ANALYSIS OF ROAD CRASHES AND ASSOCIATED BURDEN IN ONDO STATE, NIGERIA

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ABSTRACT

This study analysed the pattern of road traffic crashes in Ondo State between 2005 and 2014. It also examined the causal factors of road crashes and associated socio-economic burden in the study area. The study employed data from secondary and primary sources. The secondary data on road traffic crashes for 2005-2014 were collected from Federal Road Safety Commission (FRSC), Ondo State. Multistage sampling procedure was used to select four cities and samples for the administration of two sets of questionnaires (drivers/riders and crash victims). A sample size of 5% of registered drivers/riders and 50% accident victims on admission in hospitals were selected in the four cities for questionnaire administration. The data collected were analysed using descriptive statistics. The results indicated that road crashes increased by 455% between 2005 and 2014, serious and fatal crashes increased by 600% each during the same period. The results also showed that leading causes of road crashes in the study area were due to human error (dangerous driving, overtaking and violation of speed limit), mechanical failure and environmental influence. The results further showed that socio-economic burden of crashes in the area results into waste of working hours in the hospital, and medical costs on both crash victims and relatives. About 37% and 32.8% of the crash victims spent ten and five days respectively in the hospitals and average medical cost per victim in government owned hospital was at most twenty thousand naira (₦20,000). The study concluded that road crashes caused loss of life, loss of time and money on treatment for the affected people in the area.The study also offers possible strategies towards the reduction of road crashes and management of the crash related socio-economic burden in the state and elsewhere in Nigeria.

Key words: Burden, Crashes, Nigeria, Ondo, Road

INTRODUCTION

The role of road transport in the movement of goods and services in space all over the globe is of unique economic and social importance (Gbadamosi, 2015).This is particularly true in Nigeria, where road transportation accounts for over 75% of the movement of goods and services across the country (Olagunju, 2016). However, reliance on road transportation has caused loss of lives and socio-economic problems to Nigerians and the country as a whole. According to Ipingbemi (2008), the deaths and injuries that occur through road traffic crashes in Nigeria are worrisome and beside the magnitude of the problem and other indices (fatality rate and severity

index) point to a decreasing safety on Nigerian roads. In terms of effects of road traffic crashes, Atubi and Gbadamosi (2015) observed that road traffic accidents have physical, social, emotional and economic implications. For instance, Nigeria loses about 80 billion naira annually to road crashes, and of all subjects that are involved in road traffic crashes in Nigeria, 29.1 percent suffer disability and13.5 percent are unable to return to work (Labinjo et al., 2009, Atubi, 2012a).

Over the years, a considerable number of studies have examined different aspects of road traffic crashes and road safety. The focus of studies on road traffic crashes in the country include issues such as spatio-temporal analysis of road traffic crashes (Jegede, 1988; Asogwa,1992; Filani and Gbadamosi, 2007); variability in road traffic crashes (Atubi and Onokala, 2009; Atubi, 2012b; 2010); determinants of road traffic crashes (Osayomi, 2013); safety issues and socio economic cost of road traffic crashes (Ipingbemi, 2008, 2012; Juillard, *et al*, 2010; Adaramo, 2012a; Oladepo, 2016) and epidemiology and risk factor of road traffic crashes (Oyemade, 1973; Labinjo et al., 2009).Other studies concentrated on aspect of crashes such as: road traffic Injuries and labour productivity (Adaramo,2012b); traffic regulations and road traffic crashes (Gbadamosi, 2002). Of important note is that most of these studies singled out the important of human errors as the leading causes of road traffic crashes in the country (Onakomaiya, 1981; Jegede, 1988; Oyeyemi, 2002; Akanbi et al., 2009).

Missing from these studies is a detailed study on the road traffic crashes based on the analysis of data sourced from combined secondary and primary data sources. The paucity of knowledge on the combined views on causes of road traffic crashes and the increasing trend in fatality and injuries associated with road traffic crashes provides a foundation for this study. The need for this study is also due to huge cost of caring for victims of road crashes and the growing interest in understanding socio-economic burden of road traffic crashes in Nigeria.

