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ANATOMICAL DISTRIBUTION OF INJURIES IN VIOLENT FATALITIES AN AUTOPSY STUDY, NAIROBI KENYA

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Abstract
This study aimed at investigating the anatomical distribution of injuries in fatalities resulting from violence to inform public health policy on the necessity for their prevention and management. This is a descriptive prospective study of the regional distribution of injuries in violent deaths in Nairobi; of all the bodies brought to the city mortuary Nairobi between June 1 2009, and May 31 2010. This study included all cases of violent deaths for twelve consecutive months. The data sheets were handled confidentially. Data was entered on a proforma data sheet. The day, date, day of the week, month and times of death were noted. The cases were divided into male and female, and each gender was divided into eight age groups. Data were analysed using SPSS 11.5.0 (SPSS Inc., Chicago, and III.) It is presented using frequency tables, graphs and pie charts. This study found out that all regions of the body were affected often in combination, namely the head, neck, thorax, abdomen and extremities. The most commonly affected region was the head, followed by the chest; the least affected region was the pelvis. The study concluded that the major anatomical site that contributes to fatalities in violent deaths is the head, followed by the chest. Haemorrhage also plays a huge role in these deaths. The study recommends that the healthcare system be prepared to deal with emergencies emanating from violent injuries and to be alert on the most injured anatomical site in order to avoid fatalities.

Key terms: Autopsy, deaths, injuries, public health policy, violence.

1.0 INTRODUCTION

Violence causing fatal trauma to the body, the commonest cause of unnatural death, is a preventable leading global public health problem. Violent deaths are categorised as those due to homicide, accidents or suicide. In the United States, violent deaths from suicides, homicides, and accidents are the leading cause of death of people aged 1-39 (Abel & Zeidenberg, 1985). A verbal autopsy to ascertain the cause of death in resource-limited settings has been described where s clinical autopsy and vital registration are scarce (Lulu et al., 2005; Araya et al., 2004; Reniers et al., 2005). A verbal autopsy is an indirect method of discovering the cause of death based on an interview with the caregivers or the next of kin regarding symptoms, signs, and circumstances preceding death (Soleman et al., 2006). This leads to misclassification of the cause of death and a high degree of variability (Chandramohan et al., 2001). Autopsy findings in Addis Ababa analysed 256 autopsies conducted at Addis Ababa Results from these studies indicated that in 66.4 per cent of the cases, clinical diagnoses were confirmed by autopsy, 31.2 per cent revealed a different diagnosis and 2.4 per cent were inconclusive. These results demonstrate the value of autopsy in developing regions to support clinical observations and advance epidemiological studies. (Gebre-Selassie, 1984).

2.0 LITERATURE REVIEW

The World Health Assembly declared violence as a leading global public health problem. This declaration acknowledged the need to implement a worldwide strategy to address violence as a preventable health issue. The first step toward laying the foundation necessary to prevent and control violence is describing the magnitude and nature of the problem in the individual countries (WHO 1999, 2000). In Africa, studies indicate that violence rates may be greater compared to the rest of the world and that there is also considerable variation in homicide rates between different urban centres (Violent deaths in South Africa, the 2003 National Injury Mortality Surveillance System published quarterly No 13,2005).

Excess of rapid deaths among vehicle occupants is mainly due to a higher proportion of aorta rupture and severe cerebral trauma (Man Dong et al., 2006). Studies demonstrated varying anatomical causes of violent deaths. One study found Cerebral injury and uncontrollable haemorrhage (mainly thoracic) at 34.4 per cent and 25.2 per cent, respectively (Kamdar et al., 1974); another study revealed multiple fractures, long bones without head injury (37.7%), head/upper spinal injuries (24.6%), crushed body injuries (22%) and intrabdominal organ injuries (15.6%) (Abel et al., 1985). McCarroll et al. (1962) revealed that Skull fracture (21.9 %), organ system injury (17.2%), and brain tissue injury (9.3%) constituted the intermediate causes of death, while immediate causes of death were reported as acute anaemia (21.9%) asphyxia (14.4%) and traumatic shock (12.0%), intracerebral haemorrhage (23.2%), severe brain damage (12%), massive internal haemorrhage (12.7%) and severe multiple injuries (17.6%), hemorrhagic shock (59.9%), severe raised intracranial pressure (38.2%), septicaemic shock (1.3%) and asphyxia (0.7%).

