Original Article

# Medicolegal Autopsies and Causes of Death in Mass Casualties in a Developing Country and Challenges Encountered

**Komolafe AO[1], Adefidipe AA[1], Olorunsola IS[1], Akinyemi HAM[2], Ogunrinde OV[1], Alade OT[1], Soremekun AI[3]**

[1]Department of Morbid Anatomy and Forensic Medicine, Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, [2]Department of Morbid Anatomy and Histopathology, Ladoke Akintola University of Technology Teaching Hospital, Osogbo, Osun State, [3]Department of Anatomic Pathology, Ekiti State University, Ado-Ekiti, Ekiti State Nigeria

## ABSTRACT

**Background:** Mass casualties are frequent occurrences in low income societies where multiple factors result in premature deaths. The pathologist has a crucial role in the effective management of the corpses of victims of mass casualties. This role must be attended to with the engagement of the minimum standards of forensic medicine that would allow revisits to the cases without losing vital records.

**Aims and Objectives:** The study reviewed the autopsies conducted on mass casualties at OAUTHC, Ile-Ife; for the most vulnerable gender, methods of preservation, pattern of injuries, circumstances of death, mechanisms of death, cause of death, challenges encountered in the management of the corpses, and results of toxicology studies.

**Materials and Methods:** There was a review of the reports of autopsies conducted on mass casualties by anatomical pathologists at the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife and their jurisdiction of practice over a period of January 2010 - December 2017.

**Results:** A total of 52 cases were analyzed, all homicidal deaths consisting of 46 cases of deaths due to communal crisis and 6 cases of poison related deaths. The homicidal deaths resulted from blunt force to the head in 32 cases, sharp force in 9 cases, severe burns in 3 cases and strangulation in 2 cases. Most of the deaths was due to raised intracranial pressure complicating severe head injury. The cases of suspected poisoning at autopsy showed severe anatomic and pathological changes which were the basis of pathophysiological basis of death but toxicology was unhelpful in the detecting the poison, perhaps due to preservation technique.

**Conclusions:** The role of the forensic pathology is pivotal in the management of deaths in mass casualties. Forensic pathology practitioners in resource limited must at least keep to minimum standards to ensure basic documentation are not compromised.

**Key words:** Developing country, managing mass casualties, medicolegal autopsies

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## INTRODUCTION

Mass casualties and events overwhelming local and institutional facilities[1] are frequently encountered by anatomical pathologists in the third world countries characterised by rampant poverty, government ineptitude, bad leadership, anti-people policies, abysmal budgetary allocation to national health, generally poor infrastructure among others that impinge negatively on healthcare delivery, quality of life and poor forensic science practice.[2,3] In Nigeria, the pathologist still has to perform post-mortem examinations, improve his skills, develop his expertise and subspecialty even in the face of daunting challenges. This study aims at unravelling some of the challenges involved in managing mass casualties.

## MATERIALS AND METHODS

A review of the reports of autopsies conducted on mass casualties by anatomical pathologists at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife and their jurisdiction of practice over a period of eight (8) years (January 2010–December 2017) were analysed for the following:

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**Address for correspondence:** Dr. Komolafe AO, Department of Morbid Anatomy and Forensic Medicine, Obafemi Awolowo University Teaching Hospitals Complex, P.M.B. 5538, Enuwa Post Office, Ile-Ife, Osun State, Nigeria.
E-Mail: akinkomo1@yahoo.com

most vulnerable gender, method of preservation, injuries, circumstances of death, mechanism of death, cause of death and challenges encountered in the management of the corpses. Available results of toxicology studies were also considered. Only deaths involved in mass casualties that had post-mortems examinations were included in the study. The data was analysed by simple descriptive statistical methods. Cases with incomplete biodata were excluded from the study. Ethical approval was not indicated or absolutely required for this study because we used anonymised data and without photographs. The data obtained did not infringe on the rights of deceased subjects or their relations and did not violate the principles of confidentiality or compromise police investigations or law court proceedings in any way.

