

Pattern and Mortality Rate of traumatic Injuries in a Tertiary Hospital in Nigeria- 2 Year Comparative Analysis

Type of Article: Original

Babatunde Olayemi Akinbami, Bismarck Bio Kombo

Departments of *Oral and Maxillofacial Surgery and **General Surgery, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria

ABSTRACT

BACKGROUND

Trauma ranks as one of the leading cause of mortality in Sub-Saharan Africa. The aim of this study was to compare the pattern of injuries and mortality rates in our hospital.

METHODS

Demographic and clinical data of patients that sustained injuries due to trauma to all regions of the body were included in the study. The cause, type and site of the injuries were documented. Cases of mortality with the sites and severity of injuries and number of days on admission before death was documented for each period.

RESULTS

A total of 673 patients presented in the first period(March 2011 to February 2012) and 1869 in the second period(March 2012 to February 2013). More males were involved with injuries in both periods. RTA and Burns were responsible for most of the injuries in both periods. Head injury was highest followed by the extremities in both periods. In the first period, a total of 46 patients died with mortality rate of 6.8%,in the second period, a total of 47 patients died with mortality rate of 2.5%.

CONCLUSION

There was an increase in the cases of trauma in the second period of the study. The pattern in both periods was similar but mortality figure was much lower in the second period.

KEYWORDS: *Pattern Mortality Trauma, Tertiary Hospital.*

Correspondence: *Dr. B. O. Akinbami*
Email: *<akinbamzy3@yahoo.com*

INTRODUCTION

Trauma accounts for the highest number of disease presentation in Nigeria¹. The burden of these injuries seems to be on the increase with increasing population and struggle for improved socio-economic status¹. The patterns of these injuries vary and are strongly influenced by seasonal and economic factors². These injuries are caused by road traffic accidents, falls, gunshots, interpersonal violence/homicidal injuries, domestic accidents, industrial accidents and other work/occupational related injuries, sports related injuries, animal injuries, suicidal, earthquake and iatrogenic injuries³. However, the prevalence of the causes differs in geographic location and also dependent on social and environmental factors¹. Many articles have been written on injuries to different parts of the body but there is need to see the monthly/yearly variation in number and pattern of cases presenting to our hospital⁵. The aim of the study was to compare the pattern of injuries and mortality rates in two preceding period of years (March 2011 to February 2012 and March 2012 to February 2013)in our tertiary health care facility.

PATIENTS AND METHODS

The study was a retrospective survey designed to document the monthly pattern of injuries in all the patients that presented to the casualty department of the University of Port Harcourt Teaching Hospital, Rivers State, South-South

geopolitical zone, Nigeria from March 2011 to February 2013. The hospital is one of the four federal tertiary health care centers in the zone that takes care of a large population of citizens within and beyond the state. The casualty department comprises of both the pediatric and adult sections. Approval to carry out the study was obtained from the ethics and research committee of the hospital. Demographic and clinical data of patients that sustained injuries to all regions of the body were included in the study. The gender and age distribution, cause, type and site of the injuries were documented. Cases of mortality with the sites and severity of injuries in such cases as well as the number of days on admission before death were documented for each period. Data obtained was imputed into the computer and was expressed as frequencies and percentages; parameter values were compared. Data analysis was done using the SPSS software version 16. Differences in categorical variables were tested by Chi-square and values equal or less than 0.05 were considered statistically significant.

RESULTS

A total of 673 patients presented in the first period (March 2011 and February 2012) and 1869 patients presented in the second period (March 2012 to February 2013). In the first period, males were 478 (71%), and females were 195 (29%) with male to female ratio (2.4:1). In the second period males constituted 1119 (64.8%), and females were 658 (35.2%), M:F (1.8:1) (fig. 1). Trauma constituted 15% of all emergencies for first period and it was 21% for the second period.

Chi-square values for males in both years were 1.333 and 0.833; p value was 0.998 and 1.000, showing no significant statistical difference, for females, it was 1.500 and 1.333; p values were 0.993 and 0.998, also reflecting no statistical significant difference. Difference between males and females in each period was statistically significant, p value < 0.05.

