

Research Paper

Violence against children: A review of cases at a forensic anthropology unit, Johannesburg, South Africa

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ARTICLE INFO

Handling Editor: Wilma Duijst

Keywords:

Child abuse
Forensic anthropology
Trauma
Skeletal pathology

ABSTRACT

South Africa is experiencing a scourge of violence against women and children, with alarming levels of violence, and as such, juvenile cases are sometimes encountered in a forensic anthropological setting. The aim of this research was to assess the cases of juveniles (under 20 years) presenting at the Human Variation and Identification Research Unit (HVIRU) for a 6-year period (2016–2022), in order to assess patterns and types of cases referred. A total of 19 cases were assessed, of which 10 were 16–20 years old, 3 between the ages of 5 and 15 years and 6 less than 5 years old at the time of death. Of the 14 children with known sex, 12 were female with features suggesting that they fell prey to sexual violence. Many of the individuals were either known (and referred for trauma analysis) or identified following investigation. Of the 19 juveniles, 11 (58 %) had evidence of perimortem trauma (sharp and/or blunt), attesting to the violent nature of their deaths. Two cases had both sharp and blunt force trauma, of which one is a possible case of dismemberment. The remains of two individuals showed signs of perimortem burning, which may or may not be related to the cause of death. Three individuals had signs of antemortem (healed) trauma, which may suggest a longer period of abuse. Five of the individuals showed signs of disease – two had cribra orbitalia, while two others had various porous lesions indicative of chronic disease or malnutrition. One individual had advanced osteomyelitis, suggesting a natural cause of death. Some of these cases had unusual trauma and pathology, highlighting the contribution of forensic anthropologists.

1. Introduction

Violence against women and children is of serious concern worldwide, but especially so in South Africa where it has been described as a national emergency¹, with the homicide rate of children in South Africa reported as twice that of the global average^{2,3}. While actual figures related to child abuse and homicide specifically are difficult to come by, the South African Crime statistics for 2018/2019 reported a total of 18 644 assaults, 1184 attempted murders and 1014 murders involving children for that year. For the period of January to March 2022, a staggering 37.2 % increase in murder of children under the age of 17 years over the previous year (totalling 306 murders for the first three months of 2022) as well as 331 cases of attempted murder and 1937 of assault (with attempt to cause grievous bodily harm) were recorded^(4, 2021/2022; as quoted; figures for under 18 years not available). In their Soweto-Johannesburg study related to health and growth, Richter et al.⁵ reported that less than 1 % of children in their study sample from

Johannesburg-Soweto had not been exposed to one or other form of violence in their communities or households. These figures are not much different elsewhere in the country (e.g.,⁶). The COVID pandemic most likely made this worse, as lockdown was reported to have compromised childcare and increased abuse (e.g.,^{7,8}).

The alarming rates of violence against children is leading to high numbers of juvenile cases ending up in forensic pathology laboratories. The Johannesburg Forensic Pathology Service (Gauteng Province) facility is one of the busiest in the country. In 2019, there were 3458 cases admitted to the facility. Of these, 8.96 % were children ranging in age from 1 day to 17 years old. In the child death cohort, homicidal deaths comprised 7.42 % (n = 23) of the cases. There were 6 deaths from gunshot wounds, 3 from blunt force injuries, 3 from strangulation, 3 from neglect (child abuse), 3 from sharp force injuries and 1 from multiple injuries. Five deaths remain under investigation and is undetermined⁹.

Some of these cases, especially in cases where the remains have been

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<https://doi.org/10.1016/j.jflm.2023.102623>

Received 29 September 2023; Received in revised form 13 November 2023; Accepted 16 November 2023

Available online 25 November 2023

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buried or were severely decomposed, required forensic anthropological analysis. Forensic anthropology is often broadly defined as the science relating to the human skeleton (or decomposed human remains) found in a medical-legal context^{10,11} – i.e., where badly decomposed or skeletonized remains are found, they cannot be analysed through traditional autopsies as these mostly deals with soft tissues. Forensic anthropologists also assist in distinguishing between human and animal bones. Such remains are often unidentified, and as a first step to aid in the identification of these deceased individuals various demographic characteristics (age, sex, population affinity and stature) are described. More and more, however, remains of known individuals are also referred to forensic anthropologists who are asked specifically to assist with analysis of trauma, as they have an intimate knowledge of the human skeleton and the way in which bone reacts to various forms of trauma^{10,12}. In cases of suspected chronic abuse, an estimation of the timing or age of a fracture can also be assessed by an anthropologist through methods such as moisture content of bone, macroscopic and microscopic assessment^{13,14}.

Juvenile remains are not frequently encountered amongst forensic anthropological cases – most probably because a missing child is reported soon after disappearance, and there is usually a concerted effort made by families, communities, and law enforcement agencies to find missing children³. Nevertheless, these attempts are not always successful and according to reports by Mkize¹⁵ a child goes missing every 6 h with approximately 25 % of these children never found³. In most cases where a deceased child is discovered, the identity of the child is known, or the remains are found soon enough to allow for a traditional forensic autopsy. To our knowledge, only one forensic anthropological case report of a child from a South African context has been published before¹⁶ – in this case a known child, where the anthropological analysis was requested long after death (and burial) to assess for signs of chronic child abuse.

