

THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Descriptive Analysis of Road Traffic Crashes in Federal Capital Territory, Abuja, Nigeria

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Abstract:

The yearly total number of fatalities due to road accidents in Abuja has been consistently above 200 over the past few years. Although the fatality trends are declining and increasing (unstable), the actual figure is still at an alarming stage. In order to help in reducing the number of road accident and fatalities, the availability of a reliable and comprehensive road accident database and analysis system is critical to understand the pattern of accident causation.

The Federal Road Safety Commission (FRSC) plays a major role in road accident data collection and throughout the years, there has been an abundance of data available for analysis. In order to help in reducing the number of road crashes and fatalities, the availability of a reliable and comprehensive road crashes database and analysis system is critical to understand the pattern of accident causation.

However, the existing road crashes system in Nigeria is focused onto record management without basic data analysis. A new advanced data analysis system can be developed to take advantage of the available accident data. Road crashes characteristics gathered by FRSC were collected from their Accident Record Office, structured and segregated into a new comprehensive database system. Better structured data will create conditions for deeper analysis, aiding in the formulation of evidence-based research on road safety and enabling better road safety interventions as well as performance monitoring. The analysis of accident causes in this study indicates that Speed violation and lack of Control by careless driving are the predominant accident causes and most of the RTC cases occurred in the routes that lead to Abuja Municipal. Also, RTCs in the night were higher than the day because most workers travel both early in the morning and late in the night in order to avoid traffic jam.

Keywords: Road Traffic, crashes, Road Traffic Crashes (RTC), Accident, Car, Motorcycles (Mc), Heavy Duty Vehicles (HDV), Speed Limit Violation (SPV), Loss of Control (LOC), Tyre Violation (TYT), Route Violation (RTV) and Dangerous Drivine (DGD).

1. Introduction

Road crashes are a serious problem in Nigeria and are human tragedy. The number of road traffic crashes increases every year worldwide and these crashes kill not less than one million people and injure at least 23 million others annually. In Nigeria, according to FRSC Annual Report of 2012, 4,765 road crashes were reported in 2011 which rose to 6,289 in 2012 resulting to an increase of 31.6%. Also, 4,260 people were reported to be killed in 2012 as a result of road crashes. Road traffic accidents can now be considered as one of the highest killers in Nigeria, killing an average of not less than 20 people per day. The road traffic crashes also have a very strong impact on the Health System in Nigeria. In some hospitals 50% of the patients are said to be road traffic casualties. They involve human sufferings and monetary costs in terms of untimely death, injuries and loss of potential income. Road traffic crashes are however amiable to remedial actions. Retting et al. (1999) reported that about 40% of motor vehicle accidents in US happens in urban areas. Many countries have curbed the menace by adopting a multipronged approach to road safety that encourages broad range of measures such as traffic management, design and quality of road infrastructure, application of intelligent transport system, safer vehicles, law enforcement, effective and quick accident response and care etc. The heterogeneity of traffic, plying of modes with varying speed and maneuvering time makes the highways of cities like Abuja even more complex. Of particular concern are the urban roads, particularly the signalized ones that are problematic locations and have been identified as among the most hazardous roads which account for a substantial portion of

traffic accidents in a nation (Tay *et al.*, 2006; Helai *et al.*, 2008). The only source of accident data in the developing countries is available from the Traffic Police (Federal Road Safety Corps (FRSC) as in Nigeria). Using these FRSC data, this study attempted to investigate the accidents occurring at one of the busiest and major city named (Abuja).

This paper aims to provide a broad overview of some characteristic features of accidents that occurred at some Road in Abuja between the period of 2001 and 2010. Based on the data analysis, the study also attempted to shed some light on the major causes, factors and types of accidents in order to identify the problem intersections and suggest appropriate counter-measures to reduce such accidents.



Figure 1

1.1. Road Accidents

Road accidents occur due to failure in the traffic system which is the interaction of the characteristics of some basic elements such as road users, the vehicles and the roadway environment. In safety research from the international standpoint, many studies have shown that roadway or highways are critical sites that require more attention. For many highways, especially those within urban corridors, accident frequency and severity remained relatively high despite the implementation of various geometric and traffic countermeasures. In a study of urban intersection accidents in Riyadh, Ghamdi (2002) found that among the major causes for severe accidents, excess speed ranked first, followed by driving the wrong way and failing to yield. On the other hand, the major causes for Property Damage Only (PDO) accidents are failing to yield, excessive speed and following too closely.

The mandate of Federal Road Safety Commission (FRSC) and other Road Traffic agencies/ Workers which is reducing road accidents on our roads can be viewed as rendering services to the citizens of Nigeria and the more the road accidents are curtailed, the better the costumers (citizens) are satisfied. Detection of rates of road crashes is an indicator of the performance of the Federal Road Safety Commission. This study also presents the usefulness of Accident Statistics using widely available software operating in a Windows environment in determining rate and changes in underlying recurrent patterns of road crashes. The Government and Federal Road Safety Commission can use these techniques to monitor the occurrence of road traffic crashes which will allow us to have Quality Road Traffic Services by giving the needed attention to curb the occurrence of road crashes in high ways. As discussed in the following paragraph, these applications have general use well beyond these commissions.