Thorax is the most standard site involved in strong force compared to the head in blunt force. The hand and forearm are the most familiar sites of defence injuries in sharp and blunt force homicides, respectively. Most blunt force victims have lesions in only one region in contrast to the involvement of 2-4 regions in sharp force (WHO, 2002). However, mob justice victims would have multiple blunt traumas (Gemechu et al., 2009).

3.0 METHODOLOGY

Materials were all the bodies that fulfilled the criteria of violent fatal outcome between June 1, 2009, and May 31 2010. Bodies were categorised by gender and divided into ten age groups of 10 years each. A complete forensic autopsy examination was done on each, and details of causes, site and extent of injury were recorded on a data collection form. The Kenyatta National Hospital/University of Nairobi Ethics and Research Committee sought the study's approval. Authority to conduct the study was sought from the Medical Officer of Health, Nairobi City Council, and permission was obtained from the Superintendent and pathologist in charge of the city Mortuary. Conducting autopsies was done professionally, adhering to ethics that include consent from the relatives and confidentiality of the information gathered. Only vitreous humour was taken from the bodies. Coding of the information was done to delink the samples from the source. The Data sheets were handled confidentially. Data was entered on a proforma data sheet. The day, date, day of the week, month and times of death were noted. The cases were divided into male and female, and each gender was divided into eight age groups. Data were analysed using SPSS 11.5.0 (SPSS Inc., Chicago, and III.) It is presented using frequency tables, graphs and pie charts.

4.0 RESULTS AND DISCUSSION

Autopsies were conducted on 2566 bodies over one year, out of which 124 cases were excluded, 82 cases were of natural deaths, and 42 cases were those of whom the cause of death could not be ascertained at post-mortem (Table 1).

Table 1: Distribution of Deaths by Categories, In Nairobi, Kenya

Cause	**Total**	
	No.	**%**
Violent deaths	2442	95.2
Natural Death	82	3.2
Unascertained	42	1.6
Total	2566	100

Two thousand four hundred and forty-two cases were analysed for violent deaths. Of these, 186 were females, and 2256 were males. The age range was from 10-79; they were all from Nairobi. The causes of death were distributed amongst all the known causes of violent deaths, namely homicide, suicide and accidents. The most common cause of death was homicide, 47.3 per cent; accidents at 43.6 per cent followed this, while the least common cause was suicide, 9.1 per cent (Table 2).

Table 2: Distribution of Violent Deaths by Cause in Nairobi, Kenya

Cause of Death	Numbers	%
Homicide	1154	47.3
Accident	1064	43.6
Suicide	224	9.1
Total	2442	100

Anatomical Distribution of Injuries

All body regions were often affected in combination, namely the head, neck, thorax, abdomen and extremities. The most commonly affected region was the head, followed by the chest; the least affected region was the pelvis (Figure 1).

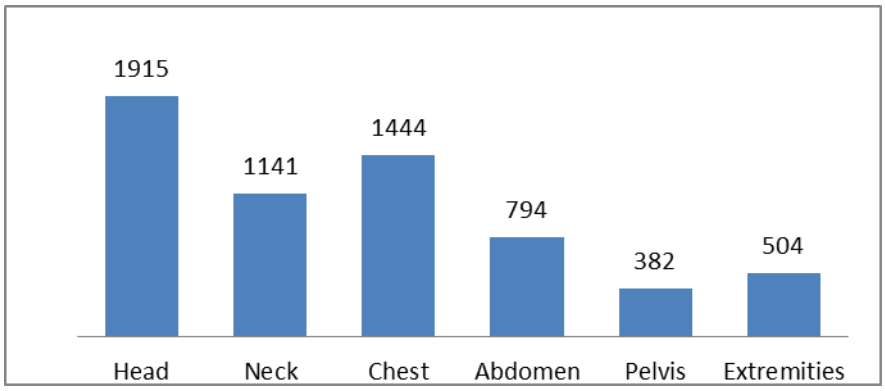

Figure 1: Anatomical Distribution of Injuries in Violent Fatalities

Head Injuries

Head injuries contributed to (31%) of all the injuries sustained and comprised of fractures on the base of the skull (20%), frontal bone (24.8%), occipital bone (15.2%), parietal bone (23.2%) and temporal bone (16.8%). Skull fractures were often multiple (Figure 2).

