

Autopsy Study of Accidental Mortality in Rivers State, Nigeria

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Abstract

Background: Accidents constitute serious healthcare burden and public health challenge globally. In Nigeria, it is responsible for significant morbidity and mortality. This work describes the common forms, patterns, causes and demographic distribution of accident related mortality in Rivers state and proffers preventive and mitigation measures.

Methods: A review of coroner autopsy findings of accident victims between 1998 and 2008 was retrospectively undertaken. Information on age, gender, circumstances, mechanisms, and causes of death were obtained and analyzed.

Results: Accidental deaths constituted 35.8% of 2087 reviewed medicolegal autopsies. Males constituted 76.9%. The commonest circumstances of accidental deaths were road traffic accidents (RTA) with 63.5% while other forms of accidents in descending order of occurrence were plane crash, drowning, electrocution, fire explosions, falls, and building collapse. The mean age of victims was 30.8 \pm 14.5 years while the peak age was 20-29 years. Children and adolescents constituted 20.6% of the cases while adults aged between 20 and 59 constituted 73.9%. The commonest vehicle types involved in RTA were commercial buses with 44.7% and 91.6% of the victims were vehicular occupants. Head and neck injuries dominated in the victims with 58.6%. Unsafe motorists' behaviour especially non compliance with wearing of seat belt by drivers and passengers predisposed to majority of the deaths.

Conclusion: Improvement in our road infrastructure and provision of critical care facilities and trained personnel in the accident and emergency units of our hospitals will reduce preventable deaths from accidents. Provision of toxicological diagnostic infrastructure will obviate the missed opportunities in poisoning and medical errors uncommonly recorded in Nigerian studies.

Keywords: Accident, road, traffic, air crash, drowning, electrocution, fire

Introduction

Accidents constitute a serious healthcare burden and public health challenge globally. It is responsible for significant morbidity and mortality *world over* and was designated by

WHO as a global epidemic. Various studies in Nigeria show that about 70% of surgical cases in the emergency units of tertiary hospitals are due to accidents of various forms while over 41% of mortality is due to accidents.^{1,2,3,4}

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All ages are involved but specifically, accident related mortality among the elderly and the children have been investigated.^{5,6,7,8,9,10} In the USA, Ryan¹¹, reported that accidental deaths rank as number one cause of deaths in those aged between 1 and 42 years while Trunky and Lim also¹² observed that the young productive age in America are at high risk of accidental death.

Among the common circumstances are transport accidents which include air, sea, rail and road accidents¹³. Other circumstances are choking, fires, poisoning, shooting¹¹, falls,^{5,9,14} hangings¹⁵, organophosphate exposure¹⁶, electrocution¹⁷, medical errors¹⁸ and even self-induced air embolism¹⁹.

The trends and patterns of accidents vary across geographic regions. While reports indicate decreasing trend in accidental deaths across Europe between 1999 and 2009¹³, India showed increasing trend between 2000 and 2010.²⁰ Majority of accidents in the USA happen at home with the top five causes stemming from routine activities¹¹ while majority of accidental deaths across Europe are transport related and occur in out-door circumstances.¹³ Studies in India have shown that positive short term income gains cause the exhibition of increased risk-taking behavior that result in accidents.²¹

Despite the common occurrence of accidents of varying types in our environment with its attendant morbidity and mortality, there has been paucity of publications on accidental deaths in Rivers state of Nigeria. This research brings to the fore, the patterns, causes and demographic distribution of accident related mortality in the state and proffer preventive and mitigation measures.

Materials and Methods

This is a retrospective review of coroner autopsy findings among accident victims between January 1998 and December 2008. These

autopsies were carried out by the authors at different public and private mortuaries located in different localities covering the 23 administrative and geographic council areas of the state.

Autopsy examination involved thorough external examination including observation of decedent clothing and taking dimensions of lesions after due identification of body by close relative(s). Internal examination entailed detailed examination of eviscerated contents of the cranial, thoracic and abdominal cavities. Histology was performed at the discretion of the Pathologists and detailed authorized reports were issued to the police with duplicate copies archived.

In this study the duplicate copies of the reports on accident victims issued from January 1998 till December 2008 were retrieved and analyzed for age, gender, circumstances, mechanisms, and causes of death. The data was analyzed using SPSS version 17.