Ethical approval for this study (Ethical Committee ERC/2020/08/13) was provided by the OAUTHC Ethics and Research Committee.

## RESULTS

Cases from four mortuaries in the jurisdiction of the pathologists were reviewed. All the mortuaries had overflowing corpses in open space as none of them had ample space or up to 50 morgue cooling units. A total of 52 cases from three of the mortuaries met the inclusion criteria. The manners of death of the studied cases were all unnatural deaths, specifically homicidal. The circumstances of death were communal crisis in 46 (88.5%) cases and alleged poisoning in 6 (11.5%) cases. There was variable pattern of injuries classified into severe head injuries in 32 cases, burns injuries in 6 cases, cervical fracture in 1 case, fractures of the radial and ulnar bones in 1 case, severe chest injuries in 2 cases and severe abdominal injuries in 1 case. Some of the cases had multiple injuries such that the combined effect of the injuries contributed to the deaths. Figure 1 shows the pattern of injuries.

The corpses of the homicidal cases from violence due to communal crisis were in various stages of decomposition while the remaining homicidal cases supposedly due to poisoning were well preserved. None of the mortuaries had continuous supply of electricity for 24 h and there was generally poor and unreliable alternative electric power supply as well as lack of sufficient, adequate and appropriate spaces to cater for corpses with overflowing outside the morgue cooling units The homicidal deaths due to communal crisis occurred by different means namely blunt force usually to the head in 32 (61.5%) cases, sharp force in 9 (17.3%) cases, severe burns in 3 (5.8%) cases and strangulation in 2 (3.8%) cases. The mechanisms of death in the cases were severe neurological damage in 32 cases, multiple organ damage in 4 (7.7%) cases, burns hypovolemic shock in 3 (5.8%) cases, respiratory failure in 3 (5.8%) cases and exsanguination in 4 (7.7%) cases. Figure 2 shows the mechanisms of death. The specific causes of death in the homicidal cases include raised intracranial pressure in 29 cases, multiple severe injuries in 4 (7.7%) cases, severe craniocerebral injuries in 3 (5.8%) cases, burns in 3 (5.8%) cases, asphyxia in 3 (5.8%) cases and multiple organ failure due to haemorrhagic shock in 4 (7.7%) cases. Table I shows frequencies and percentages of the causes of death versus the circumstances of death.

In the cases of suspected poisoning, the circumstances leading to poisoning was failure of one of the victims to consent to a love proposal. The cause of death in 5 (9.6%) of the cases was pulmonary oedema with acute tubular necrosis while in 1 (1.9%) case, the cause of death was listed as hypertensive heart disease with evidence of decompensated chronic renal disease and acute tubular necrosis. The precipitant in the sudden deterioration in function of the organs was not stated despite assays.

## DISCUSSION

Our study involved the analysis of 52 cases consisting of 46 (88.5%) cases due to homicidal deaths from communal crisis and 6 cases of homicidal deaths due to alleged poisoning. There were 47 (90.4%) males and 5 (9.6%) females. All the homicidal cases were males, while one of the cases of alleged poisoning was male. The remaining victims in the suspected poisoning were females. There were 47 males to 5 females, being a male female ratio of 9.4:1. The preponderance of males in disasters is most probably due to the adventurous nature of males generally which places males at the risk of death when