In the first period, the age range of patients was 6-65 years, mean 37 (8.3%) years and in the second period, age range was 8-69 years, 33 (10.5%) years, no significant difference between the mean ages between males and females in both periods (tables 3&4); for age distribution, there were 413 (61.4%) and 1000 (53.5%) patients within ages 19-49 years in both periods respectively; 124 (18.4%) and 396 (21.2%) respectively for patients below 19 years (fig. 2).

Time Trend of Injuries

In the first period, incidence of injuries was lowest in the third quarter (September to November) of the period, it was 79 (11.6%) and incidence was highest in the fourth quarter, (December to February), 363 (54.9%). In the second period, incidence of injuries was lowest in the third quarter, (September to November) of the period, it was 410 (21.9%) and incidence was highest in the fourth quarter, (December to February), 536 (28.7%), (Tables 5&6).

Cause and Site of Injuries

RTA constituted the highest etiology in both periods of study, these were 264 (39.2%) and 777 (41.6%). Burns were 163 (24.2%) and 309 (16.9%) of the injuries. Assault was next to RTA and Burns in both periods constituting (14.4 and 18.2%) respectively (tables 5&6), (fig. 3).

Head injury constituted the highest number of cases 352 (52.3%) and 786 (42.1%) followed by injuries to the extremities 221 (32.8%) and 394 (21.1%), (tables 7&8); (fig. 4).

Mortality of Injuries

In the first period, a total of 46 patients died with mortality rate of 6.8%, 23 (50.0) deaths were due to complications from moderate to severe Burns, 11 (23.9%) were due to moderate to severe spinal cord injury, moderate to severe head injury/base of skull fractures and multiple bone fractures/multiple injuries contributed 10 (21.7%) and 2 (4.3%) cases respectively. Of the cases that were not secondary to Burns, RTA caused 20 (43.4%), gunshots caused 2 (4.3%) deaths and 1 (2.7%)

death each was due to assault and industrial accident. Two (4.3%) patients died on same day brought into hospital, 23(50.0%) patients died within 1-7days, 10(21.7%) patients within 8 days -3 weeks and 6(12.9%) cases within 3.1 weeks-6.5 months after admission, 7(15.2%) cases were not recorded.

In the second period, a total of 47 patients died with mortality rate of 2.5%, 29(61.7%) deaths were due to complications from moderate to severe Burns, moderate to severe head injury/base of skull fractures and moderate to severe spinal cord injury, accounted for 12(25.5%) and 6(12.8%) cases respectively. Of the cases that were not secondary to Burns, RTA caused 15(31.9%) and fall accounted for 3(6.4%) cases. 27(57.4%) patients died within 1-7days, 7(14.9%) patients within 8 days- 3 weeks and 8(17.0%) patients within 3.1 weeks-6.5 months, 2(4.3%) were not recorded. Male gender accounted for over 94% of deaths in both periods (fig. 5).

Table 1: Monthly Gender Distribution of 673 trauma cases(March 2011 and February 2012)

Month	Male	Female	Total
March	9(1.3)	10(1.5)	19(2.7)
April	23(3.4)	11(1.6)	34(5.1)
May	24(3.5)	8(1.2)	32(4.8)
June	34(5.1)	14(2.1)	48(7.2)
July	36(5.3)	16(2.4)	52(7.7)
August	36(5.3)	10(1.5)	46(6.8)
September	20(3.0)	11(1.6)	31(4.6)
October	17(2.5)	4(0.6)	21(3.3)
November	23(3.4)	4(0.6)	27(3.7)
December	94(14.0)	31(4.6)	125(18.6)
January	77(11.4)	33(4.7)	110(16.3)
February	85(12.6)	43(6.4)	128(19.0)
Total	478(71.0)	195(29.0)	673(100)

Table 2: Monthly Gender Distribution of 1869 trauma cases (March 2012 and February 2013)