Results

Accidental deaths constituted 747 cases (35.8%) out of an overall 2087 reviewed medicolegal autopsies. Males constituted 76.9% (table 1). Gender ratio varied with the causes of accidental deaths, with electrocution having the highest gender ratio in favour of males. (table 1). The commonest circumstances of accidental deaths were road traffic accidents (RTA) with 63.5%, and other circumstances are as shown in table 1. The age range of victims was 1 year

Table 1. Type of accident and gender distribution

	M	F	MFR	TOTAL	%
RTA	364	110	3.3:1	474	63.5
Air	67	42	1.6:1	109	14.6
Water	82	12	6.8:1	94	12.6
Electric	33	3	11:01	36	4.8
Fire	9	4	2.3:1	13	1.7
Falls	10			10	1.3
Collapse	4	2	2:01	6	0.8
Other	5			5	0.7
Total	574	173	3.3:1	747	100
MFR					

to 80 years and the mean age was 30.8 \pm 14.5 years while the peak age was 20-29 years. The trend of age involvement showed an overall increase in incidence with increased age from

for 30.6% while neck and spinal injuries (whiplash) lesions accounting for 28%. (Table 4).

Table 2. Frequency of accidental types

Fall	Eletrocutation	Drowning	Fire	RTA	AIR	Collapse	Others	Total	%
		4	1	18	4	1		28	3.7
1	2	11	2	48	60	2		126	16.9
3	13	31	4	162	12	1	1	227	30.4
3	11	23	2	128	19	2	2	190	25.4
1	5	11	2	63	7		2	91	12.2
1	2	9	-	25	7	-	-	44	5.9
1	3	3	-	20	-	-	-	27	3.6
-	-	2	2	10	-	-	-	14	1.9
10	36	94	13	474	109	6	5	74	100

childhood till 3rd decade and decrease thereafter chronologically till the 8th decade. (table 2) Children and adolescents constituted 20.6% of the cases while adults aged between 20 and 59 constituted 73.9% (table 2).

The commonest vehicle types involved in RTA deaths were buses with 44.7% (table 3). Only 8.4% of the RTA victims were pedestrians as 91.6% were boarded vehicular and motorcycle occupants (table 3). Like overall age pattern there was steady increase in incidence of RTA

Table 3. Road traffic accident breakdown

	Pedestrian	Occupant	Total	%
Car	22	134	156	32.9
Buses	8	204	212	44.7
Pick Up	3	7	10	2.1
Lorries	3	24	27	5.7
Motor Cycle	2	65	67	14.2
Train	2		2	0.4
Total	40	434	474	100
	8.40%	91.60%		

till peak age of 20-29 and steady decrease till the elderly.

The injury distribution pattern among victims of road traffic accident show most involvement of the head and neck areas with skull fracture (with or without brain extrusion) accounting

Air plane crash was the next cause of accidental death with 14.6% frequency. Remarkably the first decade (10-19) years formed the peak of plane crash victims, with 60 out of the 109 victims.

Table 4. Injury distribution in road traffic accident

Injury Type	NO	%
Head Crushing with		
Brain Extrusion	26	5.5
Skull Fracture with		
Brain Extrusion	119	25.1
Whip-Lash(Spinal injury)	180	38.0
Crushing of Chest/Abdomen	53	11.2
Wound to Limbs	58	12.2
Multiple site wound	38	8
Total	474	100

Drowning accounted for 12.6% of the deaths with deaths in fresh water being most common and drowning from self tripping and falls from boat as well as swimming accounting for the majority.

Deaths from electrocution accounted for 4.8% and majority (72%) were neither electrical engineers nor electrical technicians. Fire explosions took the lives of 1.7% of the cases

and most cases (61.5%) died from Septic shock. There were 10 cases (1.3%) that died from circumstances of falls and majority of them (60%) were in the productive age range of 20-39 years (table 2). Half of the cases of the falls died instantly from severance of spinal cord at the neck region. Six persons (0.8%) died as a result of being trapped under collapsed buildings while other forms of industrial accidents claimed the lives of 0.7%.

Discussion

Deaths attributable to accidents occurred in 35.8% of a total of 2087 medicolegal autopsies reviewed. This finding shows significant contribution of accidents to mortality in our society in general and is consistent with earlier studies that have demonstrated high burden of morbidity and mortality in our society.¹⁻⁴ Death to injury ratio of accidents varies with the type and extent of impact of the accident on the victims, but commonly tilts to more injuries and disabilities than deaths. In India, it varies between 1:10 and 1:5 in favor of injuries,²² while in Nigeria different clinical studies have demonstrated that accidents are responsible for about 50% - 70% of patients' admissions into accidents and emergency units of the various tertiary hospitals.¹⁻³ In a population based study, Labinjo *et al*²³ noted that over 4 million people may be injured and about 200,000 killed annually in Nigeria from RTA. These data underlie the morbidity burden posed by accidents and reminds us also of the toll on the health care infrastructure and personnel. The need for improvement in the existing infrastructure for the care of critical patients is highlighted as many of our accident and emergency units are inadequately equipped to handle such cases. Majority of accident victims especially those with head injuries immediately require critical care facilities.

