ANALYSIS OF REPORTED CASES OF ROAD TRAFFIC ACCIDENTS IN UMUAHIA METROPOLIS

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Abstract

The occurrence of road accidents in Abia State has been of a great concern to the citizens and as a result this research work has examined the Analysis of road traffic accidents' data in Umuahia Metropolis for the period 2010 – 2013 with data collected from the State Traffic Office, Central Police Station, Umuahia. The research identified some of the problems of road accident which includes; the factors that cause the prevailing rate of road accident, the vehicle types involved in such accidents, the days in the week and the year that recorded the highest number of road accidents and inter-dependence of the nature of casualties caused by road accidents and the vehicle type involved. Analyzing and describing the data using descriptive statistics, the Friedman test, the Kruskal Wallis H test and the Chi-square test for goodness of fit and independence, it was discovered that majority of the road accidents are caused by human factors like over speeding, recklessness, drinking and driving, drug abuse, arrogance and illiteracy. Number of reported cases of road accident is not uniformly distributed across the years and vehicle types, and the casualties in road accident are dependent on the vehicle type involved.

Keywords: *Road traffic accidents, Friedman test, Kruskal Wallis test, Chi-square test for goodness of fit and independence, Casualties*

1. Introduction

Over the years, Africans and indeed Nigerians have been deceived to believe or accept that road traffic accident is an integral part of human fate. This belief tends to inspire a considerable indifference to the road traffic accident syndrome, because deaths and injury resulting from road traffic accidents were accepted as part of human destiny.

Back in the 1970s, during the trial of the oil boom, which as a matter of fact reshaped wealth distribution and tests in our society, were many devastating and long lasting side effects among such was the influx or coming in of motor vehicles into a country where only a few number of good road existed.

There is no doubt that this increase in the number of vehicles changed the nations driving style. A large percentage of Nigerian motorists took up the driving business as if they had a set or number of people to kill before sunset; the rate at which accidents happen on our roads has almost turned them into slaughter slabs making road traffic accidents in Nigeria number two life taker after diseases.

No wonder the bank data revealed publication that the ratio of road traffic accidents especially the totality rate in Nigeria was ten times higher than the percentage obtained or recorded in developed countries. The impact of that sudden awareness was translated into the motivation to create a safer road culture in Africa as a whole.

The researchers therefore are much concerned with the problems encountered by citizens with respect to road accidents in Abia State, determining which factors cause higher rates of road traffic accidents, whether road accidents are independent of vehicle types and which vehicle type is mostly involved in road accidents.

Road accidents are defined as unpleasant events in a vehicle that happen unexpectedly and cause injury or damage.

Jorgensen and Kirsten (2011) defined road accident as a result of a chain of events in which something has gone wrong with vehicles on the road, resulting in an undesired outcome. Road traffic accidents according to the Official Statistics of Finland (OFS) (2014) is an event having led to personal injury or damage to property that has taken place in an area intended for public transport or generally used for transport and in which at least one of the involved parties has been a moving vehicle specified in the road traffic Act; such party can also be a tram and in level crossing accidents, a train.

The International Road Assessment Programme (2014) classifies road accidents (collision) into four types namely: head-on collision, single-vehicle collisions, intersection collisions and run-off collisions. (See also Road and Maritime Services (2011)).

Murtala (2014) observed that the causes of road traffic accidents are conventionally classified into Human, Mechanical and Environmental factors. The human factors accounts for up to 90% of accidents, in fact, the mechanical and environmental factors are subsequent to it. Lack of knowledge of road signs and regulations, illiteracy, health problems like poor eye sight, excessive speeding, alcoholism, drug abuse, arrogance, over-confidence are some of the human factors too numerous to mention that cause bad traffic accidents. Mechanical Factors include poor vehicle maintenance, tyre blow outs, poor lights, un-road worthy vehicles, broken down vehicles on the road without adequate warning sign etc. Rainfall, sun

reflection, storm, heavy, wind, pot holes, interred roads are some of the environmental conditions that contribute to road traffic accidents. According to Murtala (2014), Nigerian roads despite the current effort of Road maintenance Agency are still in very bad states especially those leading to rural areas.

