions apart from the six above are dangerous overtaking (DOT), wrongful overtaking (WOV), sign light violation (SLV), road obstruction (OBS), mechanical deficient vehicles (MDV), poor weather condition (PWR) and bad road (BRD). Previous studies on road safety in the developing countries also found these factors to be among the crash contributing factors, for instance, road obstruction (Haadi, 2012), wrongful overtaking, bad road and heavy rainfall (Ogunmodede et al., 2012). Overloading (OVL), use of phone while driving (UPWD) and sleeping on the steering (SOS) are the factors that made the least contributions to the road traffic crashes in the State.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

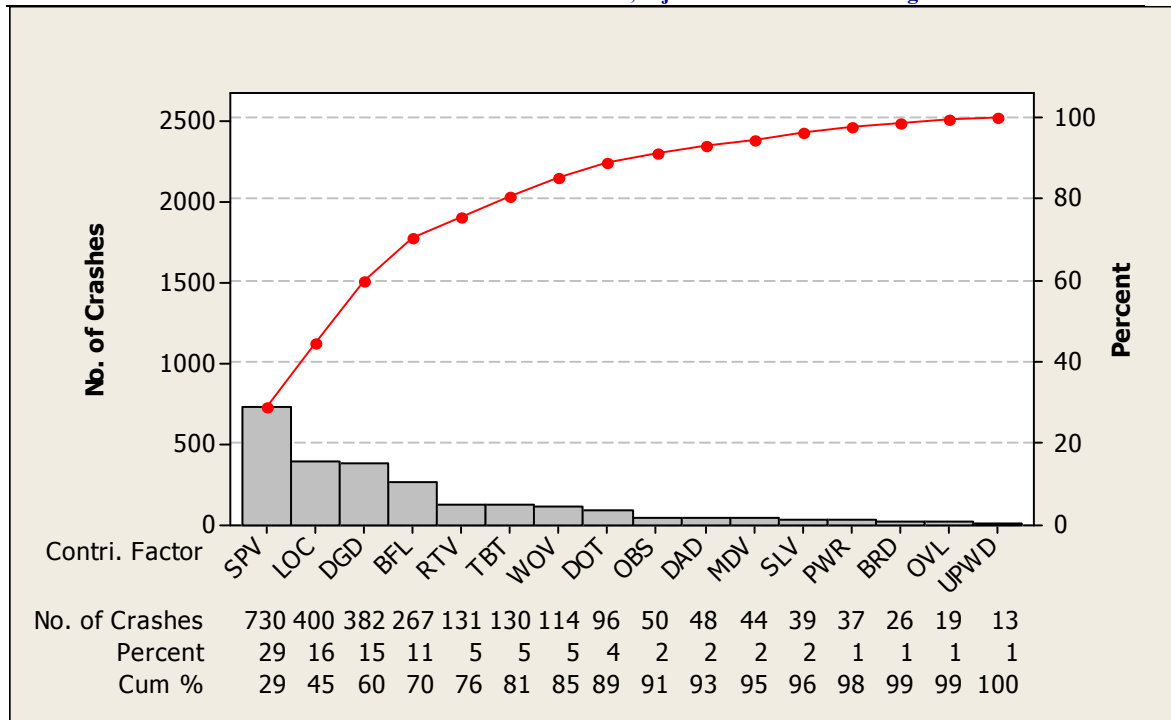


Figure 6: Pareto Chart for Contributing Factors

4. Recommendations

Road transportation is a very important means of transportation in Nigeria, hence, the safety of road users must be given a paramount attention by all the stakeholders in Nigeria. Having analysed the data from FRSC and observed the behaviours of drivers and pedestrians on the roads for some years now, the following recommendations are made in order to ensure the safety of road users in Anambra State in particular and Nigeria in general:

- Speed Limiting Devices:** over speeding was found to be the leading contributing factor to road traffic crashes in this study; the Federal Road Safety Commission should enforce the speed limiting laws in all the highways in the state to reduce incessant crashes caused by speed violation or over speeding in the state.
- Road Safety Campaign and Education:** Driver's or human factor was found to contribute over 76% of road traffic crashes in the state. The FRSC should invigorate the road safety campaign and education to the public so as to reduce drastically human's contribution to road crashes in the state.
- Road Safety Education** should be included in the school curriculum from primary schools to higher institutions. This will inculcate safety consciousness in all age categories. In addition, drivers must be made to pass all necessary road traffic safety trainings before they get driving license. Every short cut to licensing should be blocked by the necessary authority.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