Our finding that 35.8% of sudden deaths medicolegally investigated resulted from accidents, sharply contrasts the observation of a Thailand study which also evaluated causes of sudden deaths. While natural deaths caused

by coronary atherosclerosis were the most common manner of sudden unexpected deaths in Thailand,²⁴ accidental deaths were much more common than natural deaths in our environment. It is likely that improved transportation infrastructure and higher life expectancy in Thailand unlike Nigeria is responsible for the contrast.

Although the rate of accidental deaths is high in this study, it would have been higher if our system provided for effective and efficient reportage and documentation of all cases as required by the coroners' law. We have gross under reportage of most sudden deaths including accidents where in many instances the involved parties in contentious cases settle their cases without the police while the non contentious cases bury their dead, thus representing missed opportunities for autopsy performance and documentation as well as the preventive lessons there from.

The marked gender imbalance with preponderance of male victims is consistent with reports of other researchers.¹⁻¹⁰ Males are generally more daring, adventurous and outgoing than females, probably because of the fact that adult males are the heads and bread winners of most homes. The quest to meet with this onerous headship responsibility keep most men on their toes with higher activities levels than females. Risks of accidental events are increased with activity level and so do the chances of death from such accidents. It is our opinion that the highest gender ratio observed in electrocution caused-death victims could be an indication of the more involvement of males in electrical engineering and technical works which is a risk factor for electrocution although, majority of the male electrocution victims were non-electrically skilled. The latter probably alludes to the more daring and adventurous nature of males.

The mean age of 30 ±12.7 years obtained in this study compares favorably with the mean range of 24 – 36.5 years reported by other Nigerian workers^{1,4, 25,} but less than the 55.3 years reported in a related Thailand-based

study²⁴. The low mean ages reported from Nigerian studies, is in keeping with the low life expectancy at birth years in Nigeria. While the average life expectancy of the world is 67.7 years, that of Nigeria as at 2005-2010 is 46.94 years.²⁶ Accidental deaths strongly contribute to the low life expectancy in Nigeria. That 20.6% of the cases were children is significant and in keeping with observations that trauma has become a common surgical disease in African children^{6,8,27}. The trend of increasing incidence of accidental deaths with age till peak of 2nd decade and decreasing incidence thereafter is also in keeping with activity level of the various age groups as the younger age show more activity which predisposes them to accidents. Road traffic accidents (RTA) were the commonest circumstances of deaths. This is consistent with previous reports on the common occurrence of fatal RTA, in Nigeria.^{4, 6, 25, 28} Globally, millions of people cope with the death or disability of family members from RTA and the global economic cost of road crashes is estimated to be 518 billion dollars per year, with the low income countries accounting for more than they receive in developmental assistance.²⁹ These costs are due to short or long term medical care, repair of damaged vehicles or other properties or their replacement as well as funeral expenses. Besides the financial cost of RTA, children and other dependents also suffer psychosocial trauma, deprivation and orphan hood due to the loss of their parents or guardians to RTA. The long term impact of such childhood psychosocial trauma is the high propensity to juvenile delinquencies and adulthood antisocial behavior deleterious to societal peace.

The reasons for the high frequency of RTA in our environment are adducible to human, vehicular and road infrastructure factors. In the United States, distracted driving has been pointed out as common causes of RTA,¹¹ while in Europe use of alcohol or drugs, failure to observe speed limits and refusal to wear seat belts have been reported as responsible for about half of road fatalities.¹³ However, in Nigeria most reports blame occurrence of accidents on poor road infrastructure and the

predominant use of fairly used cars whose maintenance and optimal efficiency is not guaranteed^{3, 5, 25} while others have also considered the influence of alcohol on the motorists.^{30, 31} However in our opinion, the assessment of human factors causing RTA in Nigeria is very deficient and neither objective nor reliable due to poor infrastructure. This is unlike in the Europe and America where adequate infrastructure is available. For instance there are no road side CCTV cameras for use in reviewing accident cases, neither are there available and routinely accessible tests of alcohol on motorists involved in road accidents. Ineffective traffic controls as a result of epileptic light supply and lack of dedicated and motivated traffic control officers is also contributory.

Unsafe motorists' behavior is further buttressed in this study by the fact that about 90% of RTA victims were vehicle occupants. Use of seat belt is not a culture yet in Nigeria especially in commercial vehicles which, constitutes greater proportion of human transportation. However, Akhiwu⁵ in his autopsy study of geriatrics found 63% of elderly RTA victims to be pedestrians while another study in London also showed more pedestrians involvement in childhood RTA related deaths.³¹

The other reason for fatal RTA is the vehicular factor. There is increased motorization especially of second handed vehicles purchased abroad and many of these vehicles are poorly maintained especially the commercial ones. Forty-four percent of the vehicles in this study were commercial buses. The fact that commercial buses are mainly involved also points to the involvement of the low income group in RTAs as these people mostly patronize commercial buses owing to the cheapness of the transportation cost. This is consistent with the notion in India²² that generally, poor people are more often involved in RTA while their access to quality health care is limited. Motorization is further encouraged by the virtual absence of rail transportation in Nigeria, causing proliferation of heavy duty Lorries

which transport bulk materials that otherwise would be transported by train. The absence of lorry driving times has further compounded issues unlike in Europe where strict rules on lorry and bus driving times and reduced lorry overload has reduced the annual number of road fatalities.¹³