When forensic anthropologists are tasked with the analysis of juvenile remains, they not only assess the remains for acute trauma that may have occurred around the time of death, but also look for signs of chronic abuse. Children’s bones are very pliable and quick to heal, and therefore long-lasting signs of abuse are few and difficult to detect. From their series of cases, Walker and colleagues¹⁷ emphasized five signs in skeletonized remains that are suggestive of chronic abuse. These included subperiosteal new bone formation, disruption of healing by multiple trauma, multiple fractures, fractures in different stages of healing, and growth disruption. In their series of cases from the US and South Africa, Steyn et al.¹⁸ also found many cases of children with cribra orbitalia – a condition that presents as porosity in the roof of the orbits, resulting from chronic disease, anaemia and/or malnutrition^{19–21}.

There are a few forensic anthropology laboratories in South Africa, with one of these operating under the auspices of the Human Variation and Identification Research Unit (HVIRU) at the School of Anatomical Sciences, University of the Witwatersrand (Wits). This laboratory mainly services Forensic Pathology Services from the South-Central Gauteng region, but cases from other regions of the country are also sometimes referred here. All forensic anthropology units in South Africa are associated with large South African universities.

The aim of this paper is to report on forensic anthropology cases involving juveniles analysed through HVIRU, in order to firstly demonstrate the plight of children in South Africa, but secondly to also highlight the contributions that forensic anthropologists can make in cases of abuse and murder of children.

2. Materials and methods

HVIRU has formally been involved in forensic anthropology case analysis since April of 2016, and in this paper all cases under the age of 20 years, dating to May 2022 (a period of ±6 years), were included. It should be kept in mind that it is never possible to give an exact age of an individual based on the skeleton alone, and the age estimates are always

provided as a range – the younger the child, the narrower the range¹⁰. It should also be kept in mind that in some cases the child was known, usually in cases that were referred to for trauma analysis.

In this paper we provide a summary of cases received and also include five case reports outlining various aspects of interest relating to disease and trauma. Standard anthropological methods were used to analyse all cases (e.g.,^{10,22,23}). As it is very difficult to estimate sex and population affinity in young children, the focus as far as demographic characteristics is concerned are often on an accurate age estimation. Here, we used both dental^{24,25} and skeletal development²⁶. In older post-adolescent individuals, the secondary sexual characteristics have started to develop, and sex can be estimated using the pelvis and skull²⁷. In adults, stature estimation forms part of the demographic analysis, but in children the focus is more on long bone (diaphyseal) length as representative of growth and nutrition and not stature estimation. For this purpose, South African data standards^{28,29} were used.

All cases were assessed for signs of trauma, which in forensic terms are usually described as blunt force (BFT), sharp force (SFT), and high velocity (gunshot) trauma. Remains were also assessed for taphonomic alterations (for example burning), and signs of disease and malnutrition (e.g.,^{30,31}).

3. Results

Out of a total of 164 cases analysed at HVIRU from April 2016–May 2022, 19 (11.6 %) involved juveniles and children less than 20 years of age (Table 1). These ages and sexes are mostly estimated (based on osteology), but in a few cases they were known individuals who were referred for trauma analysis or sometimes enough soft tissue was available for sex to be identified. Most of the juveniles (53 %) were in the 16–20 years age category, and almost all of them (where sex was known) were female. Several small children under the age of 5 years were the next most frequent group, with the age group of 11–15 years comprising one individual only. Of the 10 children with known population affinity, 9 were of Black South African and one of White South African origin.

Eleven juveniles (58 %) had evidence of perimortem trauma, attesting to the violent nature of their deaths. The remains of two individuals showed signs of perimortem burning, which may be related to the cause of death or the concealment of the remains. Three of the cases had signs of antemortem (healed) trauma, which may suggest a longer period of abuse.

It was interesting to note that several of the children showed signs of disease and malnutrition. Five of the individuals showed signs of disease – two had cribra orbitalia, while two others had various porous lesions indicative of chronic disease or malnutrition. Two of the individuals had very severe dental lesions, probably related to dental decay (Fig. 1), while one had advanced osteomyelitis and will be discussed in more detail below.

3.1. Highlighted case studies: case 1

In late 2019, an adult male was arrested in the Gauteng Province of South Africa for the suspected murder of his daughter and son. The deceased children were buried in a shallow grave for approximately 3 weeks before being exhumed. One of the victims was a girl of 11 years, and although decomposed, a medico-legal postmortem examination revealed the cause of death as multiple stab wounds of the neck. The

Table 1
Age and sex distribution of juvenile forensic cases.

Age	n	Sex (where known)
0–5 years	6	1 female, others unknown
6–10 years	2	1 female, 1 male
11–15 years	1	female
16–20 years	10	7 female, 1 male, 2 unknown