1.2. Study Area

Abuja Roads (within and outside) are currently the major arterial roads of the Nigeria. They stretches Northward, Southward, Eastward and Westward to other parts of the country and acts as a prime transport corridor which the country. There is a constant heavy flow of traffic on this corridor throughout the year. It also generates quite a large number of pedestrian traffic due to the geographical location of the city and the purpose it is serving (FCT). Besides congestion, travel delay and other operational problems, traffic accident has become a recurring event on these arterial roads.

For the purpose of this study, the data collected from the Record office of the Federal Road safety Corps (FRSC) covers the Major Routes within and outside the city of Abuja for the period of 2001 to 2010.

1.3. Limitations of the Study

It was not possible to draw the collision diagrams for the high accident locations due to lack of sketches of accident locations in the FRSC Accident Report Forms and other factual information. Also the exposure data (Traffic Volume, Vehicle-Km Travel), an important piece of information for safety related studies, was not available for the study. So the effects of these factors on accidents could not be investigated. The lack of suitable data is a critical problem for the Quality Road Safety Researchers, not only in our country (Nigeria) but in all the developing countries (Jacobs and Sayer, 1983). It can be said that this study does not

examine in depth the characteristics of urban and suburban roads crashes causes because of data problems, yet it might be considered a launching point for any further studies in this area.

2. Materials and Method

In Nigeria, Federal Road Safety Corps (FRSC) is the core organization for road accident data collection and storage. Under the current operating framework, they conduct investigation and are responsible for reporting of accidents. They use an investigation form called Accident Report Form (ARF) and are trained on its uses. Also they are responsible for transcription of data into Descriptive Statistical Analysis using simple available software. It should be noted here that the Transport Research Laboratory (TRL) of the United Kingdom specifically developed Micro Accident Analysis Package (MAAP) computer software package for storage and analysis of road accident data particularly for developing countries. For each accident, a sub-inspector of FRSC completes the traffic accident report form after visiting the accident spot. The ARF is then dispatched to the respective Accident Data Units (ADU) where the information from ARF and location of the accident is incorporated into MAAP. The Accident Record department at Abuja essentially summarizes these data. The current road safety research and investigation works is based on this database.

The accident data reporting system has some flaws such as underreporting problem. Data on traffic accidents for the last ten years extending from January 2001 to December

2010 for Abuja metropolis were collected from accident records database maintained at the FRSC Accident Record Dept. The data included accident date, time, location and other relevant information. Afterwards, the collected data were analyzed and subsequent cross tables were prepared as per requirement for time of crash using the Simple Descriptive Statistics (Tables, Line Graphs, Pie-Charts and Bar-Charts).

Finally the data tables for each section were compiled for data representation using Microsoft Excel Spreadsheet.

3. Findings

The data on Road Crash were organized and analyzed to characterize the accident patterns, such as

- Accident category (fatal or injurious)
- Accident characteristics (time and collision type)
- Vehicle class (Car, Motorcycles, Buses, Heavy Duty Vehicles and others)
- Killed and Injured Persons
- Number of Vehicles Involved

The number of casualties is shown below:

- Number killed in day – time: 1916
- Number injured in day – time: 9305
- Number of persons killed in night time: 2701
- Number of persons injured in night time: 9618

3.1. Vehicle Types

Then data revealed that 11,641 vehicles involved in RTC in the period under review. The total number of 5734 representing 49% occurred in the day while 5,907 representing 51% happened in the night. Car had the highest with 6353 representing 55%, followed by Motorcycles with 1787 representing 15%, and Buses 1729 representing 15%, Heavy Duty Vehicles 1517 representing 13% and others 255 representing 2%.

3.2. Comparative Analysis of Categories of Vehicle

- Car: The number of Road Traffic Crashes involving Cars in day was 318 representing 49% while in the night 3235 representing 51%.
- Motorcycle: This type of vehicle recorded 874 in the day representing 49% and 913 were recorded in the night representing 51%.
- Bus: This recorded 857 in the day representing 49% which 872 occurred in the night 51%.
- Heavy Duty Vehicle: A total of 748 occurred in the day representing 49% while 769 occurred in the night representing 51%.
- Probable Causes: The leading probable cause was Speed Limit Violation (SPV) with 3439 representing 64% followed by Loss of Control (LOC) with 753 cases representing 14%, Tyre Violation (TYT) with 443 cases representing 8%, Route Violation (RTV) 290 representing 5%, Dangerous Driving (DGD) 281 representing 5% and others 4%.

3.3. Descriptive Tables and Charts

The distribution of accidents by accident severity levels in Abuja and suburban intersections is shown in Table 1 below.