The dilapidated state of our road infrastructure is the most consistent of all the factors causing RTA in Nigeria. Motorists often skid off the roads in their bid to dodge the numerous deep pot-holes that dot our various road networks. The injury distribution pattern shows that injuries of the head and neck constitute the vast majority of the immediate causes of death among RTA victims. This is consistent with observations from similar studies in Nigeria.^{3, 25, 28, 32} and suggests noncompliance with the use of seat belts. Only 14.1% of the RTA deaths involved motorcycle in this study contrasts with the previous finding of 41.6% in our environment during the period preceding this study.⁴ This illustrates the changing trends in the mortality pattern of RTA in our environment and underscores the effectiveness of the ban on the use of motorcycles for commercial transportation in Port Harcourt the state capital and the surrounding towns.

Air crash was the second most common circumstance of accidental deaths with 14.6%. The 109 passengers and crew members died in a single crash event. The recorded mass disaster is typical of plane crashes often with few or no survivors. Although air travel remains the safest means of transportation as accident rate is very low and far between, it is still of grave concern because of the high casualty rate. The issues of disaster victim management especially disaster victim identification continue to echo as a dilemma in our low resource and poor infrastructure laden environment during such moments

Drowning was responsible for 12.6% of the deaths and contrasts some local studies which reported no drowning probably because the topography of the study areas accommodates few or no water bodies.^{25, 33} . On the contrary,

rivers, lakes, creeks, lagoons, swamp and offshore of varying dimensions cover about 40% of Rivers state, hence the appreciable number of drowning cases. That 94.7% died in fresh water around which there are community settlements; indicate frequent indulgence in unsafe water practices by the community settlers. Safe practices are much more observed by deep offshore water operators as evidenced by the 4.3% of the deaths recorded. This is understandable, considering that it is the multinational oil companies that operate in deep offshore. The peak age of drowning decedents was the second decade unlike the report of an Australian study which showed peak age of 1-4 years.³⁴ The circumstances of drowning include boat capsizing, individuals falling or trapping off the boat or dying in the course of swimming. One of the cases died in a hotel swimming pool.

Electrocution also significantly contributed to accidental deaths and majority of the victims were those who were neither trained as electrical engineers nor technicians. Carelessness in house wiring and the use of substandard electrical materials as well as epileptic power supply are contributory factors to the incidences of electrocution. Epileptic electric supply prompt some people including the non-electrically trained/skilled individuals into attempting the change from one electricity supply cable line to another, even at the risk of electrocution. To reduce the spate of electrocutions there is need for the government to embark on domestic and work place safety campaign.

Fire explosion, falls from height and trapping under collapsed building also contributed to accidental deaths. The use of adulterated kerosene and premium motor spirit (PMS) particularly the one generated through the illegal local refining process predisposes to fire explosions. The intermittent scarcity of PMS with hoarding and storage of gallons of PMS at home as well as faulty electrical connections and wiring contribute to fire incidences. The absence of fire alarms in most of our private and public buildings makes the prevention of

fire incidence more difficult. In the USA, the installation and regular checks on fire alarms on private and public building has dropped the incidence of fire. ¹¹

That other circumstances of accidents reported by other workers including poison and medical errors ^{4,11} were not reported in this study represents missed opportunity rather than absence of cases. Non controversial poison-suspected cases are most unlikely reported to the police for investigation and therefore not autopsied. Also the absence of toxicology laboratory in the state and indeed the country precludes confirmation of the few suspected cases which come for autopsy in addition to the potential confounding effect of embalment to reliable toxicological test result. Autopsies are done on embalmed bodies in most instances in our environment. The absence of suspected medical errors like drug overdose or other forms of accidental medical mismanagement also represents missed opportunity. Increased populace tolerance for autopsies predicated upon better awareness of the benefits of autopsy may obviate these missed opportunities and reduce the possible occurrence of such deaths.

Conclusion

Accidental deaths in our environment are majorly transport related especially road transport. Commercial buses constitute the bulk of RTAs and unsafe motorists' behaviour especially non compliance with wearing of seat belts by drivers and passengers predisposes to majority of the deaths which are majorly due to head injuries. Improvement in our road infrastructure and provision of critical care facilities and trained personnel in the accident and emergency units of our hospitals will reduce preventable deaths from accidents. Provision of toxicological diagnostic infrastructure will obviate the missed opportunities in poisoning and medical errors uncommonly recorded in Nigerian studies.

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