Month	Male	Female	Total
March	92(5.0)	60(3.2)	152(8.1)
April	109(5.8)	74(4.0)	183(9.8)
May	90(4.9)	45(2.4)	135(7.2)
June	105(5.6)	42(2.2)	147(7.9)
July	103(5.5)	63(3.4)	166(8.9)
August	99(5.3)	41(2.1)	140(7.5)
September	70(3.7)	41(2.1)	111(5.9)
October	92(5.0)	60(3.2)	152(8.1)
November	101(5.4)	46(2.5)	147(7.9)
December	136(7.3)	54(2.9)	190(10.2)
January	106(5.7)	65(3.6)	171(9.1)
February	108(5.9)	67(3.8)	175(9.4)
Total	1119(64.8)	658(35.2)	1869(100)

Table 3: Monthly Age distribution of 673 trauma cases (March 2012 and February 2013)

Month	≤ 18	19-49	≥ 50
March	3(0.4)	16(2.4)	0(0)
April	6(0.8)	23(3.4)	2(0.3)
May	9(1.3)	29(4.3)	0(0)
June	9(1.3)	33(4.9)	4(0.6)
July	10(1.5)	19(2.8)	4(0.6)
August	12(1.6)	27(4.0)	0(0)
September	12(1.6)	15(2.2)	1(0.1)
October	4(0.6)	11(1.6)	2(0.3)
November	4(0.6)	15(2.2)	0(0)
December	21(3.1)	71(10.5)	1(0.1)
January	20(3.0)	63(9.6)	2(0.3)
February	14(2.1)	91(13.5)	5(0.7)
Total	124(18.4)	413(61.4)	21(3.1)

Table 4: Monthly Age distribution of 1869 trauma cases (March 2012 and February 2013)

Month	≤18	19-49	>50
March	29(1.6)	89(4.8)	2(0.1)
April	39(2.1)	99(5.3)	2(0.1)
May	30(1.6)	64(3.4)	4(0.2)
June	41(2.2)	68(3.6)	2(0.1)
July	25(1.3)	110(5.8)	3(0.1)
August	32(1.7)	70(3.7)	2(0.1)
September	20(1.1)	63(3.3)	4(0.2)
October	35(1.9)	89(4.8)	2(0.1)
November	37(2.0)	66(3.5)	2(0.1)
December	39(2.1)	104(5.6)	4(0.2)
January	34(1.8)	87(4.7)	5(0.2)
February	35(1.9)	91(4.9)	6(0.3)
Total	396(21.2)	1000(53.5)	38(2.0)

Table 5: Monthly Etiology distribution of 673 trauma cases (Mach 2011 and February 2012)

Month	RTA	Burns	Assault	Bite	Fall	Gunshot	Total
March	2(0.3)	9(1.3)	6(0.9)	1(0.1)	1(0.1)	0(0)	19(2.7)
April	10(1.4)	10(1.4)	6(0.9)	2(0.3)	4(0.6)	2(0.3)	34(5.1)
May	12(1.8)	6(0.9)	4(0.6)	0(0)	5(0.5)	5(0.5)	32(5.0)
June	20(3.0)	20(3.0)	2(0.3)	1(0.1)	1(0.1)	4(0.6)	48(7.2)
July	25(3.5)	15(2.1)	3(0.5)	0(0)	3(0.5)	6(0.9)	52(7.7)
August	20(3.0)	20(3.0)	2(0.3)	0(0)	3(0.5)	1(0.1)	46(6.8)
September	4(0.6)	4(0.6)	0(0)	0(0)	2(0.3)	2(0.3)	31(4.6)
October	3(0.5)	3(0.5)	3(0.5)	0(0)	5(0.7)	0(0)	21(3.3)
November	9(1.5)	9(1.5)	3(0.5)	0(0)	3(0.5)	3(0.5)	27(3.7)
December	48(7.2)	24(3.6)	20(2.8)	10(1.4)	13(0.7)	10(1.4)	125(18.6)
January	45(3.4)	23(3.4)	19(2.9)	3(0.5)	10(1.5)	10(1.5)	110(16.3)
February	20(3.0)	20(3.0)	29(4.3)	7(1.0)	7(1.0)	15(2.2)	128(19.0)
Total	264(39.2)	163(24.2)	97(14.4)	34(5.1)	57(8.4)	58(8.5)	673(100)

Table 6: Monthly Etiology distribution of 1869 trauma cases (March 2012 and February 2013)

