



TRAUMATIC ASPHYXIA AS A PREDOMINANT CAUSE OF ACCIDENTAL DEATHS IN AUTOPSIES OF 10 PEOPLE WHO DIED IN A STAMPEDE FROM A RELIGIOUS GATHERING IN ENUGU

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ABSTRACT

The paper aims to review traumatic asphyxia as the predominant cause of sudden accidental death in ten Nigerians who died in an overcrowded religious event popularly dubbed ‘night vigil’ in Enugu, Nigeria, and to establish the need to put standard crowd control measures in place in addition to the provision of adequate security to avoid stampede especially when large numbers of people are gathered in such events. Traumatic asphyxia hitherto has been unreported as a predominant cause of accidental deaths especially in a setting of crowded events from all forensic reviews considered originating from Nigeria. Safety and crowd control measures have hitherto been taken for granted once such organizers obtain police permits for such events.

INTRODUCTION

Gatherings of large numbers of people are very frequent events these days in Nigeria. Hundreds, thousand and hundreds of thousands of people gather in open spaces, fenced arenas, within buildings and in-door sports halls. Music concerts, political gatherings and very commonly religious ones are also inclusive of the forms of gatherings seen. A look at street posters and Television adverts indicate that religious gatherings possible constitute the majority. Professional crowd control regulations are almost nonexistent and government enforcements of regulations concerning large gathering and use of buildings and arenas for such gatherings are virtually nonexistent in Nigeria as at today. Poor crowd control, use of canister tear gas, and poor response by the emergency services have all been identified as aggravating factors in generating stampede in crowded events.¹ Communities are confronted by the low value placed on human life by the authorities whose responsibility it is to protect public interest but feel powerless to make them accountable. We report for the first time traumatic asphyxia as a predominant cause of 10 people who died in a stampede in Enugu Nigeria owing to poor crowd control measures as well as poor safety precautions especially in a setting of a religious gathering s which are very common in Nigeria where preachers easily procure government permits because they are adjudged to be apolitical but neglect to deploy adequate crowd control measures sometimes leading to fatalities mostly due to traumatic asphyxia in our case series.

METHODOLOGY

The events of March 7, 2002 is well known to all residents of Enugu, Nigeria, a city of over 5,500,000 million people according to the last Nigerian census figure of 2006. In a regular weekly religious gathering of a popular denomination an undisclosed but substantial population of

worshippers numbering up to an estimated figure of ten thousand were gathered to begin a night vigil service in a rather relatively small enclosed space in Enugu , a pseudonym for an all night religious prayer when all of a sudden some alleged they heard sporadic gunshot shots or some wide scale loud violent sounds which led to a pandemonium and an immediate stampede that killed 14 worshippers leaving others with various degree of injuries. Ten out of a total of 14 dead patients all had autopsy done on them to establish their cause of death.

RESULTS

The ten bodies were made available for autopsy comprised of 2 adult males and 8 females. The causes of death ranged from traumatic asphyxia either alone or in combination with other diseases in 6 (60%), to severe hypertensive heart disease with cerebral oedema in 2 cases (20%). In two cases the cause of death was inconclusive because the bodies was severely autolysed.

CASE1

An adult female aged approximately 37 years. The embalmed body is that of a young adult woman, 1.6M, had peripheral cyanosis, abrasive injuries over the left side of the face, left arm/shoulder, lateral side of left knee and the upper part of the shin. A similar injury is present over the right side of the back. On opening up, examination of the internal organs shows a bilateral mild hemothorax; - the lungs show extensive intra-parenchymal hemorrhage especially in the left basal lobe. - The brain is markedly edematous with bilateral cerebellar tonsillar herniation. The other organs show no remarkable changes. Primary cause of death was indicated to be Traumatic Asphyxia.

CASE 2

Another young adult female age was not given. – On the autopsy table is the body of a young adult female 1.63M,

embalmed with bruises and abrasions on the right side of the face over the bony prominences and above the brow; milder ones are present on the left. Wide abrasive injuries are also found over the left knee and shin. Examination of the internal organs reveals mild changes of autolysis. The lungs show a generalized congestion; the left ventricular wall of the heart is moderately thickened, to about 16mm, the papillary muscles are bulbous, while the valves are normal. Other abdominal viscera are not remarkable. The brain shows a marked edema with consequent marked bilateral tonsillar herniation of the cerebellum (coning) from associated features of sudden raised intracranial pressure from severe hypertensive heart disease with left sided heart failure.