The effects or consequences of road accidents are both socially and economically distressing.

According to Ubani (2014), the consequences of road accidents over the years have proved devastating to victims and those affected. It has left a lasting scar on many with bad consequences such as: loss of lives, amputation, regrets, financial deadlock and everlasting pain. (See also Ministry of Road Transport and Highways, Government of India, 2013, Jacqueline *et al*, 2001).

Ajit *et al* (2009) in their research work: 'A statistical Analysis of road traffic Accidents in Dibrugarh city,' noted that the analysis of qualitative data gathered summarizes two principal factors namely: human and environmental, as joint significant contributor to the occurrence of Road Traffic Accidents in Dibrugarh city. Human characteristic (rush and negligence) according to them make the highest contribution (95.38%) to the road traffic accidents in the study area. The environmental factors are related to bad weather and poor road condition. (See also Atubi, 2012, Ohakwe et al, 2011, Eke et al, 2000).

2. Methods of data analysis

For proper analysis of this work, the entire data collected were analyzed using the following:

2.1. The Friedman test

The Friedman test is used to test if the mean effects of the causes of road accidents by different years are equal.

2.2. The Mann – Whitney U – test

The Mann-Whitney U test is used to compare all possible pairs of the causes of road accidents.

2.3. The Chi – square test for goodness of fit

The Chi-square test for goodness of fit is used to test if the number of road accidents is uniformly distributed across the years and among the vehicle types.

2.4. The Kruskal-Wallis H-test

The Kruskal-Wallis H test is used to test if there is a significant difference among the nature of harm caused by road accidents. It is also used to test if the casualties caused by different vehicle types are equal.

2.5. The Chi-square test of independence

The Chi-square test of independence is used to test if the casualties of road accidents are independent of the vehicle type involved.

3. Data presentation and analysis

3.1. Data presentation

Table 1. Yearly Number of Recorded Road Accidents in Umuahia Metropolis (2010 – 2013)

Years	Number of reported cases	Vehicle type				Days of accident							Causes of accident			No. of people	Casualties		
		Heavy duty	Buses	Cars	Motorcycles	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Human	Mechanical	Environmental	Involved	No. killed	No injured	No not injured
2010	53	17	12	17	8	14	7	6	3	8	7	8	45	6	2	123	46	18	59
2011	52	12	14	23	10	11	8	8	6	14	1	4	48	1	3	154	48	46	60
2012	72	12	29	18	14	8	14	13	6	6	10	15	62	5	5	257	80	85	92
2013	68	19	27	25	20	4	8	13	11	10	12	10	60	3	5	363	75	137	151

Source: State Traffic Office, Central Police Station, Umuahia

Figure 1 below shows the number of road accidents in different days for the year 2010 - 2013.