The objectives of the study are to explore the magnitude of road traffic crashes between 2005 and 2014, examine gender dimension of road traffic crashes and assess socio-economic implications of road crashes on crash victims in Ondo State, Nigeria.

THE STUDY AREA

Ondo State, the study area is located in the South-West part of Nigeria. The State lies between Latitudes 5^0 45' and 7^0 52'N and Longitudes 4^0 20' and 6^0 05'E (Figure 1). The State covers approximately 15,195 square kilometres of landmass and it is bounded in the east by Edo and Delta States, in the west by Ogun and Osun States, in the north by Ekiti and Kogi States and to the south by the Bight of Benin and the Atlantic Ocean. The population of the study area in 2006 was 3,460,877(NPC, 2006) and 4,362,599 in 2016 based on U.S. Census Bureau population estimates (USCB, 2017)

The State has a system of road networks linking cities, towns and villages together. All the inter-urban roads are tarred, few of the inter-rural roads are untarred and generally not motorable during the raining season of April to October. The State is divided into six commands by the State branch of the Federal Road Safety Commission (FRSC): RS11.2-Ondo State command;

RS11.21- Ore unit command; RS11.22- Owo unit command; RS11.23- Ikare unit command; RS11.24 -Ondo town unit command; and RS11.25- Ifon unit command.

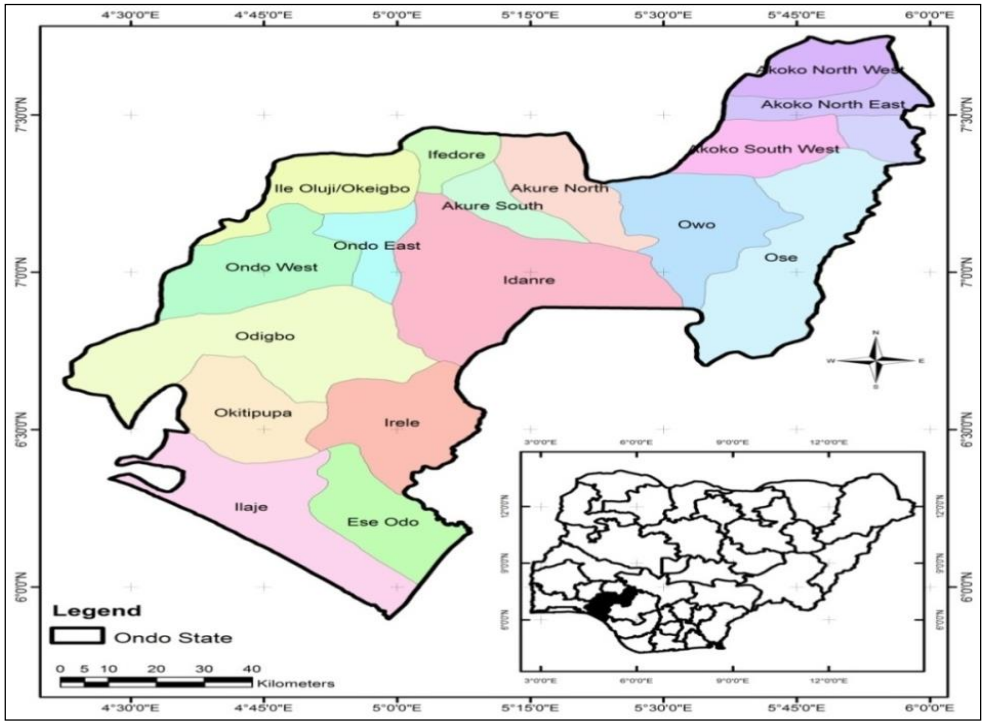

Figure 1. Ondo State
Source: Olawole, 2016

MATERIALS AND METHODS

This study made use of data collected from both primary and secondary sources. Primary data were collected through questionnaire survey conducted in months of May and June, 2015. Two sets of questionnaires were used for this study. The first set was administered on public transport service providers consisting of commercial bus drivers, truck drivers and motorcyclist. The second questionnaire was used to collect information from victims of road traffic crashes on admission in four Federal and State owned hospitals in the state. The two set of questionnaire were designed to elicit information on the socio-economic characteristics of the drivers and crash victims; number and types of crashes; injury sustained; collision manner as well as hospital expenses among others. Questions to which responses were sought were derived from issues raised in the literature on causes and socio-economic effects of road traffic crashes (Ipingbemi 2008; Labinjo et al., 2009; Juillard *et al*., 2010).