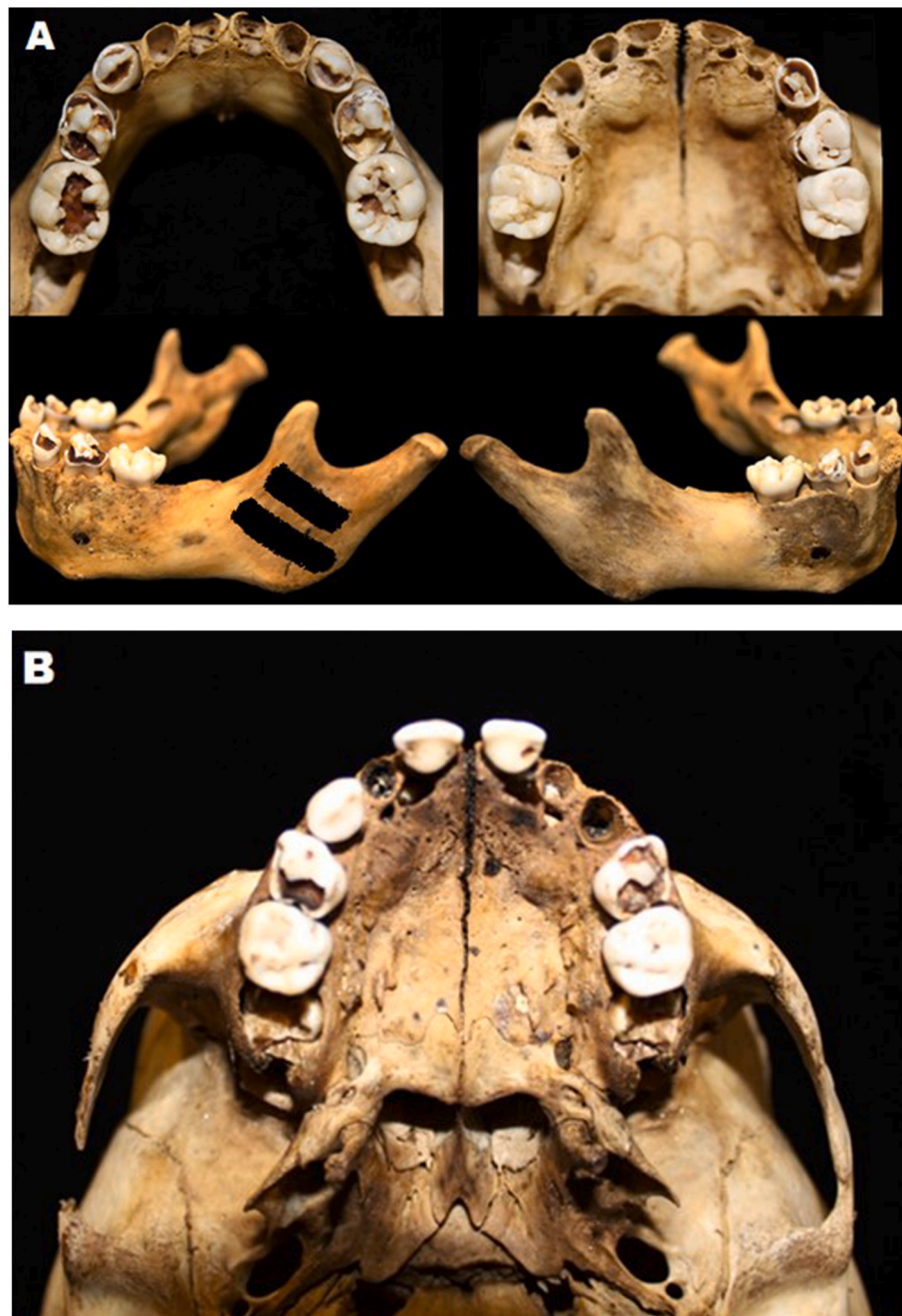


Fig. 1. Dental lesions in (A) a child of 3 ± 1 years; and (B) of 4 ± 1 years.

second victim was a boy of 10 years old, where the medico-legal post-mortem examination did not reveal a cause of death due to severe decomposition. In view of the history that the female had sustained fatal stab wounds, the case was referred for anthropological analysis after gentle maceration.

The remains comprised of a near complete skeleton of one juvenile individual of whom all major long bone epiphyses were completely unfused. A mix of deciduous and permanent teeth was present, and the combination of erupted teeth suggested an age of about 8–11 years at the time of death^{24,25}, in line with the reported age.

Evidence of sharp force trauma was found on several of the bones. On the skull, a stab/puncture type of wound was observed near the right lambdoid suture, at the back of the skull about 43 mm from the lambda (Fig. 2A). This wound perforated the inner table of the skull (Fig. 2B) but did not penetrate deeply into the skull. On the left clavicle, three parallel

incisions were observed on the inferior surface of the left clavicle, near the medial end (Fig. 3). These lesions may indicate repeated trauma in the area or may have been caused by an unusual type of instrument. It has been confirmed that these marks were not inflicted during the cleaning/maceration of the remains, as no sharp instruments have been used during the cleaning process.

A cut/stab type of wound was noted on the 7th cervical vertebra, on its right, anterior side, through the anterior bony rim of the transverse foramen (Fig. 4A). This caused a complete discontinuity, with a green bone response and some plastic deformation. This injury could potentially have been deadly, as it could have severed several major blood vessels in the neck region and/or the vertebral artery and vein running inside the vertebral foramen.