Year	Fatal	Serious	Total injury crashes	No. of persons killed	No. of persons injured	Mc	Hgv	Bus	Car	Others	Total vehicles
2001	84	197	281	170	928	149	117	95	221	2	584
2002	97	156	253	170	906	90	81	105	377	5	658
2003	46	63	109	140	483	71	41	55	147	4	318
2004	78	64	142	152	537	84	48	68	156	0	356
2005	29	121	150	71	458	85	13	37	167	58	360
2006	89	186	275	382	1199	105	82	122	206	2	517
2007	70	154	224	221	833	63	92	94	276	16	541
2008	79	145	224	157	818	82	56	67	189	10	404
2009	101	322	423	203	1319	67	72	51	493	19	702
2010	122	465	587	250	1824	78	146	163	886	21	1294
TOTAL	795	1873	2668	1916	9305	874	748	857	3118	137	5734

Table 1: Yearly Day-Time Distribution of Road Crashes in Abuja (2001-2010)

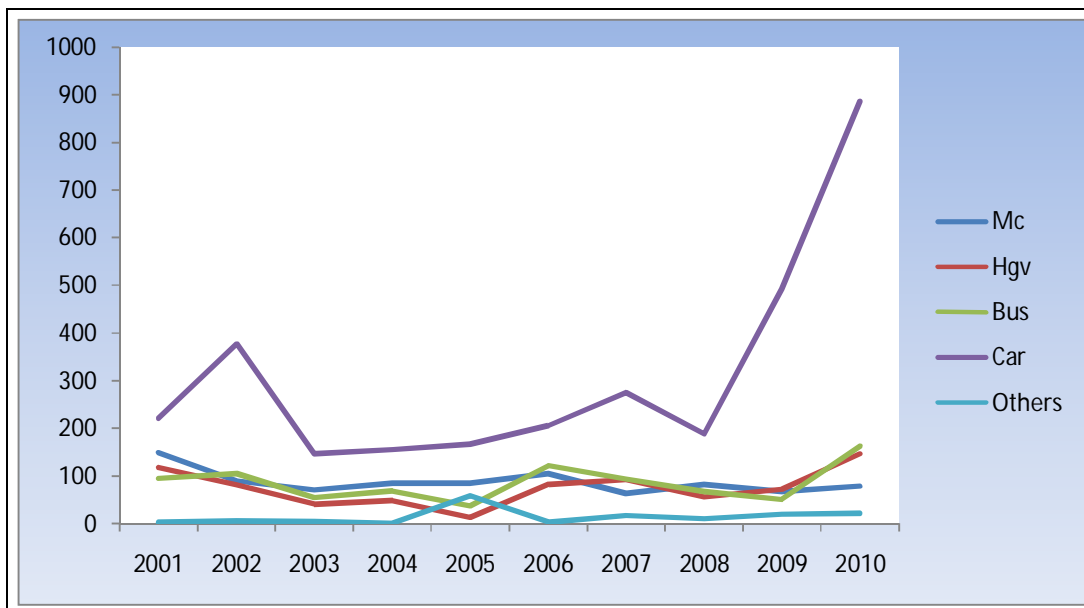


Figure 1: Trend of Vehicle Types involve in Day Crashes from 2001 to 2010

The distribution of road crashes by vehicle type is shown in the figure 1 above. The Motor Cycles (Mc) were responsible for the highest number of vehicles involve. It can also be seen that in recent year (2008-2010), the number of Mc h also significantly increased.

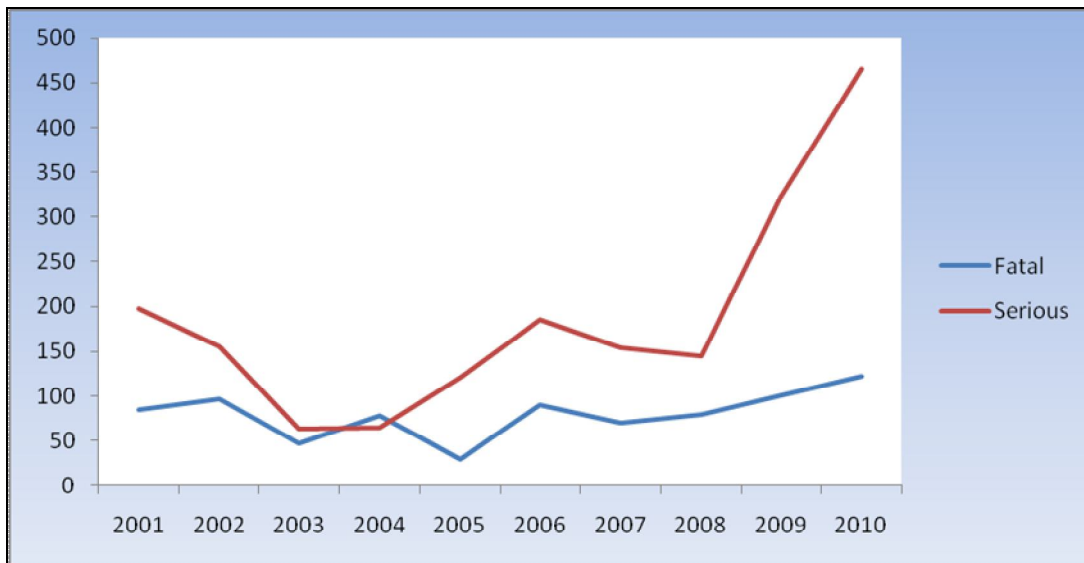


Figure 2: Trend of Crash Types involve in Day Crashes from 2001 to 2010

The distribution of road crashes by type (fatal and serious cases) is shown in the figure 2 above. The number of serious accident cases was higher. It can be seen that in recent year (2008-2010), the number of serious cases also significantly increased.