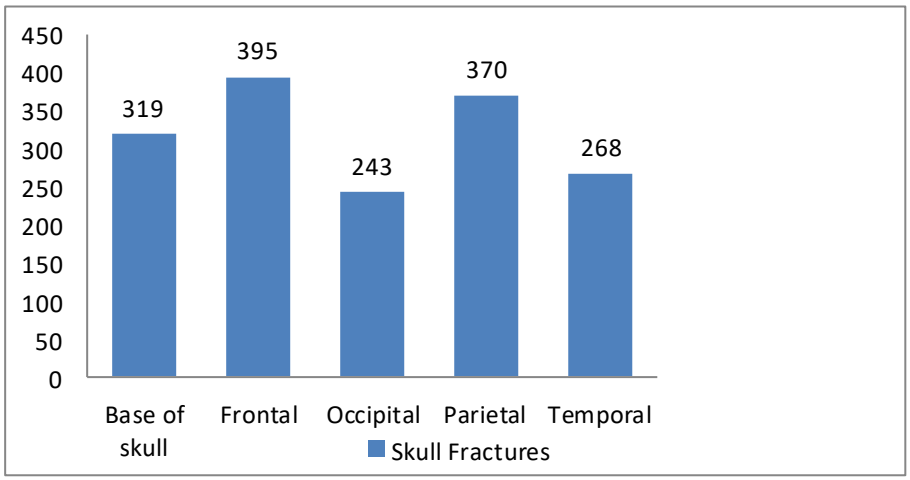

Figure 2: Distribution of Skull Fractures among the Head Injuries

The other head injuries comprised brain lacerations (31.5%), brain contusions (33.4%) and intracranial haemorrhages (35.1%). Most of the lacerations and contusions were cerebral. Fatal head injuries always involved brain lacerations and intracranial haemorrhages, often accompanied by skull fractures (Figure 3).

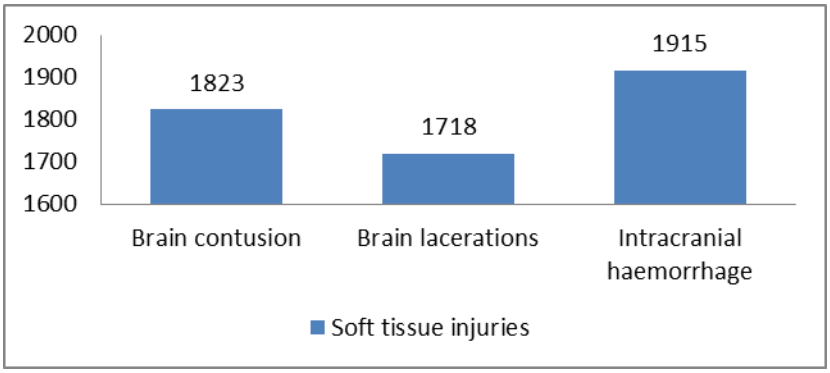

Figure 3: Distribution of Intracranial Soft Tissue Injuries among the Head Injuries

Cranial hemorrhages comprised epidural (25%), subdural (22.1%), subarachnoid (22.9%), intracerebral (25.5%) and intraventricular (4.6 %) (Figure 4).

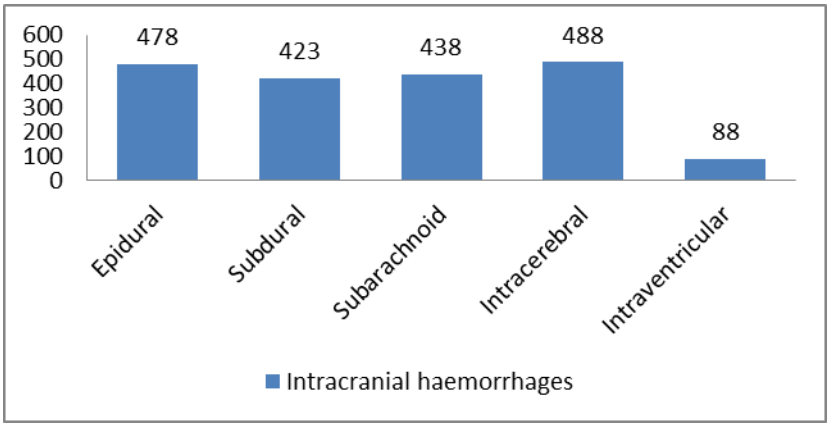

Figure 4: Distribution of Intracranial Hemorrhages among the Head Injuries

Neck Injuries

Neck injuries contributed to 18.5 per cent of all fatal injuries and comprised cervical vertebrae fractures (43.3%) and soft tissue injuries (56.7%). The soft tissue injuries involved the carotid arteries (19.5%), jugular veins (19.2%), larynx (22.2%), trachea (21.2%), oesophagus (10.3%) and pharynx (7.6%) (Figure 5).