A small, stab/puncture type wound was also observed in the anterior surface of the body of the 2nd lumbar vertebra (Fig. 4B). This would

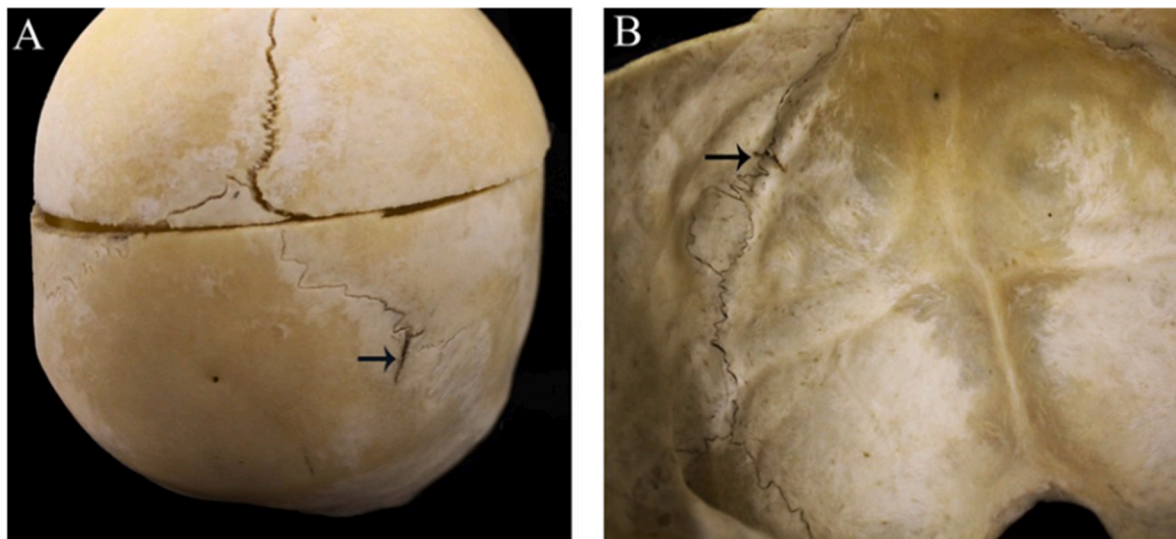


Fig. 2. Sharp force trauma to the cranium; (A) external surface of cranium and (B) internal aspect of the cranium.



Fig. 3. Sharp force trauma on the inferior side of the left clavicle.



Fig. 4. Sharp force trauma; (A) through the right transverse foramen (C7) (inferior view) and (B) on the right anterior side of the body of L2.

suggest that the victim was stabbed from the front, with the weapon of assault entering the anterior abdominal wall and traversing through abdominal organs, and possibly puncturing the abdominal aorta and/or inferior vena cava. This could therefore also have been a potentially lethal injury. A possible cut mark/incision was observed on the superior, rounded edge of the right 4th rib, in the midshaft region. This defect was quite small, and no reciprocal lesion was seen on the inferior side of the 3rd rib. It seems possible that the weapon did not enter the thoracic

cavity here.

The sequence of the injuries could not be established. It is not clear which of these injuries were the cause of death, but potentially both the wound low in the neck, on C7, as well as the abdominal wound could have been lethal. The other wounds could have caused bleeding that may have resulted in death if untreated but is unlikely to have done so acutely. The fact that some of the wounds (e.g., the skull wound) were inflicted from the back, whereas others (e.g., the abdominal wound)

were from the front, would seem to indicate that the victim attempted to defend himself or tried to get away. The anthropological analysis thus enabled the cause of death determination as multiple sharp force injuries.

Active cribra orbitalia was noted in both orbits. This would suggest that the child may have been malnourished or chronically ill. No areas of subperiosteal bone growth were noted, which is often also a sign of poor health.

The accused was found guilty of 2 counts of murder and sentenced to life imprisonment for each of the murders. The presiding judge commented on the value of the forensic anthropology report in contributing to the final verdict. This case clearly illustrates the value of forensic anthropology, knowledge of juvenile anatomy and expert knowledge and experience in the cleaning and preparation of remains for anthropological analysis. Imaging modalities were unlikely to have picked up the fairly subtle signs of SFT, especially something like the small lesion on the lumbar vertebra and thus the analysis of the cleaned remains was crucial.

3.2. Highlighted case studies: case 2

In 2016, the burning remains of a juvenile individual were observed in a trash bin next to a bus station in Johannesburg, with underwear (age tag 3–4 years) stuffed into the oral cavity. The remains were partially fleshed but severely burnt upon discovery and were macerated prior to analysis. The clothing and burnt soft tissue suggested that the deceased was a female.

The remains were near complete but charred (Fig. 5), indicating exposure to fire while still fleshed. The skull was fractured along the



Fig. 5. The cranium of Case 2 in anterior view. Note the severe charring on the right side of the cranium.

coronal suture, and only the left side of the mandible was present with the other half presumably either not recovered or completely destroyed by the burning. The individual was clearly a juvenile, and all major long bone epiphyses were unfused. Based on the pattern of dental eruption and development, an age estimate of $7.5\text{--}8.5 \pm 1$ year was made^{24,25}. This age estimate was broadly confirmed by the development of other skeletal elements, including the complete fusion of the occipital bone²⁶. Long bone lengths, according to Kidstats provided an estimate of 6.58–10.56 years (point estimate of 8.44 years; 94.8 % accuracy)^{28,29}. This child was thus most likely between the ages of 7.5 and 8.5 years (± 1 year), and much older than what the age tag on the underwear would suggest.

Estimation of sex is extremely difficult in juvenile remains, as the secondary sexual characteristics had not yet developed. Using Kidsstats which is based on long bone dimensions, the individual was classified as female (with 98 % accuracy relative to the individuals in the database)^{28,29}. This diagnosis remains tentative, and no firm conclusion could be drawn. However, the visible clothing also suggested a female.