CASE 3

Age not stated, a child Severely autolysed female body, appearance suggests it's that of a child. Autolysis far too advanced for any conclusion to be made on cause of death.

CASE 4

Age is not stated, young pregnant adult female, 1.55M embalmed with a linear bruise below the left breast. Examination of internal organs reveals a **gravid uterus** that contains a male fetus which measures 12cm crown-rump length. The lungs are severely congested with blood clots present within the trachea and bronchi. The spleen is enlarged (measures 16x16x10cm).The kidneys show congestion of the medulla. Other organs are not remarkable. Primary cause of death is Traumatic Asphyxia.

CASE 5

Age is not stated, Adult male, approx 38-40 years of age The body is that of a tall young adult male with a muscular build. 1.9M. On the anterior aspect of the lower part of the left leg is a chronic ulcer; a recent abrasive injury of about 6cm diameter is seen on the left knee and a bruise is also present on the right forearm. Peripheral cyanosis is noted. Respiratory system shows , mild bilateral hemothorax, hyperemia of the trachea, mild pulmonary edema, left pulmonary parenchymal hemorrhage. The heart is mildly enlarged (consistent with the body size). Examination of the head reveals a mild subgaleal hemorrhage slightly posterior to the vertex of the skull; there is **no** skull fracture. Moderate subdural hemorrhage predominant over the left cerebral hemisphere. The brain is moderately edematous. Other organs are unremarkable. The cause of death is consistent with Traumatic Asphyxia.

CASE 6

Not stated .The body is a severely autolysed one of an adult female. The only significant finding is that of the presence of clots within the pleural cavities (hemothorax). Autolysis is far too advanced for a conclusive determination of the cause of death. However, the presence of pleural clots suggests a traumatic asphyxia as the cause of death.

Case 7

An adult female , age not stated. On the autopsy table is a markedly autolysed body of a young female adult, 1.55M, abrasive injuries over both knees and the inner aspect of the left thigh. A markedly Examination of internal organs reveals nil of note by reason of the advanced decomposition. Superficial evidence suggests some injury but the cause of death is inconclusive.

CASE 8

Age not given.The body of an obese young adult female with marked autolysis. 1.6M, The only significant finding demonstrable is that of marked pulmonary intraparenchymal Hemorrhage. The other organs are markedly autolysed. The finding of severe intraparenchymal pulmonary hemorrhage is consistent with Traumatic Asphyxia as a **cause of death**.

CASE 9

The body is a markedly autolysed one of a young female adult. 1.58M. Superficial external injuries are difficult to demonstrate because of the degree of autolysis. Examinations of the chest organs show the presence of mild bilateral pleural hemorrhage (hemothorax). The spleen is enlarged, up to four times normal size, has a capsular tear on the coastal surface and is surrounded by blood clots within the peritoneal cavity (hemoperitoneum). The appearance of the cut surfaces of the partially autolysed kidneys are consistent with a state of shock **Primary cause:** Shock with associated Traumatic Asphyxia.

CASE 10

The body is that of a young female adult. 1.7M. There are **no** external signs of injury. - Examination of internal organs show a hypertrophic heart, with left ventricular wall thickness of 1.8cm, the papillary muscles are bulbous but the valves are normal (changes consistent with a severe hypertensive cardiovascular disease) .The lungs are congested and moderately edematous. The kidneys show the changes of benign nephrosclerosis (as seen in long standing hypertension). - In the brain is seen marked cerebral edema with marked bilateral herniation of the cerebellar tonsils (coning).

DISCUSSION

Ollivier² in 1837 in Paris, described a finding in autopsy of persons who had been trampled by crowds, with craniocervical cyanosis, subconjunctival haemorrhage, and cerebral vascular engorgement. He then applied the term *masque ecchymotic* to describe these features. Similar reports subsequently appeared in the French and German literature,"^{3, 4,5} but without explanation. In 1900, Perthes⁴ observed mental dullness, hyperpyrexia, hemoptysis, tachypnea, and contusion pneumonia, and, since then, petechial hemorrhages of the mucus membranes, epistaxis, hematemesis, rectal bleeding, hematoma of the esophagus, albuminuria, microscopic hematuria, paraplegia, peripheral nerve damage, amnesia, and convulsions have been described in what is now known as traumatic asphyxia in literature.^{6-10,11,12,13}