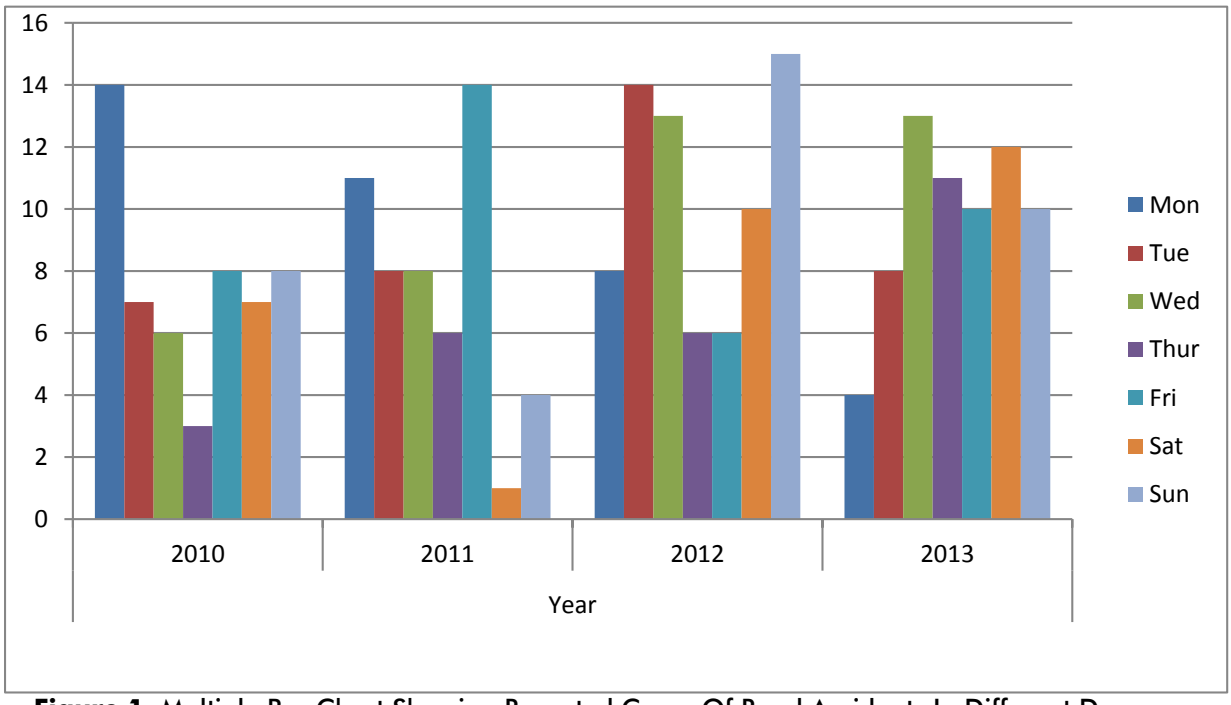

Figure 1. Multiple Bar Chart Showing Reported Cases Of Road Accidents In Different Days For The Year 2010 to 2013

From figure 1and table 1, it can be seen that;

(i) Monday recorded the highest number of reported cases of road accidents of 14 and Thursday has the least number of reported cases of 3 for the year 2010.

(ii) For the year 2011, Friday recorded the highest number of reported cases of 14 while Saturday had the least number of reported cases of 1.

(iii) For the year 2012, it can be seen that Sunday recorded the highest number of reported cases of 15 while Thursday and Friday both have the least number of reported cases of 6 each.

(iv) For the year 2013, Wednesday recorded the highest number of reported cases of 13 road accidents while Monday has the least number of reported cases of 4 accidents.

Generally speaking for the period under study, i.e from 2010 to 2013, Wednesday recorded the highest number of reported cases of 40 road accidents while Thursday had the least number of reported cases of 26 road accidents.

Also, table 1, we can also see that 2012 recorded the highest number of reported cases of 72 road accidents while 2011 recorded the least number of reported cases of 52 road accidents.

3.2. Data analysis

3.2.1. Data analysis using the Friedman test

We test the hypothesis

H_0: The mean effects of the causes of accidents by different years are equal, against

H_1: The mean effects of the causes of accidents by different years are not equal.

source, Sum of the ranks
no r
Environmental 6.5 4
Human 12.0 4
Mechanical 5.5 4
Adjusted for ties
Value: 6.533333
Pvaluechisq: 0.03813333
Alpha : 0.05

Since p (0.03813333) < $\alpha(0.05), we\ reject\ H_0$ and therefore conclude that the mean effect of the causes of road accidents are not all equal. We also conclude that there is a significant difference in the number of accidents occurring yearly.

Since the test above is significant we compare each pair of causes and test if they are significantly different using the Wilcoxon Rank Sum test.

Comparison between Human and mechanical causes

We test the hypothesis:

H_0: The mean effects of human and mechanical causes are equal

H_1: The mean effects of human and mechanical causes are not equal

W = 16, p-value = 0.01519

Since $p\ (0.01519) < \alpha(0.05)$, we reject H_0 and conclude that the mean effects of the Human and mechanical causes of road accidents are not equal.

Comparison between Human and Environmental causes

We test the hypothesis:

H_0: The mean effects of Human and Environmental causes are equal.

H_1: The mean effects of Human and Environmental causes are not equal.

data: x and y

W = 16, p-value = 0.0147

Since $p\,(0.0147) < \alpha\,(0.05)$, we reject H_0 and conclude that the mean effects of the Human and Environmental causes of road accidents are not equal.