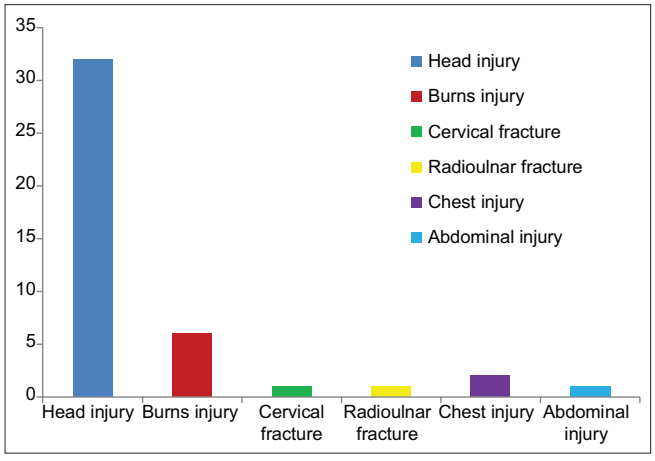


**Figure 1:** Bar chart showing the patterns of injuries

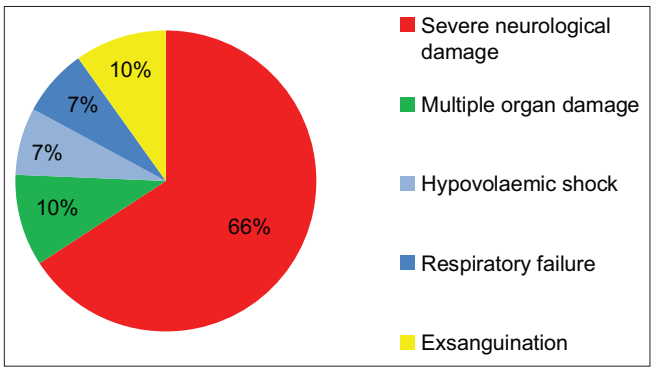


**Figure 2:** Pie chart showing percentages of mechanisms of death

**Table I: Frequencies and percentages of the causes of death**

| Circumstances of death | Cause of death | Frequency (%) |
|---|---|---|
| Communal crisis | Raised intracranial pressure | 29 (55.8) |
| | Craniocerebral injuries | 3 (5.8) |
| | Multiple severe injuries | 4 (7.7) |
| | Haemorrhagic shock | 4 (7.7) |
| | Burns | 3 (5.8) |
| | Asphyxia | 3 (5.8) |
| Poisoning | Pulmonary oedema | 5 (9.6) |
| | Decompensated hypertensive heart disease | 1 (1.9) |
| Total | | 52 (100) |

exposed to dangers. Males generally tend to be at the frontline of violence as well as tend to undertake great risks due to their egocentric nature even when the risks are quite hazardous and very unreasonable and have prognostically poor outcomes. Escoffery and Shirley in their study of trauma-related deaths found a male pre-dominance and alluded to the fact that males are much more likely to inflict or suffer injuries on other people.[4] Severe head injuries were seen in 32 (61.5%) of these cases, thus accounting for the most preponderant injuries. This is not unexpected in communal crisis and violence as the underlying factor is usually due to long held acrimony and bitterness and total annihilation of perceived enemies is what is uppermost in the mind of the assailants. For pre-meditated instances of assault with the intention to thoroughly maim and kill, the head region is the target of assailants because a devastating blow to the head quickly incapacitates their victims. Our findings of the vulnerability of the head region is consistent with the findings of Ozoilo *et al*. which had similar findings in studies on disasters arising during communal and religious crisis in the Middlebelt Region Nigeria.[5] Escoffery and Shirley in their study also found the head and neck as the most common anatomical site of injury.[4] While our findings show that the mode of inflicting injuries was by use of blunt force, Ozoilo *et al.* found that gunshot was used to inflict injuries in the cohort they studied.[5] It is pertinent to state that communal crises based on longstanding acrimonies and tribal prejudices are laden with individual and corporate hatred which could erupt into monumental destruction of property and murderous activities with even the slightest provocation. This could account for the use of blunt weapons to assault perceived enemies and opponents given the opportunity to express their grievances. The use of sharp instruments was not as frequently encountered in this study. This may be due to the relatively short duration of the communal crisis which was arrested by law enforcement agents. Thus, there was no opportunity for either party to regroup and escalate the tension into a full-blown war. While our study shows spontaneous violence in which fights were executed with readily available weapons such as blunt instruments such as clubs, Ozoilo's study group was in an environment of long-standing feud and so opposing groups may have procured firearms to cause very devastating injuries on opponents. The immediate cause of death in our study was raised intracranial pressure, a potentially fatal condition that results in death if not immediately relieved.