Traumatic asphyxia is defined as a rare condition presenting with cervicofacial cyanosis and edema, subconjunctival hemorrhage, and petechial haemorrhages of the face, neck, and upper chest that occurs due to a compressive force to the thoracoabdominal region¹⁴. Although the exact mechanism is controversial, it is probably due to thoracoabdominal compression causing increased intrathoracic pressure just at the moment of the event. The fear response, which is characterized by taking and holding a deep breath and closure of the glottis, also contributes to this process^{14,15}. This back pressure is transmitted ultimately to the head and neck veins and capillaries, with stasis and rupture producing characteristic petechial and subconjunctival hemorrhages.¹⁴ The skin of

the face, neck, and upper torso may appear blue-red to blue-black but it blanches over time. The discoloration and petechiae are often more prominent on the eyelids, nose, and lips¹⁶. In patients with traumatic asphyxia, injuries associated with other systems may also accompany the condition. Jongewaard et al. reported chest wall and intrathoracic injuries in 11 patients, loss of consciousness in 8, prolonged confusion in 5, seizures in 2, and visual disturbances in 2 of 14 patients with traumatic asphyxia¹⁶. Pulmonary contusion, hemothorax, pneumothorax, prolonged loss of consciousness. The treatment of traumatic asphyxia is supportive. Assisted ventilation may be required in cases of chest wall disruption, underlying lung parenchymal damage, or respiratory depression secondary to cerebral hypoxia. Subsequent treatment is directed towards other specific associated injuries mostly by surgery. There are reports of survival following traumatic asphyxia especially where chest and abdominal compression occurred within minutes and the patients were promptly taken to hospital with emergency medical and surgical interventional services¹⁴. The absence of any stand by adequate first aid and ambulance service in our case made survival in these individuals impossible. Helbing D et al reports that panic stampede is a serious concern during mass events like soccer championship games¹⁷. Despite huge numbers of security forces and crowd control measures, hundreds of lives are lost in crowd disasters each year. An analysis of video recordings of the annual pilgrimage in Makkah reveals how high-density crowds develop to turbulent dynamics and earthquake-like eruptions, which is impossible to control¹⁷. Although there are no expert witnesses there were evidence that maximum densities of 7 persons per meter square may have been approached or even exceeded especially when the violent sounds were heard which certainly would have generated that scenario. In fact, when the maximum density reaches about 7 persons per square meter, one can observe a surprising transition from laminar to longitudinally unstable flows, namely upstream moving stop-and-go waves[3] of period 45 s that can last for 20 minutes. A subsequent, transversal instability generates even turbulent like flows, characterized by random displacements of pedestrians into all possible directions up to 12 meters or more. With a certain probability, large displacements cause people to fall and to be trampled. The area of trampled people spreads in the course of time. All these were envisaged as having played out to generate the death of these individual by trampling following the stampede generated. The primary role of crowd controllers employed to manage entry into events or venues is to ensure potentially troublesome or intoxicated people don't enter and are safely managed at that point. Consideration must also be given to patrons leaving the venue or event and the various risks to crowd controllers, such as aggressive or abusive behaviour, patron illness or patron traffic management.¹⁹ There were no such crowd control personnel present at the venue when this event occurred. Besides, mention has been made of the lack of arrangement of any ambulance service and the conspicuous absence of any medical personnel or emergency response measures like an ambulance of a stand by paramedical team. The victims were mostly women and children who been weaker were more likely to

fall and be trampled upon. In conclusion we recommend that appropriate legislation be enacted to regulate public events like soccer , religious gatherings to make sure that the venues are large enough relative to the expected crowds and that the maximum numbers of 7 persons per square meter is not approached so as not to generate spontaneous turbulence that eventually lead to a stampede and trampling. Besides there should be adequate crowd control personnel and stand by ambulance services to minimize the casualties especially from traumatic asphyxia which will inevitably result with its attendant high casualty figures as in this case.

CONCLUSION

Traumatic asphyxia was the established predominant cause of death occurring typically more in the weaker sex and thus necessitating the additional enforcement of crowd control measures and other safety measures in addition to adequate security before approval is given to major gatherings irrespective of their purpose in Nigeria.

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