Comparing Mechanical and Environmental Causes

We test the null hypothesis

H_0: The mean effect of Mechanical and Environmental causes are equal

H_1: The mean effect of Mechanical and Environmental causes are not equal

data: x and y

W = 8.5, p-value = 0.5

Since $p\,(0.5) > \alpha\,(0.05)$, we accept H_0 and conclude that there is no significant difference between the mean effect of Mechanical and Environmental causes of road accident.

In general, we therefore conclude from the tests conducted above that only the Human factor is significantly different from other causes of road accidents, while the Mechanical and Environmental factors are the same.

3.2.2. Using the Kruskal-Wallis test to test the differences in the nature of harm caused by road accidents

We test the hypothesis:

H_0: There is no significant difference among the nature of harm caused by road accidents, against.

H_1: There is a significant difference among the nature of harm caused by road accidents.

data: x

Kruskal-Wallis chi-squared = 1.457, df = 2, p-value = 0.4826

Since $p\,(0.4826) > \alpha\,(0.05)$, we accept H_0 and conclude that there is no significant difference in the nature of harm caused by road accident.

3.2.3. Using the Chi – square test to test uniformity in the data

Here we test the null hypothesis:

H_0: Number of reported cases road accident is uniformly distributed across the years

H_1: Number of reported cases accident is not uniformly distributed across the years.

χ^2 =26.3469, df = 15, p-value = 0.03453

Since $p\,(0.03453) < \alpha\,(0.05)$, we reject H_0 and conclude therefore that the number of reported cases of road accident is not uniformly distributed across the years 2010 – 2013.

3.2.3.1. Testing uniformity in the number of road accident among . different vehicle types

Here we test the hypothesis,

H_0: Number of road accidents is uniformly distributed among the vehicle type

H_1: Number of road accidents is not uniformly distributed among the vehicle type.

data: x

χ^2 = 10.6101, df = 3, p-value = 0.01403

Since $p\,(0.01403) < \alpha\,(0.05)$, we reject H_0 and conclude therefore that the number of reported case of road accident is not uniformly distributed among vehicle type from 2010 – 2013.

3.2.4. Using the Chi-square test to test independence of casualties of road accidents on the vehicle type

Here, we test the null hypothesis;

H_0: The casualties of road accidents are independent of the vehicle type.

H_1: The casualties of road accidents are dependent on the vehicle type

Table 2. Observed and Expected frequencies of Casualties in Road Traffic Accidents of Vehicle Types

	CASUALTIES			
VEHICLES TYPE	**No. killed**	**No. injured**	**No. not injured**	**Total**
Heavy duty	54 (36.64)	35 (45.09)	43 (53.27)	**132**
Buses	64 (126.03)	163 (144.75)	227 (183.22)	**454**
Cars	85 (51.63)	57 (59.30)	44 (75.06)	**186**
Motorcycles	46 (34.70)	31 (39.86)	48 (50.45)	**125**
Total	**249**	**286**	**362**	**897**

χ^2 = 94.961, df = 6, p-value < 2.2e-16

Since$p\ (2.2e^{-16}) <\ \alpha\,(0.05)$, we reject H_0 and conclude therefore that the casualties recorded through road accidents are dependent on the vehicle types involved in the road accidents. Also, from table 2, Buses recorded the largest number of casualties and is seconded by Cars.

3.2.5. Using the Kruskal-Wallis H-test to test difference in the casualties caused by different vehicle types

We test the hypothesis

Ho: Casualties caused by different vehicle type are the same

H1: Not all the casualties caused by different vehicle type are the same

data: x

Kruskal-Wallis chi-squared = 7.0513, df = 3, p-value = 0.07028

Since p (0.07028) > $\alpha\,(0.05)$, we accept H_0 and conclude therefore that there is no significant difference in the nature of casualties by different vehicle types

4. Discussion of results

From the analysis carried out so far, it can be observed that the numbers of road accidents caused by the different factors of human, mechanical and environmental are not all the same. The analysis so far shows a clear difference between the number of road accidents caused by human factors and any other factor causing road traffic accident; but the number of road accident caused by mechanical and environmental factors are approximately equal, this results agrees with that of Ajit et al (2009), Ohakwe et al (2011), Ezenwa (1986), and Odero (1998) that human factors are the lead causes of road traffic accident in Nigeria.