- d) Establishment of Emergency Medical Services or Mobile Clinics along the major highways in Anambra State for crash victims. Incessant loss of lives will be reduced if adequate medical attention is given to crash victims immediately crashes occur.
- e) Effective vehicular morning checks by the drivers before hitting the road and routine preventive maintenance will help reduce crash occurrences. Drivers are encouraged to inspect their vehicles every morning before hitting the road. The idea of visiting the vehicle repair/maintenance workshops by drivers only when their vehicles broke down should be highly discouraged.
- f) Enforcement of all road safety policies and laws by FRSC and Police. Some of the commercial drivers in the state are still driving without valid driving license and most of them are not qualified to drive. Fishing them out will reduce the number of crashes in the state.
- g) Road traffic safety Policy and technology adoption and adaptation from advanced countries. Adopting policy and technology that worked effectively and efficiently in advanced countries and effectively implementing them in Nigeria will help reduce the number of road crashes.
- h) More pedestrian bridges should be built by the governments at all levels on the strategic locations where pedestrians normally cross the roads. This will help to reduce road traffic crashes between moving vehicles and pedestrians; and all the stakeholders should embark on vigorous campaign on the use of pedestrian bridges in the state and discourage pedestrians from crossing the expressway instead of using bridge.

5. Conclusion

This study examined the current trends and patterns of road traffic crashes in Anambra State, Nigeria from 2005 to 2019 using the crash data obtained from the Anambra State Sector Command of Federal Road Safety Corps. From the analysis of the data collected, the results revealed that the number of crashes in the State is decreasing while the number of people killed on road traffic crashes is increasing. The data showed that within the period under review, 2489 crashes occurred that left 1031 persons dead and 6234 persons injured. On average, 166 crashes occurred every year and, 69 persons and 416 persons were killed and injured respectively every year. Human factor, vehicle factor and road factor contributed about 76%, 20% and 4% of the crashes that took place respectively; and over speeding, loss of control, dangerous driving, brake failure, tyre burst and route violation contributed most of the crashes that took place within the eleven years under study. The results also showed that 76.70% of those killed were males and 23.30% were females; and 64.30% of those injured were males while 35.70% were females.

This study showed that more efforts are seriously needed in addressing road traffic injuries and death in Nigeria. The findings of this study would be useful to all the stakeholders – road users, roadway designers and road construction companies, law enforcement agencies and

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

policy makers in that they are in a better position to affect a variety of factors, hence, influencing road traffic safety. Although, the data used in this study were from only Anambra State, but considering the contributing factors analysed, and the fact that the drivers' behaviour, road mix and environmental conditions are virtually the same in Nigeria, this study provides insight into crash contributing factors in Nigeria. It would be useful in developing strategies that could help to prevent and reduce the number of crashes and injuries in Anambra State in particular and Nigeria in general. The recommendations listed above, if applied in Nigeria, will help to reduce to the barest minimum the number of crashes and the severity of such crashes in Nigeria.

One of the limitations of this study is that only the crash count data from one State in Nigeria were used in the crash analysis. It will be more useful if the data from all the states in Nigeria are used because that will give a better picture of the crash situation in Nigeria. Again, this study observed that there is a tendency of under reporting of road traffic crashes in Nigeria and age of crash victims were not included in crash statistics. There is need to improve on the collection and availability of accurate crash data as this will enable the policy makers to understand the extent road traffic injury has become a serious public health problem in Nigeria, and that the deployment of adequate resources will help in fighting the menace. This study suggests continuous, systematic and sustainable data collection efforts in Nigeria.

The future research effort in this regard should involve extending the research to the entire country and developing appropriate crash predictive models for adequate analysis and forecasting of road traffic crashes in Nigeria.