No signs of disease could be observed in the skeleton. Evidence of peri-mortem (fleshed) burning with heat lines and heat borders was present, especially around the anterior left femur, left distal tibia, proximal right tibia, vertebrae, ribs, scapula and the cranium and mandible. Parts of the skull around the right frontal and temporal regions and right maxilla were missing. Somewhat unusual is the fact that burning could be observed on the inside of the skull around the area of bone defects (Fig. 6). In burnt cases, anthropologists are looking for signs of “abnormal” burning^{10,32}; i.e., suggesting that burn patterns do not follow the expected patterns. In this case, the charring on the inside of the cranium could suggest that (a) either the heat was very intense, so that the bone in this region was completely burnt away and progressed to the inside of the cranium, or (b) that there was a pre-existing defect (fracture) in the area that allowed discolouration/burning to easily proceed inside the cranium.

In summary, the remains comprised of the skeletal elements of a juvenile, female individual who was probably around 7.5–8.5 (± 1 year) years of age at death. The remains were exposed to fire while still fleshed. The possibility of the pre-existence of a fracture to the cranium (prior to exposure to fire) should be considered but unfortunately the destruction of the cranium made it difficult to better analyse any possible fracture patterns. As far as is known, this child was never identified.

3.3. Highlighted case studies: case 3

The decomposed remains of an individual wearing a black tracksuit was found in 2015 next to a railway line in the East Rand region of Gauteng. The individual was unknown at the time, and no other information was available. The macerated remains comprised of a near complete human skeleton of one individual. Some of the elements were fragmented (right clavicle, metacarpals) and showed evidence of animal gnawing. The individual was clearly a subadult, as the full set of permanent teeth had not erupted yet and some of the epiphyses were still open. The skeletal and dental characteristics indicated an individual who was most probably between 16 and 19 years at the time of death. The skeletal characteristics tentatively suggested a male individual^{27,33}.

As the individual was deemed old enough, a FORDISC analysis was performed. FORDISC is a programme that is used to assess population affinity, by comparing cranial measurements of an individual with those of various groups represented in its database using discriminant functions. Standard measurements were entered into the FORDISC3.1 (FD3) programme and compared to a sample of black, mixed ancestry (“coloured”), and white South Africans³⁴. The programme has several shortcomings, as it will force a classification of the unknown into one of the reference groups, even if it does not belong to any of these groups. However, when this happens, the programme alerts the analyst by showing very low posterior probabilities and typicalities. The analysis



Fig. 6. Inside view of the cranium. Note the unusual discolouration/burning inside the cranium (right side).

done for this individual suggested a population affinity of White South African with a 99.9 % posterior probability and high typicality. Fig. 7 shows the outputs of the analysis, with the circles representing the three main groups used for comparison.

Several perimortem, blunt force injuries were observed in the thoracic region. Some of the ribs were absent and many were broken. The right sided ribs 2, 3, 4, 5, and 7 were fractured posteriorly (rib 6 intact). Of these fractured ribs, rib 5 showed an incomplete fracture whereas the others were completely fractured. On the left side, ribs 3 and 4 were completely fractured posteriorly, with ribs 5–8 showing

incomplete fractures, rib 9 a complete fracture and ribs 10 and 11 incomplete fractures (Fig. 8A).

Of the vertebrae, only the cervicals and L2–5 were completely intact. The right sided transverse processes of T1 – L1 were all fractured. In addition, a partial fracture of the body of T7 was observed; a complete fracture with separation of the laminae and spinous process from the body was observed in T8; T9 had a fracture through the right pedicle; T10 had a fracture through the body and both pedicles; T11 had a fracture through the body and the right transverse process; T12 had a fracture through the spinous process and L1 a fracture of the spinous

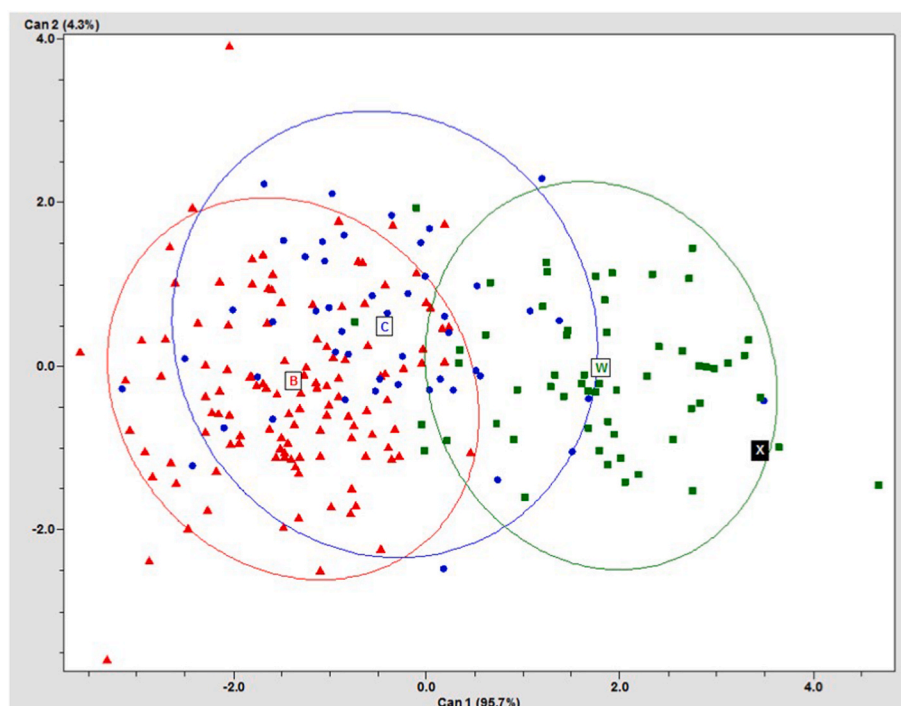


Fig. 7. Outcome of the FORDISC analysis, with the black X indicating the classification of this case. (B = black, C = coloured, W = white).