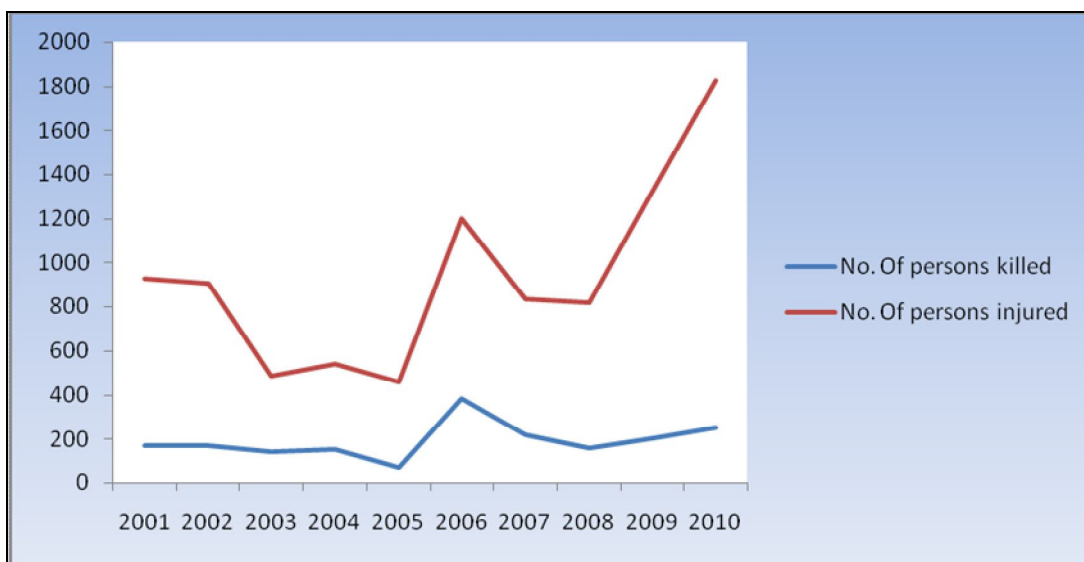


Figure 3: Trend of Casualty Types involve in Day Crashes from 2001 to 2010

The distribution of road crashes by type of casualties (killed and injured persons) is shown in the figure 3 above. The number of persons killed was higher than persons injured. It can be seen that in recent year (2008-2010), the number of persons killed also significantly increased. This indicates how much burden road traffic crashes impose on the lives of people by claiming the lives and most productive years of human lives.

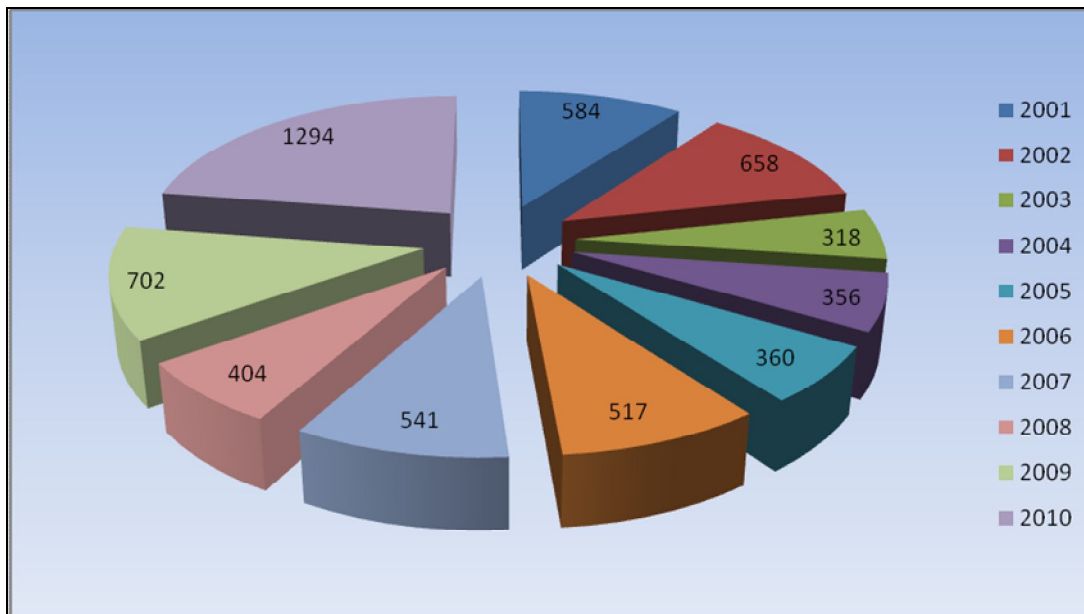


Fig 4: Pie Chart on Yearly Total Number of Vehicles Involve in Road Crashes during the Day

It can be seen from Figure 4 that the year with the predominant number of vehicles involve in road crashes was the most recent year (2010) with 1,294 vehicles followed by 2002 with 658 vehicles involved respectively.