References

- Aderinlewo, O.O., Afolayan, A. 2019. Development of Road Accident Prediction Models for Akure-Owo Highway, Ondo State, Nigeria. *Journal of Engineering Science*, 5(2), 53-70.
- Aderinola, O. 2020. A Parametric Model for Accident Prediction along Ado Ekiti-Ikole Ekiti Road, Ekiti State, Nigeria. *European Journal of Engineering Research and Science*, 5(8), 980-985.
- Afolabi, O.J., Gbadamosi Kolawole, T. 2017. Road Traffic Crashes in Nigeria: Causes and Consequences. *Transport & Logistics: the International Journal*, 17(42), 40-49.
- Atubi, A.O., 2009. Modelling Road Traffic Accident in Lagos State, South Western Nigeria. *Journal of Society and State*, 1(1), 57-74.
- Atubi, A.O., Gbadamosi, K.T., 2015. Global Positioning and Socio-economic Impact of Road Traffic Accidents in Nigeria: Matters Arising. *American International Journal of Contemporary Research*, 5(5), 136-146.
- Aworemi, J.R., Abdul-Azeez, I.A., Olabode, S.O., 2010. Analytical study of the causal factors of road traffic crashes in southwestern Nigeria. *Educational Research*, 1(4), 118-124.
-

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Federal Road Safety Corps, 2013. 2013 Annual Report. Federal Road Safety Commission, Abuja.

Federal Road Safety Corps, 2016. 2016 Annual Report. Federal Road Safety Commission, Abuja.

Federal Road Safety Corps, 2017. 2017 Annual Report. Federal Road Safety Commission, Abuja.

Haadi, A., 2014. Identification of Factors that Cause Severity of Road Accidents in Ghana: A Case Study of the Northern Region. *International Journal of Applied Science Technology*, 4(3), 242-249.

Ihueze, C.C., Onwurah, U.O., 2018a. Road Traffic Accidents Prediction Modelling: An Analysis of Anambra State, Nigeria. *Accident Analysis & Prevention*, 112, 21-29.

Ihueze, C.C., Onwurah, U.O., 2018b. Tracking and Appraisal of Road Traffic Accidents: An Analysis for Anambra State, Nigeria. *Journal of Engineering and Applied Sciences*, 13, 12-24.

Oduro, S.D., 2012. Brake Failure and Its Effect on Road Traffic Accidents in Kumasi Metropolis, Ghana. *International Journal of Science and Technology*, 1(9), 448-453.

Ogunmodede, T.A., Adio, G., Ebijuwa, A.S., Oyetola, S.O., Akinola, J.O., 2012. Factors Influencing High Rate of Commercial Motorcycle Accidents in Nigeria. *American International Journal of Contemporary Research*, 2, 130 – 140.

Ojo, A.L., 2014. Predominant Causes of Road Traffic Accident among Commercial Vehicle Drivers in Ekiti State, Nigeria. *The International Journal of Humanities and Social Studies*, 2, 1 – 5.

Oladepo, O., Brieger, R., 2006. Road Traffic Accidents: Applying the Brake to a Killing Trend. *African Health*, 8, 30-32.

Oluwole, A.M., Rani. M.R.A., Rohani, J.M., 2015. Commercial Bus Accident Analysis through Accident Database. *Journal Transportation System Engineering*, 2(1), 7 – 14.

Onwurah, U.O., Ihueze, C.C. 2022. Road Traffic Accidents Analysis and Prevention in Nigeria. Saarbrücken, Germany, Lambert Academic Publishing.

Onwurah, U.O., Ihueze, C.C., Nwankwo, C.O. 2021. Modelling Road Traffic Crash Variables in Anambra State, Nigeria: An Application of Negative Binomial Regression. *Journal of Multidisciplinary Engineering Science Studies*, 7(6), 3942-3949.

"Trends and Patterns of Road Traffic Crashes, Injuries and Fatalities in Nigeria"

Osohole, O.T., Henshaw, B.B., Aghamie, S., Balogun, K. 2019. On Road Traffic Fatalities Modelling in Nigeria. International Journal of Applied Science and Mathematical Theory, 5(3), 9-19.

Taylor, M.C., Baruya, A., Kennedy, J.V., 2002. The relationship between speed and accidents on rural single-carriageway roads. TRL Report 511, Transport Research Laboratory, Crowthorne, Berkshire.

Valent, F., Schiava, F., Savonitto, C., Gallo, T., Brusaferrro, S., Barbone, F., 2002. Risk Factors for Fatal Road Traffic Accidents in Udine, Italy. Accident Analysis and Prevention, 34, 71-84.

World Health Organization, 2014. Global Health Estimates. World Health Organization, Geneva.

World Health Organization, 2015. Global Status Report on Road safety 2015. World Health Organization, Geneva.

Zelege, L.B. 2017. Factors Associated with Road Traffic Accident Death and Victim's Social Crisis in East Gojjam Zone, Amhara National Regional State, Ethiopia. Research on Humanities and Social Sciences.