Month	RTA	Burns	Assault	Bite	Fall	Gunshot	Total
March	45(2.4)	22(1.2)	25(1.3)	15(0.8)	10(0.5)	10(0.5)	152(8.1)
April	52(2.8)	20(1.1)	35(1.9)	8(0.4)	9(0.5)	12(0.6)	183(9.8)
May	46(2.5)	25(1.3)	25(1.3)	7(0.3)	12(0.6)	15(0.8)	135(7.2)
June	40(2.2)	22(1.2)	27(1.4)	12(0.6)	11(0.6)	17(0.9)	147(7.9)
July	50(2.7)	48(2.6)	30(1.5)	7(0.3)	13(0.7)	12(0.6)	166(8.9)
August	45(2.4)	27(1.4)	22(1.2)	12(0.6)	13(0.7)	14(0.8)	140(7.5)
September	32(1.6)	20(1.1)	25(1.3)	12(0.6)	10(0.5)	15(0.8)	111(5.9)
October	44(2.4)	22(1.2)	27(1.4)	17(0.9)	20(1.1)	12(0.6)	152(8.1)
November	45(2.4)	25(1.3)	27(1.4)	13(0.7)	14(0.7)	16(0.8)	147(7.9)
December	60(3.2)	30(1.6)	35(1.9)	17(0.9)	10(0.5)	17(0.9)	190(10.2)
January	58(3.1)	25(1.3)	31(1.5)	8(0.4)	9(0.5)	11(0.6)	171(9.1)
February	55(2.9)	23(1.2)	32(1.6)	9(0.5)	11(0.6)	12(0.6)	175(9.4)
Total	777(41.6)	309(16.5)	341(18.2)	137(7.3)	142(7.6)	163(8.7)	1869(100)

Table 7: Monthly Site distribution of 673 trauma cases (March 2011 and February 2012)

Month	Head & Neck	Chest	Abdomen	Spinal cord	Leg/hand
March	4(0.6)	2(0.3)	2(0.3)	1(0.1)	6(0.9)
April	7(1.0)	2(0.3)	1(0.1)	4(0.6)	10(1.5)
May	27(4.0)	3(0.5)	2(0.3)	4(0.6)	6(0.9)
June	19(2.8)	7(1.0)	4(0.6)	3(0.5)	15(2.2)
July	22(3.3)	5(0.7)	3(0.5)	4(0.6)	12(1.8)
August	20(3.0)	8(1.2)	5(0.7)	5(0.7)	15(2.2)
September	15(2.2)	4(0.6)	7(1.0)	2(0.3)	10(1.5)
October	27(4.0)	6(0.9)	4(0.6)	3(0.5)	9(1.4)
November	18(2.6)	2(0.3)	11(1.6)	7(1.0)	10(1.5)
December	60(8.9)	17(2.5)	21(3.1)	23(3.4)	50(7.5)
January	68(10.1)	18(2.7)	20(3.0)	17(2.5)	38(5.6)
February	65(9.7)	20(3.0)	16(2.4)	19(2.9)	40(6.0)
Total	352(52.3)	94(14.0)	96(14.3)	92(13.7)	221(32.8)

Table 8: Monthly Site distribution of 1869 trauma cases (March 2012 and February 2013)

Month	Head & Neck	Chest	Abdomen	Spinal cord	Leg/hand
March	50(2.6)	10(0.5)	8(0.4)	4(0.2)	59(3.2)
April	58(3.1)	15(0.8)	6(0.3)	6(0.3)	57(3.0)
May	60(3.2)	9(0.5)	10(0.5)	3(0.1)	21(1.1)
June	72(3.9)	21(1.1)	15(0.8)	7(0.4)	28(1.6)
July	82(4.4)	17(0.9)	28(1.6)	9(0.5)	31(1.7)
August	62(3.3)	11(0.6)	7(0.4)	13(0.7)	37(2.0)
September	77(4.1)	5(0.3)	5(0.3)	18(1.0)	36(2.0)
October	69(3.7)	6(0.3)	6(0.3)	4(0.2)	16(0.8)
November	55(2.9)	8(0.4)	4(0.2)	16(0.8)	13(0.7)
December	67(3.6)	7(0.4)	8(0.4)	15(0.8)	29(1.7)
January	65(3.5)	12(0.6)	9(0.5)	11(0.6)	27(1.6)
February	69(3.7)	13(0.7)	9(0.5)	13(0.7)	40(2.0)
Total	786(42.1)	134(7.2)	115(6.2)	119(6.3)	394(21.1)