Year	Fatal	Serious	Total Injury Crashes	No. of Persons Killed	No. of Persons Injured	Mc	Hgv	Bus	Car	Others	Total Vehicles
2001	77	201	278	161	956	134	106	95	249	2	586
2002	90	202	292	176	1110	113	89	110	435	9	756
2003	66	79	145	220	682	82	58	69	187	9	405
2004	79	76	155	160	639	83	47	77	145	0	352
2005	26	109	135	59	389	79	8	40	137	38	302
2006	103	177	280	453	1317	126	91	129	228	0	574
2007	55	116	171	137	544	38	70	65	200	7	380
2008	58	145	203	111	755	72	49	65	161	19	366
2009	112	324	436	216	1371	71	76	57	524	19	747
2010	126	480	606	272	1855	115	175	165	969	15	1439
TOTAL	792	1909	2701	1965	9618	913	769	872	3235	118	5907

Table 2: Yearly Night-Time Distribution of Road Crashes in Abuja (2001-2010)

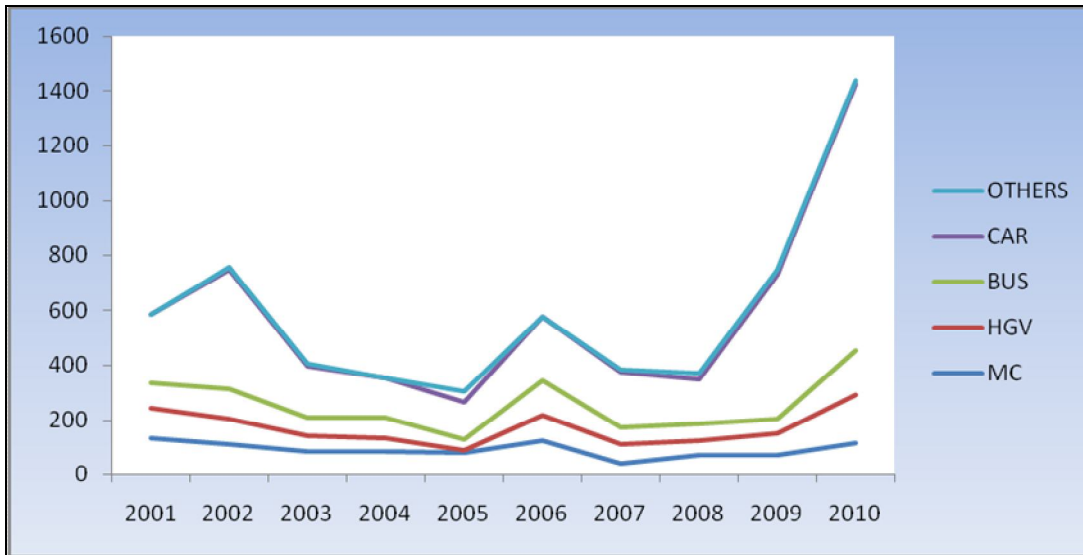


Figure. 5: Trend of Vehicle Types involved in Night Crashes from 2001 to 2010

The distribution of road crashes by vehicle type is shown in the figure 5 above. The Cars and other vehicle types were responsible for the highest number of vehicles involve. It can also be seen that in recent year (2008-2010), cars and other vehicle types also significantly increased.

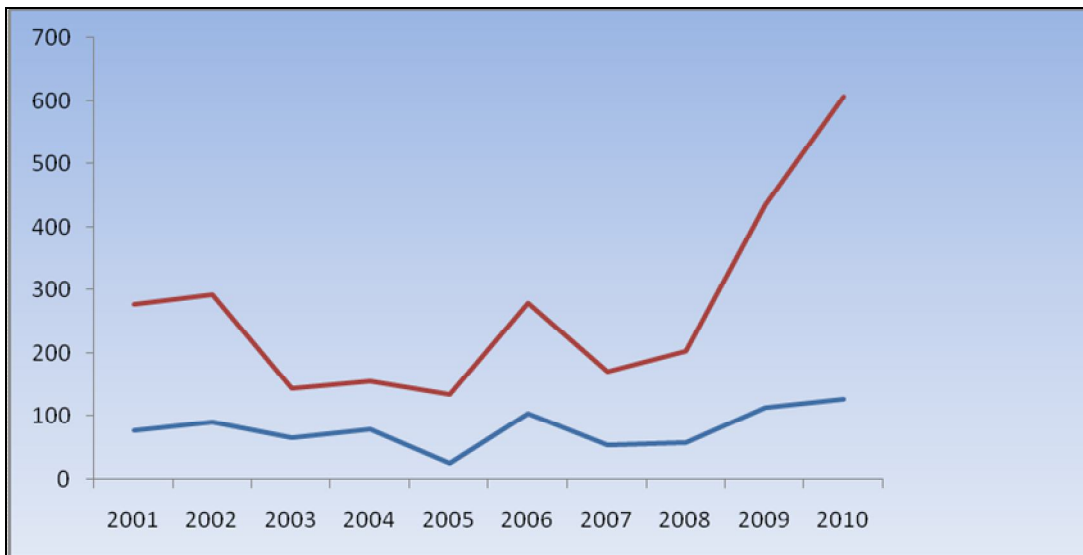


Figure. 6: Trend of Crash Types involved in Night Crashes from 2001 to 2010

The distribution of road crashes by type (fatal and serious cases) is shown in the figure 6 above. The number of fatal accident cases was higher. It can be seen that in recent year (2008-2010), the number of fatal cases also significantly increased.