Primary data were collected through a multi stage sampling procedure. The first stage involved the selection of cities in the state on the criteria that such city must be among the major cities in the state and must also have a functioning Federal or State specialist hospital. Four cities, Akure, Ondo, Owo, and Ore satisfied this condition and were selected for the study. The second stage involved the selection of motor /motorcyclist parks in the four cities for the administration of drivers/riders questionnaire. The main intercity motor park and adjoining Motorcyclist Park in each of the four cities were selected for the survey. The third stage involved the selection of 5%

of registered drivers and motorcyclists using purposive sampling technique, for the administration of questionnaires. Sampled drivers and riders were selected with the help of the officials of their association in each of the park. At the end of the selection exercises, two hundred and seventy drivers/riders were surveyed (Table 1).

Table 1: Sample Transport Service Providers

Category of Service Providers	Cities				Total
	Akure	Ondo	Ore	Owo	
Motorcyclist	19	15	13	12	59
Commercial Bus/ Car	30	44	26	27	127
Tanker/ Tuck	4	2	12	3	21
Total	53	61	51	42	207

Source: Authors' Field Survey 2015

The last stage involved the selection of road traffic crash victims on admission at the selected hospitals for the administration of the second questionnaire. Ethical issues concerning the victims were discussed with the hospitals management prior to the interview. A total of 67 victims were purposively selected for the survey. The hospitals and number of sampled victims are as shown in Table 2.

Table 2: Sampled Road Traffic Crash Victims

City	Name of Health Facility	Sampled Victims
Akure	Ondo State Specialist Hospital, Akure	14
Ondo	Ondo State trauma and Surgical centre, Ondo	18
Ore	Ondo State Specialist Hospital, Ore	16
Owo	Federal Medical Centre , Owo	19
Total		67

Source: Authors' Field Survey 2015

Secondary data used in this study consist of road crash data from January 2005 to December 2014. The data was obtained from the Federal Road Safety Commission (FRSC), Ondo State Sector Command. The attributes of the data include: the total number of crashes recorded, total vehicles involved, number of persons involved, total killed, total persons injured, total casualties, common causes of road traffic crashes .

Data collected were subjected to descriptive statistics, which generated percentages and frequencies of drivers and victims' characteristics, causes of crashes, nature of road crashes and burden associated with road crashes

RESULTS AND DISCUSSION

Socio-economic Characteristics of Drivers/riders and Victims

The socio-economic characteristics of drivers/riders and victims of road crashes are presented in Table 3.

Table 3 Socio-economic Characteristics of Sample Population (Drivers and Victims)

Characteristics	Cases	Drivers (n=207)	Victims (n=67)
Sex	Male	100	67.16
	Female	0.00	32.84
Age Structure	0 – 20 Years	9.18	10.45
	21 – 40 Years	57.00	61.19
	41 – 60 Years	32.85	28.36
	60 Years and Above	0.97	0.00
Marital Status	Single	22.71	32.84
	Married	72.46	58.21
	Divorced	4.83	8.96
Level of Education	No formal Education	4.83	2.99
	Primary Education	19.32	13.43
	Secondary Education	60.39	49.25
	Tertiary Education	15.46	34.33
Nature of Employment	Driving	51.69	0.00
	Government Employee	8.70	13.43
	Private Sector Employee	5.80	16.42
	Farmer	8.21	8.96
	Self Employed	15.46	40.30
	Irregular Employment	3.86	20.90
	Unemployed	6.28	0.00
Income	₦20,000 and Below	4.83	19.40
	₦20,001 – ₦30,000	33.33	19.40
	₦30,001 – ₦40,000	41.06	40.30
	₦40,001 – ₦50,000	11.11	20.90
	Above ₦50,000	9.66	0.00

Source: Authors' Field Survey, 2015

All the drivers/motorcyclist and most victims (67.2%) interviewed were male. Majority of the drivers and victims were either in the age range of 21 to 40 years and 41 to 60 years. Majority of the respondents were married: drivers (72.46%) versus victims (58.2%). Most of the samples had secondary education: drivers (60.4%) and victims (49.3%). About 34.3% of victims attended tertiary institutions.