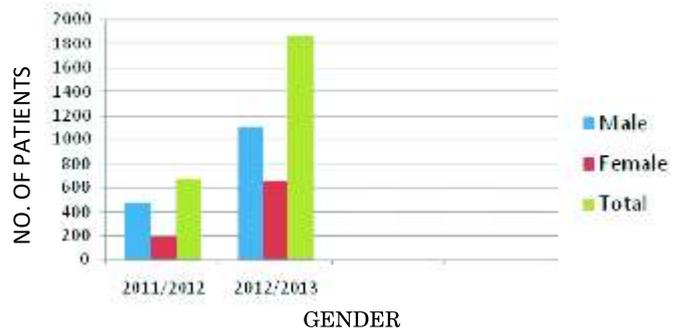


Figure 1: Annual Gender Distribution of Patients in the two periods

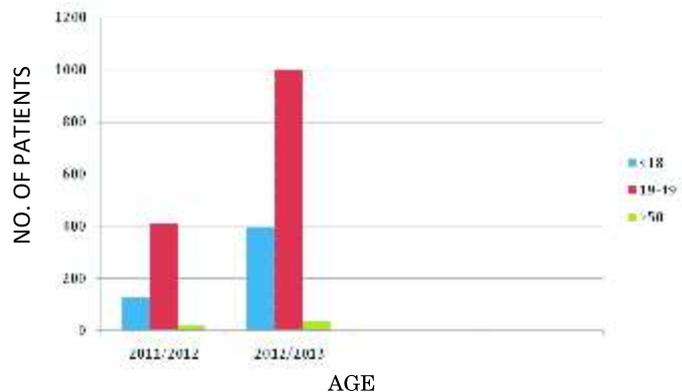


Figure 2: Annual Age Distribution of Patients in the two periods

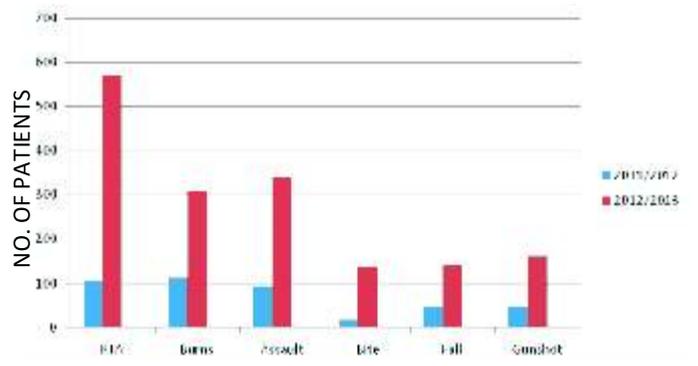


Figure 3: Annual Distribution of Aetiology of injuries in the two periods

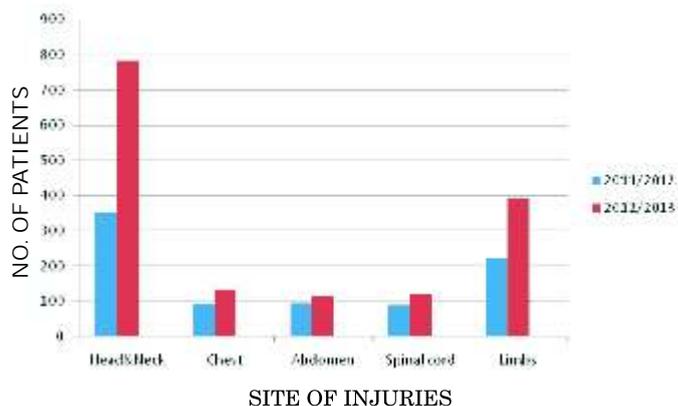


Figure 4: Annual Site Distribution of injuries in the two periods

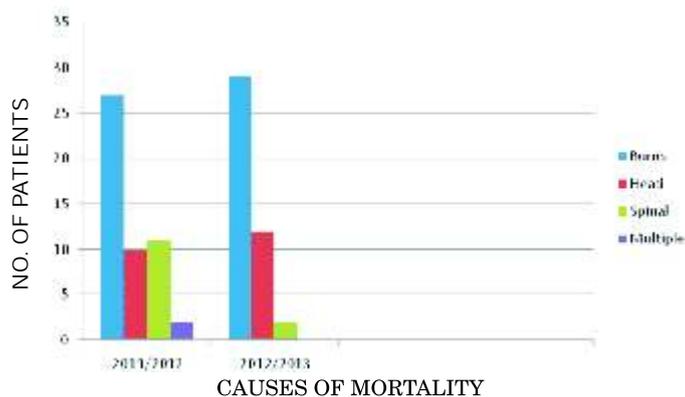


Figure 5: Distribution of Causes of Mortality in the two periods

DISCUSSION

The University of Port Harcourt Teaching Hospital relocated to the permanent site completely in 2009 with a steady increase in the number of trauma patients. Reasons for more patient load in the second period may be due to increased attendance from neighboring communities when the hospital had fully settled in its permanent site coupled with increased purchase of vehicles, generators and possibly illegal influx of ammunitions. During the period under study, more males were involved in injuries than females in both periods but female to male ratio increased from about 0.4 to 0.6 in the second period, indicating less restriction of women and involvement in socioeconomic activities but there were no statistical significant differences in the proportion of each gender when both periods were compared.

Age groups from 19 to 49 years were the most common victims of injuries in both periods, this stems from the fact that this group fell

within the prime years of effective activities for life survival and sustenance. These are people in their reproductive and productive stages of life who are responsible for socio-economic development of the society. Injuries, disabilities or deaths affecting this category of citizens have negative impact on development of any nation.

A similar pattern was observed in the quarter time trend of injuries with lowest figures in the third quarter and highest in the fourth quarter, these might be coincidental especially for the third quarter because it was difficult to allude any reason for the similar trend and also the lower figures, however, it may not be unconnected to the extra caution based on the superstitions attached to increased danger in the final four months of every year; in any case, higher figures for the fourth quarter, may be attributed to the peak of socioeconomic activities in December, which also contributed almost highest figures in both periods of our study.