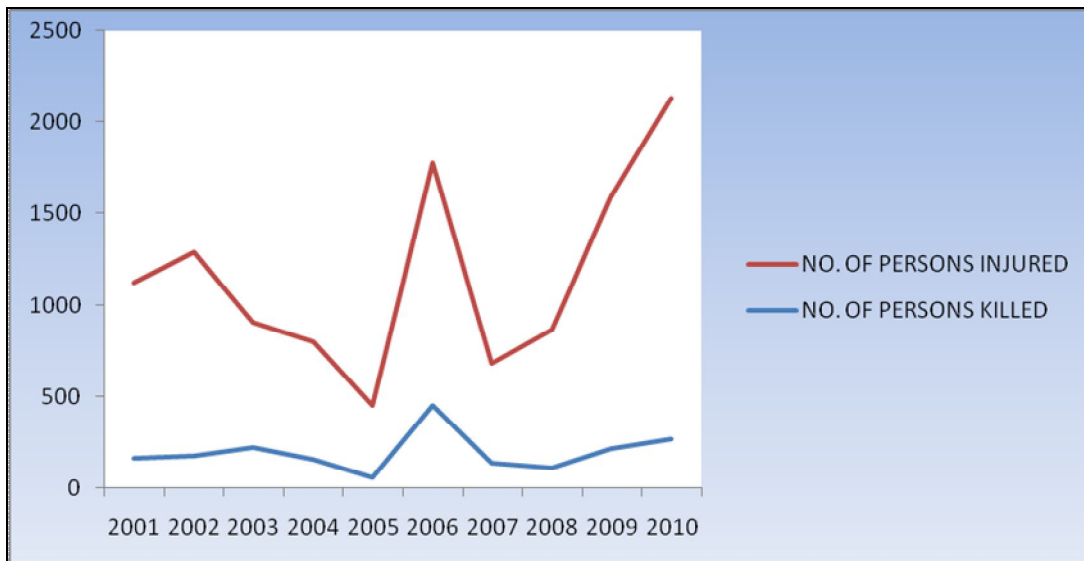


Figure. 7: Trend of Casualty Types involve in Night Crashes from 2001 to 2010

The distribution of road crashes by type of casualties (killed and injured persons) is shown in the figure 7 above. The number of persons killed was higher than persons injured. It can be seen that in recent year (2008-2010), the number of persons killed also significantly increased. This indicates how much burden road traffic crashes impose on the lives of people by claiming the lives and most productive years of human lives.

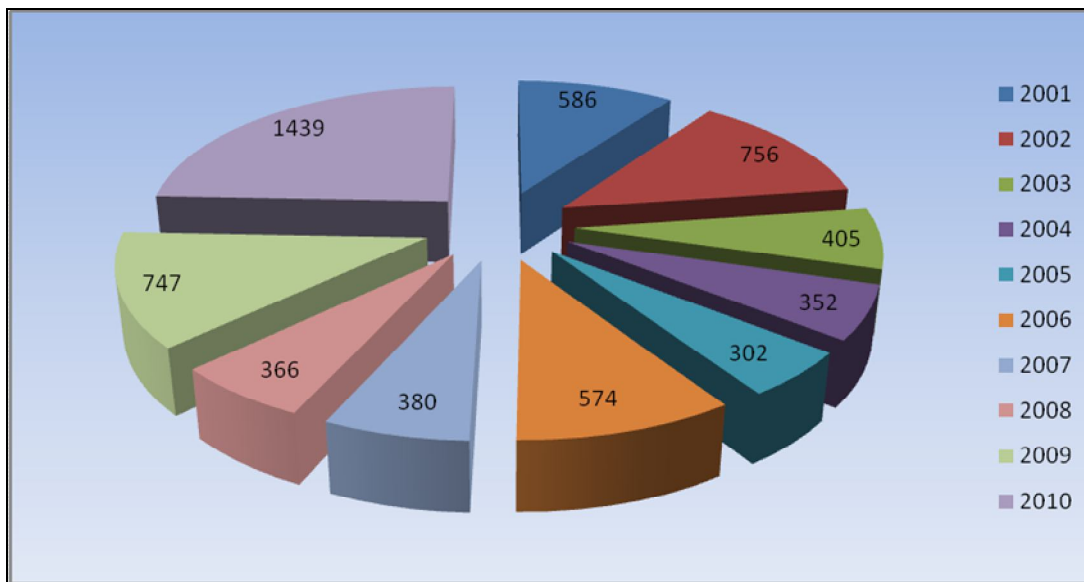


Figure. 8: Pie Chart on Yearly Total Number of Vehicles Involve in Road Crashes at Night

It can be seen from Figure 8 that the year with the predominant number of vehicles involve in road crashes was the most recent year (2010) with 1,438 vehicles followed by 2002 with 756 vehicles involved respectively.