Pattern and Magnitude of Road Crashes in Ondo State

The study period cover a decade (2005 to 2014). Table 4 shows the pattern of road crash in Ondo State (2005 – 2014) while Figure 2 shows the percentage distribution of road traffic crashes by year. A total of 2,415 road traffic crashes was recorded during the study period (Table 4). The data shows that majority of road crashes occurred in 2011 (14.04%, n = 399), followed by 2012 (13.94%, n = 337), 2013 (12.96%, n = 313), 2010 (12.13%, n=293) and 2014 (11.97%, n=289). Hence, the five years account for about two-thirds (65.05%, n = 1,571) of all road crashes reported. The period between 2005 and 2009 accounts for 34.94%, (n = 844) of reported road crashes (Figure 2).The results indicate that road crashes increased by 455% between 2005 (n = 52) and 2014 (n = 289).

The increasing magnitude of road traffic crashes in the state and elsewhere in the country has been attributed to high dependence on road transportation in the country, population explosion and increase level of motorization. Over reliance on road system has also been recognised as major causes of crashes. This effect has been made worse by deteriorating condition of the national highways (Atubi and Gbadamosi, 2015; Gbadamosi, 2015).

Table 4: Pattern of Road Crash in Ondo State: 2005 - 2014

Year	Crashes							
	Minor		Serious		Fatal		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
2005	12	3.6	25	1.91	15	1.94	52	2.15
2006	11	3.3	39	2.98	17	2.2	67	2.77
2007	52	15.62	109	8.33	76	9.82	237	9.81
2008	63	18.92	122	9.33	63	8.14	248	10.27
2009	43	12.91	128	9.79	69	8.91	240	9.94
2010	52	15.62	167	12.77	74	9.56	293	12.13
2011	40	12.01	181	13.84	118	15.25	339	14.04
2012	28	8.41	182	13.91	127	16.41	337	13.95
2013	18	5.41	182	13.91	113	14.6	313	12.96
2014	14	4.2	173	13.23	102	13.18	289	11.97
Total	333	100	1308	100	774	100	2415	100
Percent	13.79		54.16		32.05		100	

Source: Authors' computation based on crash data collected from Ondo State Federal Road Safety Command

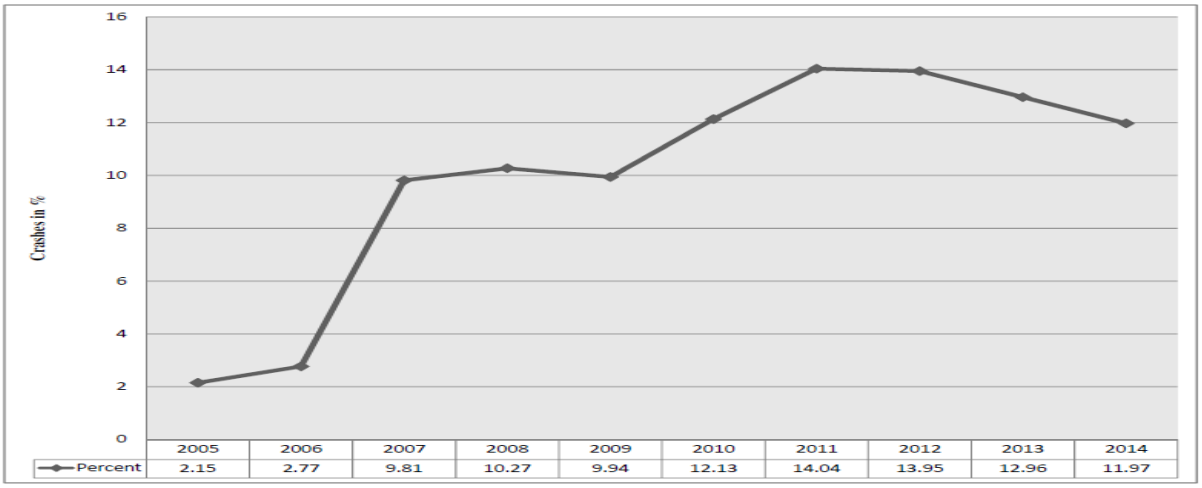

Figure 2. Distribution of road traffic crashes in Ondo State (2005-2014)
Source: Based on crash data collected from Ondo State Federal Road Safety Command