Morbidity and mortality due to RTA is on the increase globally especially in developing countries¹. This is corroborated by this study in which RTA was responsible for the second highest number of injuries for the first period, by the second period; the number has increased by over five times. A study from Jos, Plateau State², documented RTA cases of 408 (56.6%) from February 2011 to January 2012. This was much higher than our figure for that period but lower than the second period. However, our figures were much higher than those from East Africa, Asia and Europe³⁻⁵. Reasons for these are related mostly to the lack of compliance of road users to traffic rules and regulations as well as failure on the part of traffic regulators to strictly control the human and vehicular factors predisposing to these accidents.

Quite a significant number of roads were rehabilitated during these periods of study thereby minimizing the environmental/road cause of RTA. The RTA incidences in our study were cases mostly related motor vehicle

crashes because commercial motor cycling has been banned within Port Harcourt metropolis by the present government and this resulted in the lower figure of RTA recorded in the first period but the increase in the second period might be attributed to increase importation and purchase of fairly used vehicles.

In total, Burns was the second highest etiology and the figure also increased in the second period two and half times. This was not surprising, considering the fact that local marketers of fuel and gas commodities have increased in our environment and therefore the sales and storage of adulterated products, coupled with use of generators as alternative for unstable power supply. Also, there has been a surge in the rate of accidents involving petrol tanker trucks causing spillage and fire outbursts at those sites. Findings from other studies also documented Burns as a significant cause of injury⁶⁻¹⁰.

Assault recorded 14.1% and 18.2% respectively for each period in relation to other etiologies, but the number of assault cases in the second period increased by almost four. Increased frustrations from unemployment or insufficient income are reasons alluded to, as well as domestic violence, communal clashes and land disputes, our figures of assault were lower than the reports from Northern regions of the country where terrorisms, insurgence attacks and nomadic cattle rearers /farmers clashes are on the rise¹¹. However, the surge in the second period may also be related to the general increase in the turn-up of patients, inability to cope with the fees in private hospitals and improved service delivery in our tertiary hospital.