Fig. 8. Fractures observed in (A) the rib cage, both sides, predominantly near the vertebral ends and (B) the thoracic vertebrae 7 to 11.

process (Fig. 8B). The blade of the right scapula also showed a fracture.

In conclusion, the remains were those of a 16–19 year old male individual, of white/European origin. Extensive perimortem injuries of the thoracic region were evident, with many complete and incomplete fractures of the ribs and vertebrae. These injuries are suggestive of blunt force trauma.

The individual was subsequently identified through DNA analysis. He was an adolescent boy who had apparently left his house to visit family, but never arrived there. His remains lay undiscovered in the field for several months. Although the exact cause of his death cannot be determined, it can be surmised that he may have been hit by a large moving object (e.g., train or motor vehicle), causing extensive blunt force trauma to his torso.

3.4. Highlighted case studies: case 4

The remains of this individual were found in a shallow grave in 2017 in an open area where maize and peanut crops were being grown. The remains were completely skeletonized and were found by a man who was farming the land. It comprised of an incomplete and poorly preserved skeleton of one juvenile individual. The cranium was fragmented and damaged and could not be reconstructed, but the mandible was intact. No bones of the pelvis or lower limbs were present, and likewise

the left scapula, right humerus, some of the ribs and some of the vertebrae were absent. The bones were in a poor condition, with weathering and fragmentation. Roots and root etching could be observed on the inside of the cranial diploe, suggesting that the remains were buried for a considerable time period.

The individual was a juvenile, as could be observed from the fact that only deciduous teeth were present and all long bone epiphyses were unfused. The parts of the occipital bone were unfused²⁶, suggesting an age of less than 3 years. In the mandible, all the deciduous teeth had erupted and were in occlusion, while in the maxilla the second deciduous molars were partly erupted. These characteristics suggest an individual who had probably been 2.5 ± 1 years at the time of death²⁴.

Due to the young age of the individual, no attempt was made at osteological sex or population affinity estimation. When the diaphyseal lengths of the long bones (humerus ± 131 mm; radius ± 102 mm) were assessed against the average midpoint relative to the age of the individual, it seems that the growth of this individual was delayed compared to what would be expected at that age^{28,29}.

Extensive pathological changes of the left ulna were present, with deformation of the bone (Fig. 9). The ulna showed some hypertrophy and extension and new bone growth in its distal third aspect, which was most probably caused by osteomyelitis. Considerable subperiosteal bone deposition was observed over a large area, which contributed to the



Fig. 9. Left-sided ulna (top) and radius (bottom). Note the advanced osteomyelitic changes of the ulna with extensive deformation and new bone deposition. The radius is also affected.

deformation of the bone. The distal part of the bone was absent postmortem, and there was no clear evidence that the infection resulted from a fracture of the bone although that possibility should be considered. The associated radius was also deformed, with subperiosteal bone deposition evident. Slight cribra orbitalia was observed, which suggests chronic anaemia or disease.

The cranium could not be reconstructed as it was too fragmentary. Traumatic changes were present on the left side of the cranium (Fig. 10), in the form of a linear fracture across the left temporal bone. This stretched into the left frontal and sphenoid bones, in the region of the pterion. Some plastic deformation was present in this area, suggesting that the bones were still somewhat pliable at the time the trauma occurred. However, these injuries most probably occurred postmortem and the possibility that they were acquired during excavation (e.g., with a linear, sharp object hitting the cranium) should be considered.

The conclusion in this case was that the remains belonged to a child of about 2.5 ± 1 years old of which sex and population affinity could not be determined due to the young age. This child was severely and chronically ill, with advanced osteomyelitic changes to the left forearm. In a case such as this, the possibility should be considered that the individual died of disease and that it may not be of forensic interest. However, as it was buried in an unmarked grave it still required forensic investigation. The trauma observed on the cranium in this case demonstrates the difficulty of distinguishing between peri- and postmortem trauma, especially when some green bone response (elasticity of bone) is still present¹³. This child remains unidentified.

3.5. Highlighted case studies: case 5

This case is one in a series of cases from the same perpetrator, who murdered 5 females between January 2018 and May 2019 in the Mpumalanga Province of South Africa. The accused was found guilty of the murders in February 2022. All victims were late adolescent or young adult South African females. The crimes were uncovered when the police tracked the cell phone of one of the victims which led them to the residence of the accused. The accused had buried the victims in the garden of his home. The Victim Identification Centre (VIC) of the SAPS requested the maceration and skeletal analysis of two of these cases, one

of which is reported on here³⁵.

The remains presented for skeletal analysis were almost complete. Not all long bone epiphyseal closures were complete and some recent closure with visible epiphyseal lines were noted on various bones which suggested an age of 16–23 years (Schaefer 18.3–22.0 years^{36,37}. The sternal ends of the fourth ribs and the pubic symphyses were also assessed and were consistent with an individual aged between 15 and 24 years of age^{38,39}. All the third molars (except the left maxillary third molar which was lost postmortem) were fully erupted and in occlusion which in southern African individuals occur at about 17.5 years²⁵. Based on the overall skeletal age assessment, this individual was estimated to be between 18 and 22 years of age.