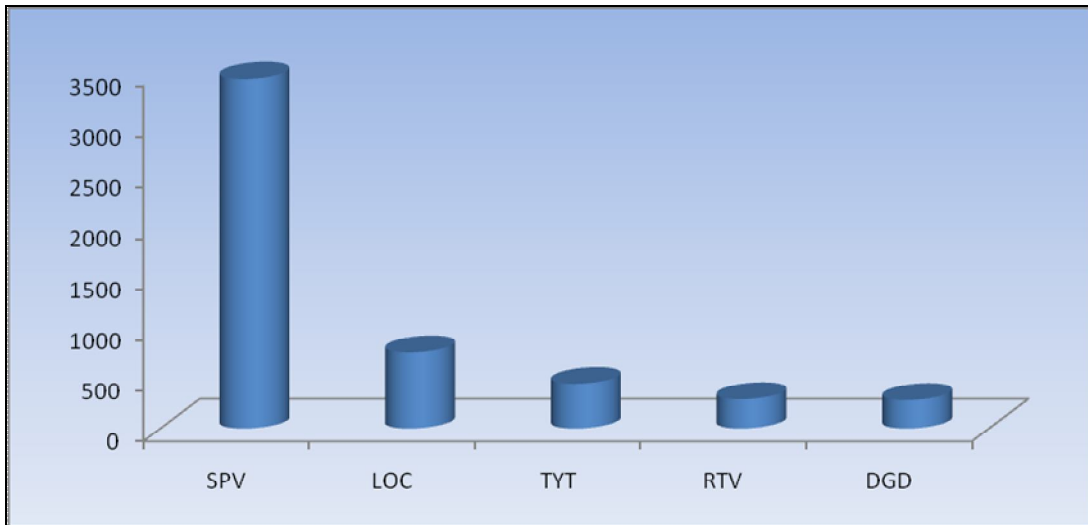


Figure. 9: Bar Chart on Probable Causes of Road Crashes

It can be seen from Figure 9 that the predominant causes of road traffic crashes was Speed Limit Violation (SPV) with about 3,500 cases followed by Loss of Control (LOC) with about 1,000 cases.

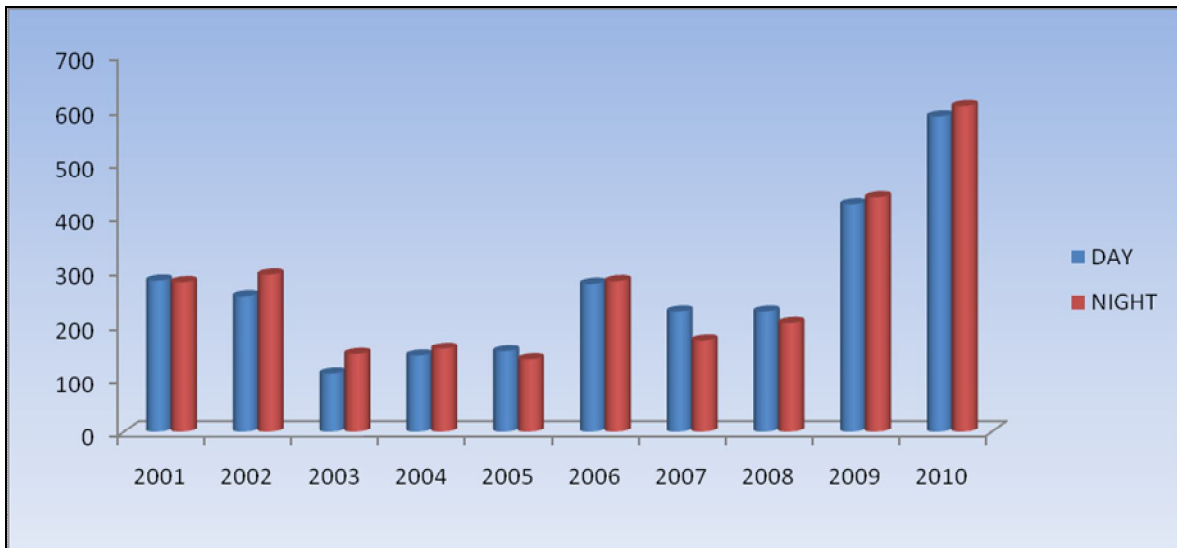


Figure. 10: Number of crashes recorded at Night and Day Road Traffic Crashes from year 2001 to 2010

From figure 10, the time of occurrence (Day or Night), it was evident in most years including the recent years that Night Crashes has the highest frequencies.