The nature of casualty recorded through road traffic accidents has been shown to be equal; that is, there is no contrast between the number of people killed, number of people injured and number of people not injured. The number of reported cases of road accidents is not uniformly distributed across the years 2010-2013.

The numbers of reported cases of road accidents for the years under study- (2010 – 2013) are not uniformly distributed among the vehicle types involved in the accident, vehicle types which are grouped into heavy duty, buses, cars and motorcycles.

For the year 2010, Monday recorded the highest number of accidents of 14 and Thursday had the least number of reported cases of 3. For 2011, Friday recorded 14 while Saturday had 7. For 2012, Sunday recorded 15 while Thursday and Friday both recorded 6 each. For 2013, Wednesday recorded 13 and Monday recorded 4 accidents.

For the entire period under study (2010-2013), Wednesday recorded the highest number of reported cases of 40 road accidents while Thursday had the least number of reported cases of 26 road accidents. Also 2012 had the highest number of reported cases of 72 road accidents while 2011 recorded the least number of reported cases of 52 road accidents. The increase in

Majority of the road accidents witnessed in Umuahia metropolis for the period under study (2010 – 2013) is caused by human factors which include; lack of knowledge of road signs and regulations, illiteracy, health problems like poor eye sight, excessive speeding, alcoholism, drug abuse, arrogance, over-confidence etc.

The casualties recorded through road accidents depend to a great extent on the vehicle type involved in the road accidents and it is also observed that there is no significant difference between the natures of casualties recorded by the different vehicle types.

5. Conclusion

From the foregoing, it has been inferred that the major factors that cause road traffic accidents are the human factors – lack of knowledge of road signs and regulations, illiteracy, alcoholism, excessive speed, arrogance and other reckless attitudes of the drivers have caused tremendous harm to the lives of commuters in Umuahia Metropolis. Casualties recorded through road traffic accidents depend to a large extent on the vehicle types involved in the road accidents and Buses records the highest number of road accidents within the period. Moreover, for the period under study, Wednesday records the highest number of reported cases of road accidents, while Thursday recorded the least number. It is also found that casualties caused by different vehicle types are the same. Therefore, Drivers of vehicles should be given adequate training from time to time by the Federal Road Safety Commission on road use and traffic regulations. Bus drivers should be given proper orientation on the use of roads as they constitute the majority of commercial drivers.

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Appendix 1

Monthly road accident data in Umuahia Metropolis (2010 – 2013)

			Vehicle type				Days of accident							Causes of accident			No. of people	casualties		
Years	Months	Number of reported cases	Heavy duty	Buses	Cars	Motor-cycles	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Human	Mecha-nical	Environ-mental	Involved	No killed	No injured	No not injured
2010	JAN	11	5	2	1	3	0	0	4	0	2	2	3	10	1	0	23	11	10	2
	FEB	3	1	0	2	0	0	0	0	0	1	0	2	3	0	0	6	3	0	3
	MAR	6	2	1	2	1	2	3	0	0	1	0	0	5	0	1	16	6	5	5
	APR	4	1	0	3	0	2	1	0	0	0	1	0	4	0	0	8	4	0	4
	MAY	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	2	1	0	1
	JUN	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	2	1	0	1
	JUL	3	2	1	0	0	0	0	0	0	2	0	1	2	1	0	4	2	0	2
	AUG	6	2	1	2	1	5	0	0	1	0	0	0	4	1	1	22	4	1	17
	SEP	4	0	3	0	1	1	3	0	0	0	0	0	4	0	0	19	3	0	16
	OCT	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	2	1	0	1
	NOV	4	2	1	1	0	0	0	0	1	0	1	2	4	0	0	9	5	0	4
	DEC	9	2	2	3	2	2	0	2	1	1	3	0	6	3	0	10	5	2	3
2011	JAN	5	2	1	2	2	0	2	2	0	1	0	0	4	0	1	10	5	1	4