In terms of classification of road crashes cases, 54.16% (n=1308) of the total road traffic crashes recorded were serious, 32.05% (n=774) were classified as fatal crashes and 13.79% (n=333) were minor crashes (see Table 4). Similarly, Table 4 shows yearly variations in the three categories of crashes. Surprisingly, the years with the highest road crashes records also account for the highest records of serious and fatal crashes. Between 2005 and 2014, serious and fatal crashes increased.

Gender Aspects of Road Traffic Crash

The distribution, by gender, of the crash victims based of the analyses of FRSC and the survey data, showed that more males are involved in road traffic crashes. For instance, male (69.25%) were involved in road crashes, and also accounted for 65.21% of the injured and 80.7% of those reported killed (Figures 3 and 4). This is in line with the findings of several studies (Dejoy, 1992; Baker and Clark, 2001; Afukaar 2003; Wang et al., 2003; Ipingbemi, 2008; Adeolu et al., 2013; McGreevy et al., 2014).

The high representation of males is expected because most of them are heads of households or breadwinners who must provide for themselves and their families. In the process of engaging in economic activities male are exposed to transport and associated hazard than female. Possible reason for the high exposure of men to RTC according to Ipingbemi (2008) and McGreevy, et al. (2014) is due to the fact that men have greater mobility and an increased likelihood to work outside the home and are very active and more daring. They are thus more exposed and prone to road traffic crashes and injuries when compared to female (Adeolu et al., 2013).