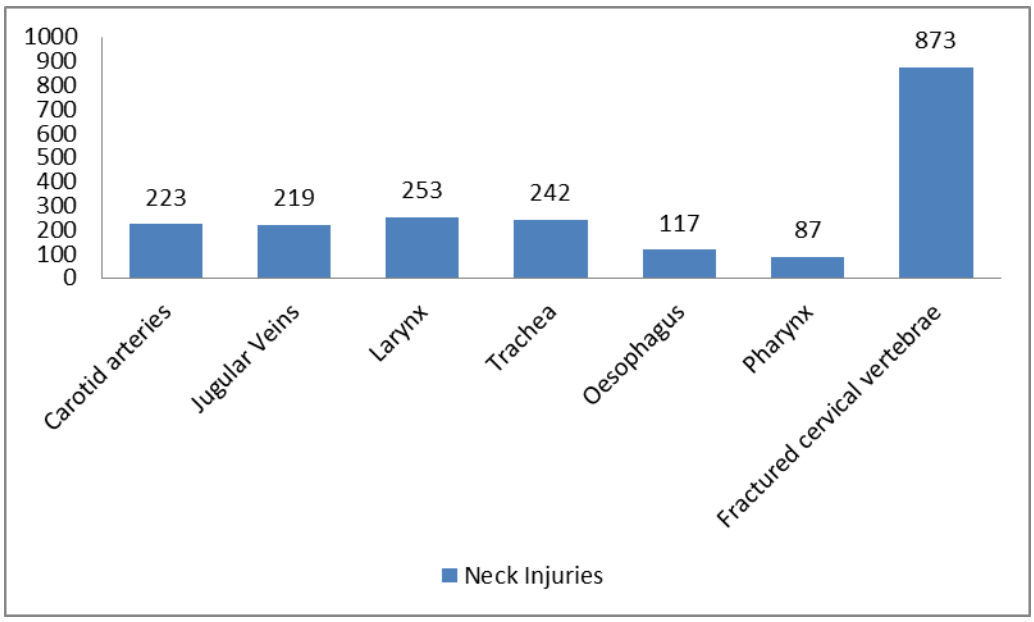

Figure 5: Categories of Neck Injuries

Chest Injuries

Chest injuries contributed to 23.4 per cent of all fatal injuries and comprised soft tissue injuries (94.3%) and fractures to the thoracic vertebrae (5.7%). Soft tissue injuries were injuries to the heart (16%), ascending aorta (11.9%), arch of the aorta (12%), thoracic aorta (13%) and the lungs (18%). Most injuries resulted in a haemopneumothorax, severely compromising cardiovascular functions (Figure 6).

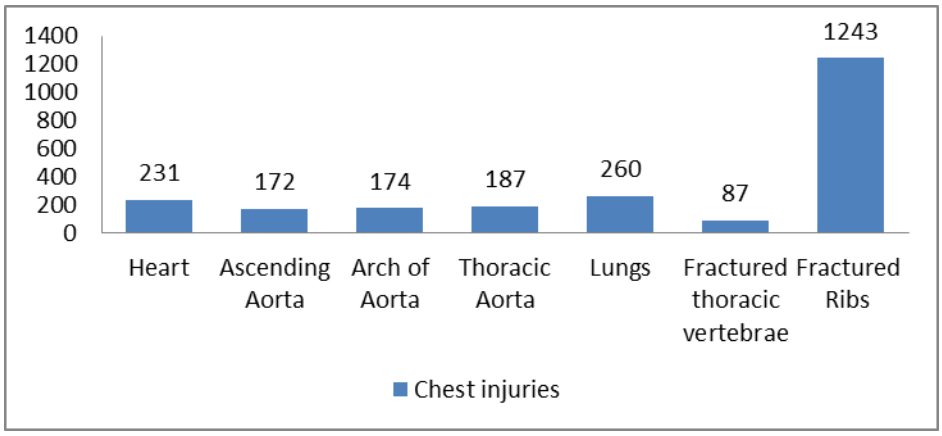

Figure 6: Categories of Chest Injuries

Abdominal Injuries

Injuries to the abdomen contributed to 12.8 per cent of all fatal injuries, including injuries to soft tissues (74.3%) and fractures of the lumbar vertebrae (25.7%). The soft tissue injuries comprised the spleen (35.9%), liver (36.3%), kidneys (6.7%), abdominal aorta (26%), stomach (9.4%), and intestines (3.7%) (Figure 7).