The practice jurisdiction is beleaguered by issues peculiar to third world countries such as poverty, traditional and religious sentiments, bureaucracies, official boredom, executive redundancy and mischief, inadequate budgetary allocations, inadequate refrigerating spaces and general lapses and incompetence.[3] The identification of the corpses in 46 (88.5%) of the cases in our study was impaired due to lack of adequate morgue space for preservation of the bodies, insufficient time before funeral rites due to traditional, culture and religious circumstances.[6] There were no radiological investigations done because facilities were not available.[7-9] The role of chemical poisoning was not sufficiently explored in the cases so as to know the contributions to the process of death. The cases in which toxicology was done were inconclusive and unhelpful to unravelling the mystery substance that was used to poison the victims in which poisoning was suspected.[10] For the category of deaths in one of the morgues adjudged to be due to natural causes, the corpses were kept in the morgues primarily for preservation. The practice fell grossly below the standards expected for the management of corpses in mass disasters.[3,11] It is to be noted that mass burials were conducted in 48 of the cases within 72 h of death because of traditional and religious reasons, without any identification means whatsoever and no DNA samples were taken for future reference and attendant risk of litigations for all stakeholders.[9,12] This precludes any possible means of identification and given the deceased befitting burial in future.[12,13] Samples for toxicology were not also taken perhaps to ascertain possible use of stimulants in instigating violence. Gruszecki *et al*. emphasised the importance of toxicological studies in detecting drugs that could have contributed to circumstances resulting in medicolegal deaths.[14] The situation is particularly appalling considering that the autopsies were conducted in secondary and tertiary medical centres. Six (11.5%) of our cases were members of the same family who were apparently well before they suddenly took ill but there was a perimortem history of poisoning. Unfortunately, at the time of autopsy, some of the bodies were embalmed and kept in open spaces because of lack of electric power supply to morgue cooling facilities. All the cases had acute tubular necrosis in common, consistent with acute renal failure but the toxicology failed to detect the alleged poison. The effect of formalin and decomposition probably contributed to the negative toxicology results. The cases studies bring to the fore the challenges encountered in the management of the dead in low resource economies where poor health facilities overwhelmed by community demands are the norms. Inadequate documentation and improper characterisation of wounds could provoke controversies and lead to unwarranted ligations resulting in ambiguous legal conclusions.[15,16] Variable degrees of decomposition could put the pathologist

in dilemma of assessing the true pathogenetic sequence of events resulting in death and logically affirm the contributions of pre-morbid disorders to death.[17] Unsatisfactory answers to obvious questions may warrant a re-conduct of the autopsy, a second autopsy by another team of pathologists or even an exhumation with attendant risks of delay in burial, mutilations of the body and psychological trauma to relatives.[18-20] Poor preservation of bodies resulting in decomposition also has its public health implications with the risk of propagation of communicable diseases.[21-23] Our study shows numerous ethical and professional gaps in the way the casualties were handled. Standard protocol can be adapted into routine practice in pathology departments and forensic pathology practice in Africa such as the template by the African Society of Forensic Medicine which states the minimum standard protocol for practice in Africa.[24-26] Our study unfortunately shows the worrisome state of mortuary services and narrative of the corpse storage facilities in a developing country where healthcare is severely underfunded, and maintenance of facilities is generally poor. Definitely, the narrative has to change for the better by following the guidelines set by standard organisations such as the International Red Cross Society that has been at the forefront of responsiveness in disaster situations.[27,28] Proper implementation of guidelines would help in proper identification, ensure befitting burial of victims of disasters with commendable sense of human dignity, prevent epidemics of diseases and prevent unnecessary medicolegal problems.[12,29]

## CONCLUSION

Medicolegal investigation of deaths in resource limited societies remains a great challenge to the management of death related issues such as identification of the victims, deciphering the circumstances of death, preserving the bodies until all aspects of the investigations are completed and legal authorities certify the body for burial. Despite all mitigating challenges, the pathologist must continue to strive for the best professional practice by ensuring at the least the minimum standards.

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### Conflicts of interest

There are no conflicts of interest.

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