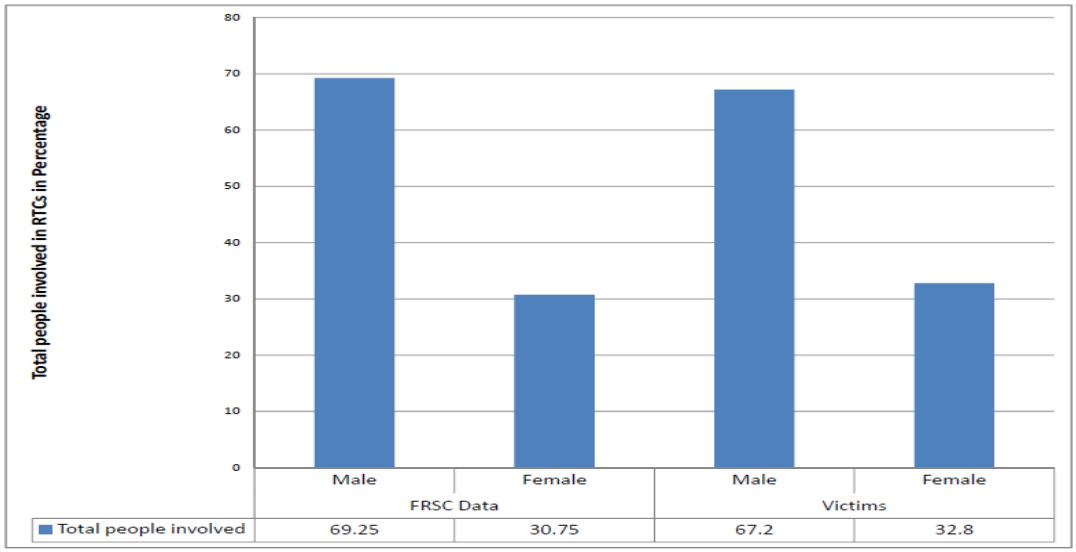

Figure 3. Sex structure of the crash victims
Authors' Field Survey, 2015

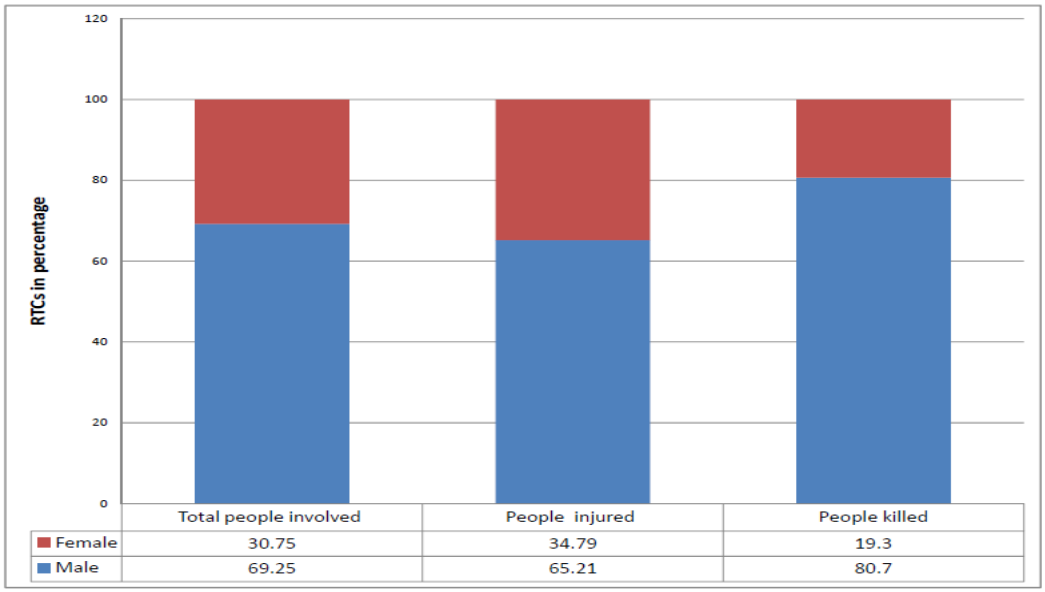

Figure 4. Sex structure of the crash victims
Source: Authors' computation based on crash data collected from Ondo State Federal Road Safety Command

Causes of Crashes

Causes of road crashes from point of view of drivers, victims and FRSC records is shown in Table 5. Human induced causes, consisting of thirteen factors, accounted for a total of 81.91% (FRSC data) and also accounted for 56.28%and 54.57% of crashes involved by sampled victims and drivers respectively. Of the thirteen human induced factors, dangerous driving, speed violation and dangerous overtaking are frequent causes of human related crashes (Table 5). Findings from studies in different developing countries also show that human factors accounted for significant proportion of road crashes (Wang et al., 2003; Ipingbemi, 2008).

The second highest causes of crashes as shown in Table 3 are associated with vehicles' mechanical faults such as brake failure, mechanically deficient vehicle, tyre violation and loss of control. Analysis of FRSC data shows that mechanical faults accounted for 14.33% of crashes. It also accounted for 19.91%and 22.11% of crashes involved by sampled victims and drivers respectively. Brake failure and loss of control are the highest mechanical causes of crashes (Table 5).

Environmental factors such as rainfall, poor visibility, temperature and slippery road collectively accounted for 2.39% (FRSC data), 17.39% and 16.08% of crashes experienced by the victims and sampled drivers respectively. The finding on impact of elements of weather on road crashes, though not pronounced, is supported by similar findings of Enete and Igu (2011) and Olawole (2016). Enete and Igu (2011) established that 29.8% of road crashes in Enugu occurred during wet months of 2009, with the highest wet crash occurring in the month of June. Bad road accounted for 1.37% (FRSC data), 8.11% (victims) and 5.53% (drivers) of crashes reported by the FRSC and experienced by victims and drivers respectively.

Socio-Economic Burden of Road Traffic Crashes in Ondo State

Road crashes do constitute costs to individual and the nation. The costs have many dimensions such as economic and social cost. Apart from disability, loss of employment, sorrow, grief and pain caused by road traffic crashes, victims also suffer socio-economic consequences of road crashes. Some of socio-economic burden associated with road crashes of sampled victims are discussed in this section, in terms of time spent in the hospital, cost of medical treatment, time spent by relation looking after the victims. Tables 6 and 7 show distributions and descriptive statistics of the variables considered.