	FEB	7	4	3	1	0	3	0	0	0	4	0	0	7	0	0	30	8	16	6
	MAR	2	0	2	0	0	1	0	0	0	0	0	1	1	1	0	16	2	2	12
	APR	4	0	0	3	2	1	0	1	0	2	0	0	2	0	2	10	7	2	1
	MAY	7	3	3	3	1	1	3	0	0	0	0	3	7	0	0	16	7	2	7
	JUN	4	0	0	3	1	2	0	0	2	0	0	0	4	0	0	6	2	1	3
	JUL	8	1	3	4	0	0	2	0	2	4	0	0	8	0	0	42	6	19	17
	AUG	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	2	1	0	1
	SEP	4	1	1	1	1	0	0	3	1	0	0	0	4	0	0	8	3	3	2
	OCT	4	0	0	3	1	0	0	1	0	3	0	0	4	0	0	4	2	0	2
	NOV	3	0	0	1	2	2	0	0	0	0	1	0	3	0	0	4	2	0	2
	DEC	2	1	1	1	0	1	1	0	1	0	0	0	3	0	0	6	3	0	3

Sources: State Traffic Office, Central Police Station, Umuahia

Appendix 2

			Vehicle type				Days of accident							Causes of accident			No. of people	casualties		
Years	Months	Number of reported cases	Heavy duty	Buses	Cars	Motor-cycles	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Human	Mecha-nical	Environ-mental	Involved	No killed	No injured	No not injured
2012	JAN	3	1	2	0	0	0	0	0	2	1	0	0	2	0	1	5	2	0	3
	FEB	7	2	1	3	1	0	2	4	0	0	0	1	6	1	0	12	5	0	7
	MAR	7	0	1	3	3	0	2	2	1	1	0	1	5	1	1	12	6	1	5
	APR	10	2	4	3	1	2	1	1	0	2	3	0	8	2	0	32	8	19	5
	MAY	6	0	3	1	2	0	0	3	1	1	0	1	4	1	1	9	6	1	2
	JUN	8	2	4	1	1	0	0	0	0	1	4	0	7	0	1	38	6	12	20
	JUL	4	1	2	1	0	1	0	1	0	0	1	1	3	0	1	24	6	10	8
	AUG	5	0	3	2	0	0	0	2	2	0	0	1	5	0	0	26	3	0	3
	SEP	5	0	4	1	0	1	3	0	0	0	0	3	5	0	0	29	6	21	2
	OCT	4	0	3	1	0	1	0	0	0	0	0	2	4	0	0	45	4	13	28
	NOV	3	2	1	0	1	1	0	0	0	0	0	0	3	0	0	6	3	1	2
	DEC	10	2	1	2	5	2	0	0	0	0	2	5	10	0	0	39	25	7	7
2013	JAN	5	2	1	2	1	0	3	0	0	0	3	0	4	0	2	10	4	4	2
	FEB	7	4	3	1	1	0	1	1	0	2	1	2	6	1	0	14	6	5	3
	MAR	2	0	2	0	0	0	1	1	0	1	0	2	4	0	0	34	3	6	25
	APR	4	0	0	3	2	0	0	0	2	0	1	0	4	0	0	30	6	5	
	MAY	7	3	3	3	4	0	0	5	2	1	1	0	9	0	1	57	12	28	17
	JUN	4	0	0	3	3	1	1	2	1	2	4	3	13	0	0	68	18	40	10
	JUL	8	1	3	4	0	0	0	1	0	0	0	0	1	0	0	2	1	0	1
	AUG	1	0	0	1	3	2	1	0	2	1	0	1	5	0	2	39	7	20	12
	SEP	4	1	1	1	2	0	0	1	3	1	1	0	5	1	0	46	8	12	26
	OCT	4	0	0	3	3	1	1	0	0	1	1	1	4	1	0	24	25	14	5
	NOV	3	0	0	1	0	0	0	0	1	0	0	0	1	0	0	3	1	0	2
	DEC	2	1	1	1	1	0	0	2	0	1	0	1	4	0	0	36	4	3	29

Sources: State Traffic Office, Central Police Station, Umuahia