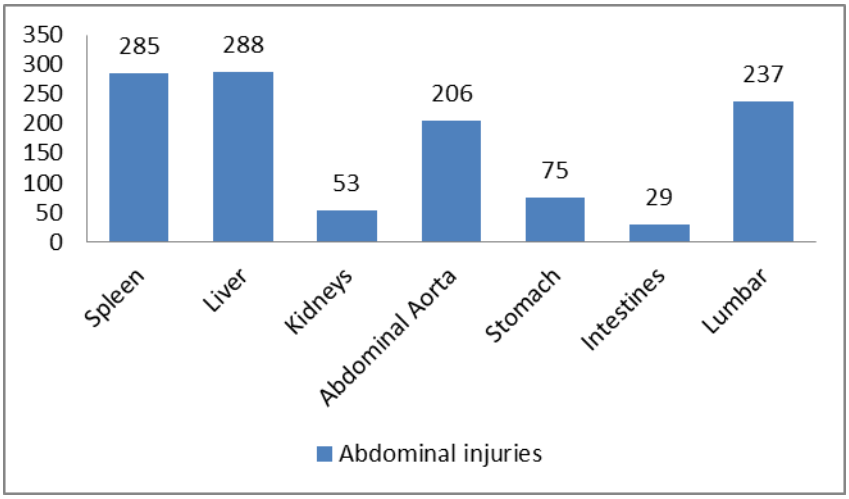

Figure 7: Categories of Abdominal Injuries

Pelvic Injuries

Pelvic injuries contributed to 6.2 per cent of all the total fatal injuries and comprised injuries to the sacral vertebrae (11.4 %), iliac vessels (15.4%), fractured pelvis (13.2%), colon injuries (32%) and urinary bladder 28% (Figure 8).

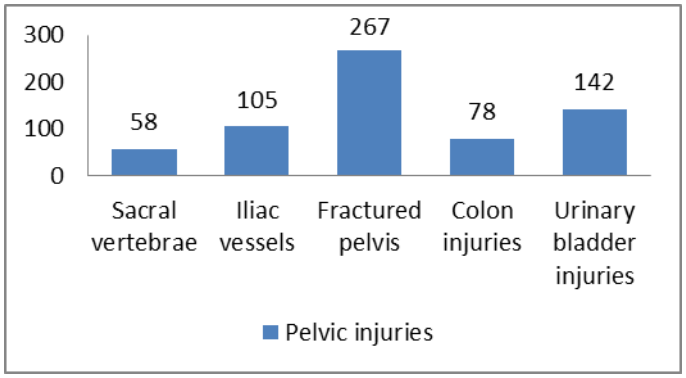

Figure 8: Categories of Pelvic Injuries

Injuries of the Extremities

These contributed to 8.2 per cent of all fatal injuries and comprised mainly fractures to the long bones. These are Femur (36.6%), tibia (33.8%), fibula (8.1%), humerus (11.7%), radius (4.2%) and ulna (2.0%). However, injuries to the femoral artery (2.3%) and popliteal artery (1.3%) were also recorded (Figure 9).