Closely related to assault injuries from non projectiles are those from gunshots which also increased in the second year by about three and half times. The proportional increase in relation to causes of injuries of 8.5% to 8.7% in the two periods was however not significant, this was because armed robbery cases tend to have reduced, restricted to financial institutions and replaced by kidnapping, there

was probably minimal access to firearms and improving cashless transactions and vehicle security devices.

Similar to the findings in previous studies, injuries from fall most especially in children also contributed to cases in this study^{12,13}. As documented by some other studies, head injury was the highest effect from these injuries in both periods followed by limb and chest injuries. Head injury was more than twice in the second year. Reports from the North-Central and South-Western of the country^{2,14-22}, documented that facial/neck injuries and limb injuries closely followed head injuries respectively.

The development of surveillance protocols is required to monitor injury events. The merits include identification and description of events leading to injury and providing effective interventions and outcomes^{23,24}. This will demand traffic regulators, public health workers and hospitals' records, clinical, rehabilitation and mortuary staff to work as a team.

Primary, secondary and tertiary prevention of all causes of injury and the effects should be directed towards human attitudinal changes on the part of drivers, pedestrians, parents, spouses, community, government, health care providers and administrators with an wholistic approach and aim to minimize mortalities and improve quality of life our citizens²⁵⁻²⁷. Road safety law enforcement agents must ensure strict adherence to traffic rules, especially in relation to speed limit, use of seat belt and maintenance of vehicles²⁸⁻³⁰. Improved employment opportunities, provision of stipends for those not yet employed and orientation on ways to prevent falls and domestic /industrial injuries as well as modest lifestyle will also minimize these injuries.

Burns, head, spinal and multiple injuries contributed to the mortality outcomes. The mortality rate was much lower in the second period under study despite the higher number

of injuries; this may be due to less severe injuries sustained by majority of patients, prompt presentation to the hospital and also improved response and level of care by the health providers.

We observed that most of the cases of death occurred after the acute phase of recovery from trauma, these may be due to insufficient funds for CT and MRI investigations which will help in the prompt diagnosis and treatment of complications of head/spinal injuries. Research on usefulness of nerve growth factor and stem cell therapy in the nerve healings and regeneration is on –going and in the near future, these forms of therapy may help to minimize mortality of traumatized central nervous tissues after appropriate radiological evaluation and surgical intervention³¹.

CONCLUSION

In conclusion, there was a significant increase in the frequency of trauma cases presenting to our hospital in the second period, pattern in both periods was similar with figures for gender, age groups, etiology and site higher in the second period but mortality figure in relation to number of cases was much lower in the second period. Apart from the need to adopt preventive strategies, it is vital to plan, formulate policies and provide adequate resources that will be able to meet up with the challenges in subsequent years. There will be need to provide state of the art facilities, increase all staff strength and improve on regular training of all doctors involved in trauma management.

Acknowledgment

We like to appreciate of Prof. Aniekan Ekere and Dr. Nkiru Okolo for their effort in the facilitation of the write up of this article.

REFERENCES

1. Krug E. Editor. Injury: a leading cause of the global burden of disease. Geneva: W H O ; 1 9 9 9 .
www.who.int/violenceinjuryprevention/index.html
2. Adoga AA, Ozoilo KN. The Epidemiology and pattern of injuries seen at the accident and emergency unit of a Nigerian referral center. *Journal of Emergencies, Trauma and Shock*. 2014;7:77-82.
3. Odero WO, Kibosia JC. Incidence and characteristics of injuries in Eldoret , Kenya. *East Afr Med J*. 1995; 72: 706-710.
4. Crandon I, Carpenter R, McDonald A. Admission for trauma at the University Hospital of the West Indies: A prospective study. *West Indian Med J*. 1994; 43: 117-120.
5. Oskam J, Kingma J, Klasen HJ. The Groningen Trauma study. *Injury patterns in a Dutch trauma*
6. Robertson LS. Injury epidemiology. In: *Injury Prevention: An international perspective- epidemiology, surveillance and policy*. 1993; pg 49-69. Oxford University Press, New York.
7. Nwadiaro HC, Yiltok SJ, Kidmas AT. Immediate mass casualty management in Jos University Teaching Hospital: a successful trial of Jos Protocol. *West Afr J Med*. 2000; 19(3): 230-4.
8. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA. *World report on road traffic injury prevention*. Geneva: World Health Organization. 2004; available: <http://www.who.int/world-health-day/2004/infomaterials/worldreport/en>.
9. Matheus CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med*. 2006; 3: e442.
10. Ameratunga S, Hajar M, Norton R. Road traffic injuries: confronting disparities to address a global health problem. *Lancet*. 2006; 367: 1533-1540.
11. Yusuf U. Ethno-religious crisis: The north and the rest of Nigeria. *Vanguard Newspaper*, august 8, 2009.
12. Ekenze SO, Anyanwu KK, Kwumam DO. Childhood trauma in Owerri (south-eastern), Nigeria. *Niger J Med*. 2009; 18(1): 79-83.