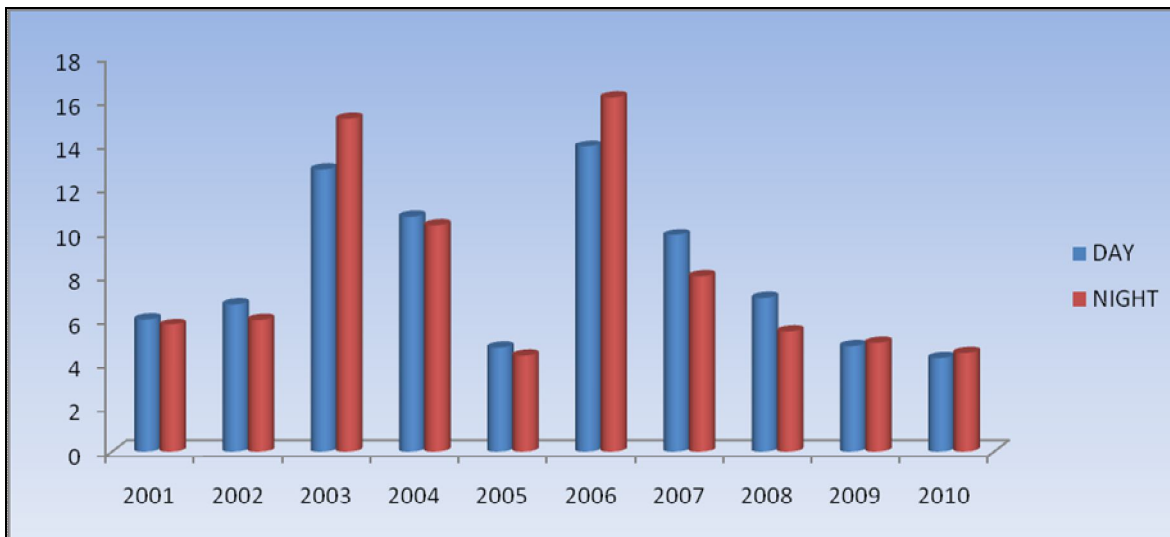


Figure. 11: Number of persons killed in every 10 crashes recorded at Night and Day Road Traffic Crashes from year 2001 to 2010

From figure 11, it was evident that the number of persons killed in every 10 crashes both during the day and night is decreasing from year 2006 to the most recent year (2010)

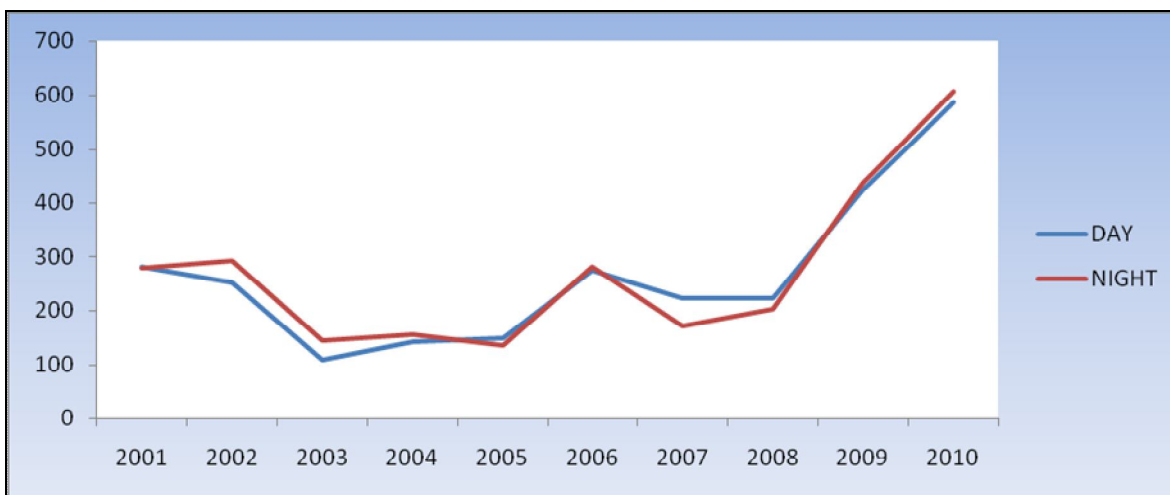


Figure. 12: Trend of crashes recorded at Night and Day Road Traffic Crashes from year 2001 to 2010

It can also be seen from figure 12 that the trend shows that the number of road crashes both during the day and night is increasing from 2007 to 2010 which was the most recent year.

4. Discussion

A total number of 5369 Road Traffic Crashes were recorded between 2001 and 2010 in FCT, Abuja. The Total number of Road Traffic Crashes (RTC) that occurred in the day was 2,668 representing 49.7% and 2701 in the night representing 50.3%. The record revealed that most of the RTC occurred in the suburb of Abuja which may be due to large population of people that live there while their businesses and workplaces are domain in Abuja Central Area. Hence, most of the RTC cases occurred in the routes that lead to Abuja Municipal. Also, RTCs in the night were higher than the day because most workers travel both early in the morning and late in the night in order to avoid traffic jam. Out of the total number, 1916 were killed in the day time representing 49% and 1965 in the night representing 51%. The analysis of accident causes in this study indicates that Speed violation and lack of Control by careless driving are the predominant accident causes. This result indicates that Road Traffic Laws enforcement is insufficient to ensure compliance with traffic rules and abidance of the traffic signal regulations.

5. Conclusion

In conclusion, it is important to understand the driver characteristics, vehicle types, type of crashes (Fatal or Serious and Killed or Injured) and time of the crashes are other factors need to be considered to reduce the recurrent rate of road crashes on the highways. From the perspective of these characteristics, improvement of configuration conditions may contribute to reducing road crashes, driving time and improving visibility of traffic control workers and devices. This may reduce the number of road crashes on our highways.

6. Recommendation

An enlightenment or workshop program/campaign to emphasize the risks of highway traffic violation is strongly suggested for all age group of drivers and road users. Majority of the fatal and injurious accidents involved a pedestrian, indicating the need for protecting pedestrians in such busy roads. Majority of pedestrian accidents occur at suburban areas rather than at urban areas. This indicates the need for improving the pedestrian crossing facilities on such areas. It is also recommended that a separate signal phase should be provided (all red for pedestrian) with high visibility zebra crossing and diagonal crossing pavement marking.

7. References

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