Morphological features of the pelvis including an elongated pubic bone, subpubic concavity and narrow ischiopubic ramus^{10,40} and of the skull including a smooth glabellar region and sharp supra-orbital margins⁴¹ were indicative of a female individual. As research by Ross and Williams³³ have suggested that cranio-facial maturity is complete from 14 years of age, cranial measurements in conjunction with a South African custom database in FORDISC 3.1³⁴ was used to assess sex and population affinity (Fig. 11). A discriminant analysis for both sex and ancestry, using eight Forward Wilks stepwise selected variables, indicated closest affiliation with South African Black females (56.1 % posterior probability, significant typicalities and a cross validated accuracy of 59.0 %).

Blunt force trauma was noted to both the cranium and mandible. A single large perimortem circular depressed fracture was visible at the site of impact on the left frontal and parietal bones, running across the coronal suture. The depressed fracture measured ± 3 cm in width and ± 4 cm in length and was characterised by the inward displacement of the fractured bone. Radiating and concentric fractures (Fig. 12), consistent with failure under tensile stress were noted. An incomplete perimortem fracture consistent with blunt force trauma was also noted on the left gonial angle of the mandible with the angle slightly displaced internally, suggesting an external force to the angle (Fig. 13) and subsequent failure in tension. A shaving defect consistent with sharp force trauma was noted on the posterior aspect of the squamous part of the left temporal bone. The oblique linear defect was ± 1.5 cm in length and ran from superior to inferior (Fig. 12). The possibility that this shaving



Fig. 10. Cranium in left sided view. Note the linear injury to the temporal bone (arrows), and the associated trauma/postmortem damage more anteriorly.

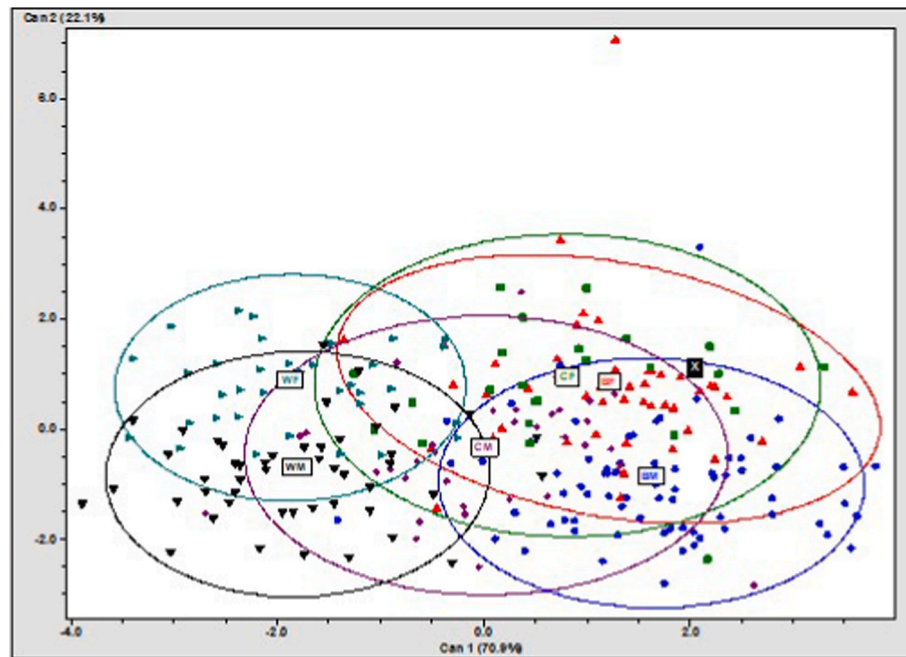


Fig. 11. Outcome of the FORDISC analysis, with the black X (unknown individual) indicating closest association with black females (BF = black female, BM = black male, CF = coloured female, CM = coloured male, WF = white female, WM = white male).

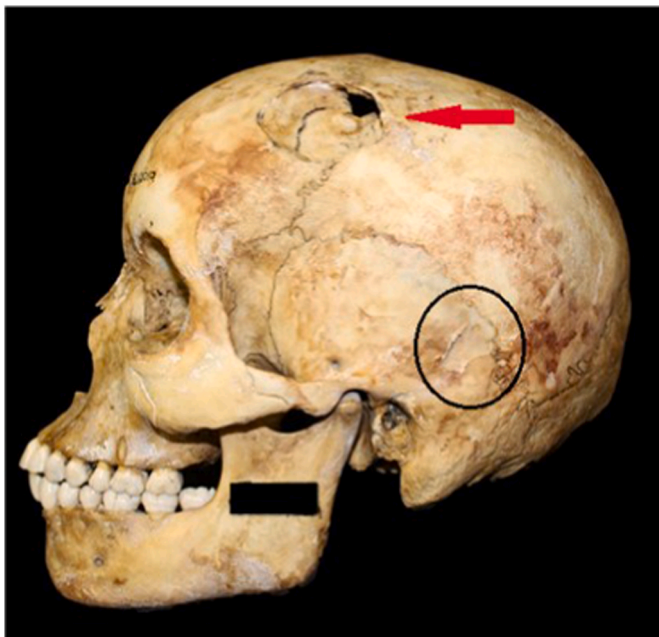


Fig. 12. Left lateral view of skull of Case 5. Note the depressed blunt force trauma across the coronal suture (red arrow) as well as the sharp force trauma on the squamous part of the temporal bone (encircled in black). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

defect was produced during maceration should be considered.