Table 5. Causes of Crashes

SN	Classification	Causes of Crashes	FRSC Data (n=553)[1]	Drivers (n=207)[2]	Victims (n=67) [2]
1	Environment	Obstruction	2.05	5.46	5.03
2		Heavy rainfall	0	1.47	2.01
3		Poor visibility/weather	0.34	8.7	4.02
4		High temperature	0	0.29	2.01
5		Slippery flooded road surface	0	1.47	3.02
		Sub Total	**2.39**	**17.39**	**16.08**
6	Human	Dangerous Driving	14.33	19.47	16.08
7		Speed Violation	42.32	3.69	10.05
8		Dangerous Overtaking	4.78	8.11	9.05
9		Overloading Violation	0.34	3.1	3.52
10		Wrong Overtaking	1.02	5.01	5.03
11		Route Violation	3.75	1.33	1.01
12		Speed limit Violation	10.58	4.13	4.52
13		Drunkenness	1.71	9.00	4.02
14		Dangerous pedestrian crossing	0.00	0.44	2.01
15		Use of phone while driving	0.68	0.00	0.00
16		Sleeping on Steering	2.05	0.00	0.00
17		Fatigue	0.34	0.00	0.00
18		Animal crossing	0.00	0.29	1.01
		Sub Total	**81.91**	**54.57**	**56.28**
19	Mechanical	Brake failure	7.51	5.9	6.53
20		Tyre Violation	4.10	1.18	2.01
21		Loss of Control	0.34	9.88	10.55
22		Mechanically deficient vehicle	2.39	2.95	3.02
		Sub Total	**14.33**	**19.91**	**22.11**
23	Infrastructure	**Bad Road**	**1.37**	**8.11**	**5.53**
	Total		100.00	100.00	100.00

Sources: [1] Authors' computation based on 2014 crash data collected from Ondo State Federal Road Safety Command

[2] Authors' Field Survey 2015

Table 6. Time and Cost Implication of Road Traffic Crash

Variable	Case	Frequency	Percent
Length of stay in hospitals	10 Days and Below	25	37.31
	11 to 20 Days	24	35.82
	21 to 30 Days	3	4.48
	31 to 60 Days	9	13.43
	Above 60 Days	6	8.96
Length of stay of helpers in hospitals	5 Days and Below	22	32.84
	6 to 10 Days	12	17.91
	11 to 15 Days	30	44.78
	16 to 20 Days	3	4.48
Medical treatment cost	₦20,000 and Below	23	34.33
	₦20,001 to ₦40,000	17	25.37
	₦40,001 to ₦80,000	14	20.90
	Above ₦80,000	13	19.40
Cost of drugs (if not provided by hospitals)	₦10,000 and Below	9	13.43
	₦10,001 to ₦20,000	9	13.43
	₦20,001 to ₦30,000	4	5.97
	₦30,001 to ₦40,000	45	67.16

Source: Authors' Field Survey 2015

Table 7. Average Time and Cost Implication of Road Traffic Crash

Descriptive Statistics (N=67)	Min.	Max.	Mean	Std. D.
Length of victims stay in hospitals	1	80	20.06	19.76
Cost of medical treatment at hospitals	₦5000	₦120,000	₦44,720.90	₦38,563.93
Cost of drugs, where applicable	₦5000	₦35,000	₦27,940.30	₦10,991.22
Length of stay of helper in hospitals	0	17	9.37	5.27

Source: Authors' Field Survey 2015

The mean number of days spent by the victims in hospitals as at the time of survey was 20.06 (SD = 19.76). According to Ipingbemi (2008), the length of stay of victims in hospitals depends on the seriousness of the injury as well as hospital expenses. Table 6 shows that proportion of victim's decreases with increase in the numbers of days spent. As at the time of survey 37.31% of victims interviewed at the hospitals had spent 10 days, 35.82% had spent between 11 to 20 days, 4.48% spent between 21 to 30 days. Those that spent between 30 to 60 days are 13.43% and 8.96% had spent more than two months in the hospitals (Table 6). The finding of this study on average length of stay in hospitals is similar to the observation in
the studies conducted by Juillard et al. (2010) and Ipingbemi (2008), where more crash victims spent mostly 2 to 4 weeks in the hospitals. However, the duration of disability is higher in other studies - an average of 27 days is spent in hospital in Trinidad and Tobago (Bernard and Matthews, 2003) and 3 weeks to 1 month in Kenya (Odero et al., 1997).