13. Emejulu JK, Shokunbi MT. Aetiological patterns and management outcome of paediatric head trauma: one year prospective study. *Niger J ClinPract.* 2010; 13(3): 276-9.
14. Mohan D. Road safety in less industrialized environments: Future concerns. *Int J Epidemiol.* 2002; 31: 527-532.
15. Asogwa SE. Road traffic accidents in Nigeria: A review and a reappraisal. *Accid Anal Prev.* 1993; 25: 485-87.
16. Thanni LOA, Kehinde AO. Trauma at a Nigerian Teaching Hospital: Pattern and documentation of presentation. *Afr Health Sci.* 2006; 6(2): 104-107.
17. Balogun JA, Abereje OK. Pattern of road traffic accident cases in a Nigerian University Teaching Hospital between 1987 and 1990. *J Trop Med Hyg.* 1992; 95: 23-29.
18. Oluwasanmi AJ. Road accidents trends in Nigeria. *Accid Anal Prev.* 1993; 25: 485-87.
19. Osofo OD, Osagie TO, Iribhogbe PE. Paediatric road traffic accident deaths presenting to a Nigerian referral centre. *Prehosp Disaster Med.* 2012; 27(2): 36-41.
20. Nwadiaro HC, Ekwe KK, Akpayak IC, Shitta H. Motorcycle injuries in north-central Nigeria. *Niger J ClinPract.* 2011; 14: 186-9.
21. Nzegwu MA, Aligbe JU, Banjo AA, Akhiwui W, Nzegwu CO. Patterns of morbidity and mortality amongst motorcycle riders and their passengers in Benin city, Nigeria: one year review. *Ann Afr Med.* 2008; 7: 82-5.
22. Oluwadiya KS, Oginni LM, Olasinde AA, Fadiaro SO. Motorcycle limb injuries in a developing country. *West Afr J Med.* 2004; 23(1): 42-7.
23. Papua New Guinea. *Asia Pac J Public Health.* 1991; 5: 41-48.
24. Nantulya VW, Reich MR. The neglected epidemic: Road traffic injuries in developing countries. *BMJ.* 2002; 324: 1139-1141.
25. Peck-asa C, McArthur DL, Kraus JF. The prevalence of non-standard helmet use and head injury among motorcycle riders. *Accid Anal Prev.* 1999; 31: 229-33.
26. Murray C, Lopez A. The global burden of disease. Vol 1; Cambridge MA: Harvard University Press; 1996.
27. Weddell JM, McDougall A. Road traffic injuries in Sharjah. *Int J Epidemiol.* 1981; 10: 155-59.
28. Jayasuriya R. Trends in the epidemiology of injuries due to road traffic accidents in Seleye-Fubura D, Ekere AU. Vehicular road deaths in the Niger Delta. *Orient J Med.* 2003; 15: 41-4.
29. Thanni LO. Epidemiology of injuries in Nigeria- A systematic review of mortality and aetiology. *Prehosp Disaster Med.* 2011; 26(4): 293-8.
30. Sidel VW. War, terrorism and the public's health. *Med ConflSurviv.* 2008; 24(1): S13-25.
31. Aloe L, Rocco ML, Bianchi P, Manni L. Nerve growth factors: from the early discoveries to the potential clinical use. *Journal of Translational Medicine* 2012; 10: 239.