In summary, the remains belonged to a female individual aged between 18 and 22 years that sustained blunt force trauma to the cranium and mandible. The individual was subsequently identified.

4. Discussion

Similar to what Mathews et al.² found in an extended



Fig. 13. Internal view of mandible showing blunt force trauma/fracture to the left gonial angle of the mandible (arrow).

mortuary-based study on homicides among juveniles in South Africa, most of our cases occurred in the very young (less than 5 years) and late adolescent group. Here, juveniles were deemed to be individuals younger than 20 years whereas in the Mathews et al. study only individuals younger than 18 years were included. Our definition was slightly wider, as it is difficult to do exact age estimates in a forensic anthropological setting. In contrast to what was found by Mathews et al. where most adolescent deaths were amongst boys, in our study we found females (especially adolescent females) to more often be the victims.

This is most probably related to the types of cases that end up in a forensic anthropological setting – it is possible that sexual violence played a role, with the perpetrator then trying to hide the body. This then results in a delay until the discovery of the body, causing varying degrees of decomposition, thus making identification more difficult.

In our study, BFT was the most common kind of trauma observed (in at least 8 cases), followed by SFT (in two cases, possibly 4). Similarly, Mathews et al.² found these two types of trauma to be the most common, although they also recorded victims of gun shots and other causes. They also reported that many of the children were killed by people known to them – parents, care givers, acquaintances etc. This was true for two of our cases that could be ascertained – one was a girl of about 13, seen to be leaving school in the company of a known male individual – later to be found with blunt force trauma to the head. In another case (Case 1 described here), the boy was stabbed to death by his father.

The occurrence of signs of disease such as cribra orbitalia, as well as the signs of healed trauma in many of the juveniles discussed here, support the notion that children ending up in a forensic anthropological setting are often not healthy/well-nourished¹⁸. Mathews et al.² found that the deaths of nearly half of their cases were preceded by abuse or neglect – this pattern seem to hold true for our group as well. It should be taken into account that injuries heal quicker in children^{42–44} and that there may have been more individuals with antemortem trauma but where complete remodelling has taken place and is no longer detectable. In our study though, at least one juvenile may have died of natural (pathological) causes, with the parents most probably not reporting the death and burying the body outside of a formal cemetery.

Of the 14 children with known sex, 12 were female. Many of these were in the 15–20 years age group, and it can be surmised that they possibly fell prey to sex-related violence in more secluded areas. It was also disturbing to note that 11 of the 19 individuals showed signs of perimortem trauma, indicating the violent nature of their lives and deaths. Most of the BFT cases presented as cranial fractures, probably suggesting that these individuals were killed by a blow to the head with a blunt object. Rib fractures were also common and occurred in 3 cases. Two of the individuals with blunt force trauma also had evidence of sharp force trauma – in one case a possible attempt at decapitation, and in another (Case 5) a shaving defect which may have been associated with the maceration. Two individuals had sharp force trauma only – one is Case 1 described above, while another is a case with chop marks on a humerus. Two individuals showed signs of thermal destruction, with Case 2 also possibly having a perimortem cranial fracture (not included in the 8 quoted with BFT due to the ambiguous nature of the injury). In this case the body was most probably set alight after death in an attempt to destroy it.

Adult forensic cases analysed from the same time cohort (2016–2022) included 40 individuals (24.4 % of total number of cases) that presented with perimortem trauma. If considering only adult cases, 27.6 % of individuals suffered perimortem trauma, which is roughly half of what was reported for juvenile cases (58 %). This emphasizes the level of violence sustained by these children that ultimately resulted in their deaths. Blunt force trauma was the most frequent type of trauma inflicted in both adults and children, followed by sharp force trauma. Blunt force trauma speaks to impulsive violence, rather than a well-planned act of murder. The trauma type/pattern observed in these cases thus typically links to abuse and inter-personal violence.

Due to their intimate knowledge of osteology, and specifically juvenile osteology, forensic anthropologists can make significant contributions in juvenile homicide investigations. In Case 1 the forensic anthropological report was mentioned specifically in court, also as to how it assisted in providing a cause of death (multiple sharp force trauma) which may not have been possible without careful maceration and analysis. It is interesting that although subpoenas for forensic anthropologists to appear in court are sometimes received, in none of these cases were we ever actually called to court to testify. At this point in time, in South Africa, it seems that the reports are accepted without

serious cross-questioning by the defence.

The epidemic of violence against children in South Africa is continuing unabated. Despite many voices of protest from a variety of sources, the political will to change this seems to be lacking. This is reflected in the fact that so many of these children remain unidentified, as the investigations into their deaths are for the most part, inadequate. For the time being, at least, it seems that this situation will remain unchanged. We hope that this paper will add to the voices of those that demand firm action against the violence against children, as well as proper prosecution of the perpetrators.

Declaration of competing interest

The authors declare that we have no conflict of interest. No funding was received for this research. Ethics clearance has been obtained.

Acknowledgements

No funding was received for this study. We would like to thank our colleagues and students from Forensic Pathology for their dedication with the careful cleaning and maceration in this regard. In particular, we would like to mention Trish Mahon and Alison Gilbert. We are also indebted to Ms R Masiu for assisting in the laboratory. Unfortunately, it was not possible to obtain permission for the publication of the case studies from the next-of-kin of the victims, but an Ethics Clearance Certificate (No. M220877) for this study was obtained from the Human Research Ethics Committee, Faculty of Health Sciences, University of the Witwatersrand.

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