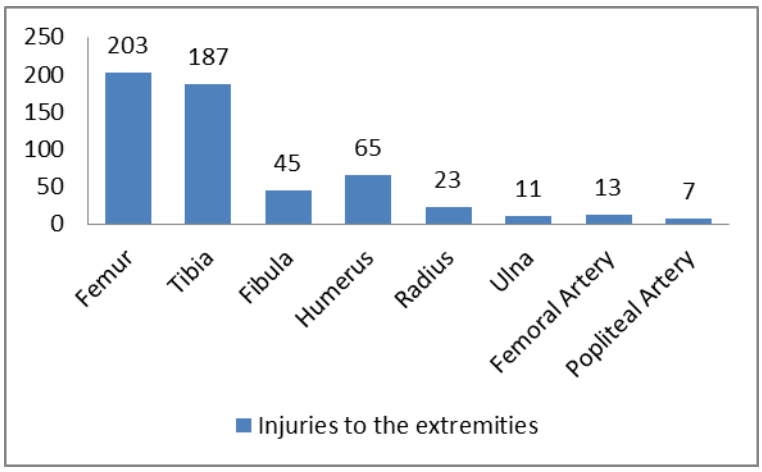

Figure 9: Categories of Injuries to the Extremities

All regions of the body were affected often in combination, namely the head, neck, thorax, abdomen and extremities. The most commonly affected region was the head, followed by the chest; the least affected region was the pelvis. The current study reveals that head injuries contributed to 31 per cent of all the injuries sustained and comprised of fractures of the base of the skull, 20 per cent of the frontal bone, 24.8 per cent of occipital bone 15.2 per cent, parietal bone 23.2 per cent and temporal bone 16.8 per cent. Skull fractures were often multiple; other head injuries comprised brain lacerations at 31.5 per cent, brain contusions at 33.4 per cent and intracranial haemorrhages at 35.1 per cent. Most of the lacerations and contusions were cerebral. Fatal head injuries always involved brain lacerations and intracranial haemorrhages and, most often, were accompanied by skull fractures.

Cranial haemorrhages comprised epidural 25 per cent, subdural 22.1 per cent, subarachnoid 22.9 per cent, intracerebral 25.5 per cent and intraventricular 4.6 per cent; neck injuries contributed 18.5 per cent of all the fatal injuries and comprised fractures of the cervical vertebrae 43.3 per cent and soft tissue injuries 56.7 per cent. The soft tissue injuries involved the carotid arteries, 19.5 per cent, jugular veins, 19.2 per cent, and the larynx, 22.2 per cent. The trachea is 21.2 per cent, the oesophagus 10.3 per cent and the pharynx 7.6 per cent. Chest injuries contributed to 23.4 per cent of all the total fatal injuries and comprised soft tissue injuries at 94.3 per cent and fractures to the thoracic vertebrae at 5.7 per cent.

Soft tissue injuries were injuries to the heart 16 per cent, ascending aorta 11.9 per cent, arch of the aorta 12 per cent, thoracic aorta 13 per cent and lungs 18 per cent. Most of the injuries resulted in a haemopneumothorax that severely compromised cardiovascular functions. Injuries to the abdomen contributed to 12.8 per cent of all the fatal injuries and comprised injuries to soft tissues at 74.3 per cent and fractures of the lumbar vertebrae at 25.7 per cent. The soft tissue injuries comprised the spleen 35.9 per cent, liver 36.3 per cent, kidneys 6.7 per cent, abdominal aorta 26 per cent, stomach 9.4 per cent, and intestines 3.7 per cent. Pelvic injuries contributed to 6.2 per cent of all the total fatal injuries and comprised injuries to the sacral vertebrae 11.4 per cent, iliac vessels 15.4 per cent, fractured pelvis 13.2 per cent, colon injuries 32 per cent and urinary bladder 28 per cent.

Injuries of the extremities contributed 8.2 per cent of all the total fatal injuries and comprised mainly fractures to the long bones, Femur 36.6 per cent, tibia 33.8 per cent, fibula 8.1 per cent, humerus 11.7,

radius 4.2 per cent and ulna 2.0 per cent. Other studies also demonstrated varying anatomical causes of violent deaths. One study found Cerebral injury at 34.4 per cent and uncontrollable haemorrhage (mainly thoracic) at 25.2 per cent. Another study revealed, Multiple fractures, long bones without head injury at 37.7 per cent, head /upper spinal injuries at 24.6 per cent, crushed body injuries at 22 per cent and intraabdominal organ injuries at 15.6 per cent. Other studies reveal skull fracture at 21.9 per cent, organ system injury at 17.2 per cent, brain tissue injury at 9.3 per cent as intermediate causes of death, intracerebral haemorrhage at 23.2 per cent, severe brain damage at 12 per cent, massive internal haemorrhage 12.7 per cent and severe multiple injuries 17.6 per cent and Hemorrhagic shock 59.9 per cent.

5.0 CONCLUSION AND RECOMMENDATION

Conclusion: According to this study, the major anatomical site that contributes to fatalities in violent deaths is the head, followed by the chest. Haemorrhage also plays a huge role in these deaths.

Recommendation: The study recommends that the healthcare system be prepared to deal with emergencies emanating from violent injuries and to be alert on the most injured anatomical site in order to avoid fatalities.

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