Akin to the above is the loss of valuable and productive time by friends, relations and spouse of victims who stay at the hospitals during the period of disability to take care of their loved ones in trauma. On the average, such relatives spent 9.37 (SD= 5.27) days at the hospitals (Table 7). Table 6 shows that 32.84% of the victims' relations spent less than 5 days, 1.91% (6 to 10 days) days, 44.78% (11 to 15 days) and 4.48% had spent 16 to 20 days attending to other needs of their relations on admission.

In Ondo State and elsewhere in Nigeria, hospital fees and supplies are paid for out-of-pocket by patients and their relations. Where prescribed drug are not available in the hospital pharmacy, such drugs are purchased outside the hospitals by relatives. Table 7 shows that the average cost of treatment at the sampled hospitals is ₦44,720.90 (SD=38, 563.93).

Similarly, the distribution of treatment cost is presented in Table 6. About 34.33% of victims spent up to ₦20,000 on medical bills, 25.37% of victims spent between ₦20,001 and ₦40,000, 20.90% spent between ₦40,001 and ₦80,000 on medical bills, while 19.40% of the sample crash victims had spent above ₦80,000 on medical bills. Based on the above medical cost of treating road crashes victims, families face economic crisis when the primary economic earner is injured and hospitalized, leaving the family in a position where there is need for them to source for money by all means in order to settle every necessary medical bill. In addition, in a country where minimum income is less that ₦20, 000, paying above ₦20,000 for medical treatment becomes difficult for majority of the people. The situation is complicated in cases where the main earner is the victim of road traffic crash. This agrees with similar study in Bangladesh (Mashreky et al., 2010)

In terms of unavailability of prescribed drug at the hospitals, trauma victims, through their relatives buy such drugs outside the hospitals. The average amount expended on drugs by sampled road traffic crash victims amounts to ₦27,940.30 (SD=10,991.22). Majority (67.16%) of the victims spend between ₦30,001 and ₦40,000 on such drugs purchased outside the hospitals (Table 6)

CONCLUSION

This study examined the magnitude of road traffic crashes and its gender dimension in Ondo State, Nigeria. The study also assessed socio-economic impacts of road crashes on crash victims. An important finding of this study is that road traffic crashes continue to be on the increase coupled with increasing socio-economic consequences on crash victims and their relatives in the Ondo State.

Based on the findings of this study, it is recommended that training and education of young drivers need to be intensified as most of the drivers are youths. Training on safety issues should be made compulsory for all drivers and also made as part of the requirements for the award and renewal of drivers' license in the State. In addition, motorcyclists' safety can be ensured by creating dedicated lanes for them, such lanes are to be delineated from the existing road network in major cities and townships. Also, the use of helmets must be encouraged among motorcycles operators and their passengers.

Financial and human resources should be allocated to road safety organizations in the country for adequate and nationwide enforcement of existing crash reduction strategies and road safety rules. In particular, the Federal Road Safety Commission should be equipped sufficiently to embark on regular tests such as eyes and breathe tests for drivers to detect drivers that drive under the influence of alcohol/drugs. Necessary modern equipment such as breathalyzer, video and speed camera should be made available to the Commission. Finally, Regular surveillance and enforcement of law against the use of expired tyres by motorists in the country should be adopted by the FRSC. This is important because drivers prefer to buy used imported second hand tyres known as "Tokunbo" instead of new and expensive ones (Ipingbemi, 2008).

These suggestions, if implemented will help to improve existing programmes designed for reduction of road traffic crashes and associated fatalities in Ondo State and other states in Nigeria.

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