Sharing Features in Archaeological and Crime Scene Investigations: A Comparative Methodological Analysis of Human Remains at Nguvu-Kazi in Mang'ola, Northern Tanzania

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Abstract

This paper outlays preliminary archaeological investigation on human remains exhumed at Lake Eyasi basin in Mang'ola, Arusha Tanzania. The study intended to underscore the complexities of burial practices in terms of burial styles, chronological sequences of burial cairns, human remains biological profile, pathology and morphological variations. The field excavation of burial graves was carried out at the Nguvu-Kazi, almost three kilometers southeast of Mumba rock-shelter, on the foot of Laghangereri-Ishemjega hill. The graves were tightly clustered in an area of about 60 square meters. Each grave was covered over with sizeable angular stone slabs to the height of about 50 cm above the ground surface. Buried individuals were poorly preserved and highly fragmented from geomorphological processes and anthropogenic actions. The human remains were directly placed underneath of the stones. The graves were therefore not interred so much in the ground. Corpses were buried between 20 cm and 50 cm deep and covered with piled large gneiss slabs. Such burial practices caused severe postmortem trauma leading to the deterioration, fragmentation and crumbling of human remains. Poorly preservation conditions of collected human remains and lengthy duration from the date of burial to the date of the reburial posed severe challenges as long bones were highly fragmented. These accumulated results provide primary results that may contribute significantly to crime scene detective procedures.

Key words: Archaeological skills, Burial cairns, Crime scene, Investigation

Introduction

The Lake Eyasi Basin is an important fossiliferous deposit situated in the southern end of the East African Rift Valley (EARV) in northern Tanzania (Figure, 1). The Basin contains numerous open-air sites and rock-shelters with stratified archaeological records, ranging from the Middle Stone Age (MSA) to the historic period. The Neolithic and historical sites are widely distributed in the rock-shelters scattered around the Precambrian inselbergs, which run parallel to the dominant northeast-southwest tectonic direction. These include a number of rock-shelters, namely Mumba, Njarasa, Eshau, Gishimangeda (Kisimangeda) and Shemjega (Kohl-Larsen, 1958; Ikeda & Hayama, 1982; Mehlman, 1989; Domínguez-Rodrigo et al., 2007). These shelters have been part of the human existence ever since the beginning of the Upper Pleistocene around 130,000 years ago (Mehlman 1989; Bushozi et al., 2017, 2020). The sites preserve thousands of stone artefacts, fossil bones, mollusc shells, stone and shell beads, human skeletons and ancient rock art. In more recent levels, historical objects such as pottery, slag, beads and early Iron Age materials are extensive (Mehlman, 1989). The lowland plain, including the sloping edges of Langhangerer-Ishemjega Hill and Oldean Mountain, exhibit unique burial cairns and stone enclosures (Kohl-Larsen, 1958; Mehlman, 1989). In the Basin, burial cairns and stone enclosures have also been reported at Eshigesh Hill, Mumba rock-shelter, Olpiro, Oldogom, Kisimangeda, Sechikuencho, Nguvu-Kazi, Jangwani I, Jangwani II, Barjomajega and Ngorongoro Creator (Kohl-Larsen, 1958; Fosbrook, 1950; Ikeda & Hayama, 1982; Mturi, 1978; Mehlman, 1989; Sutton, 1998).
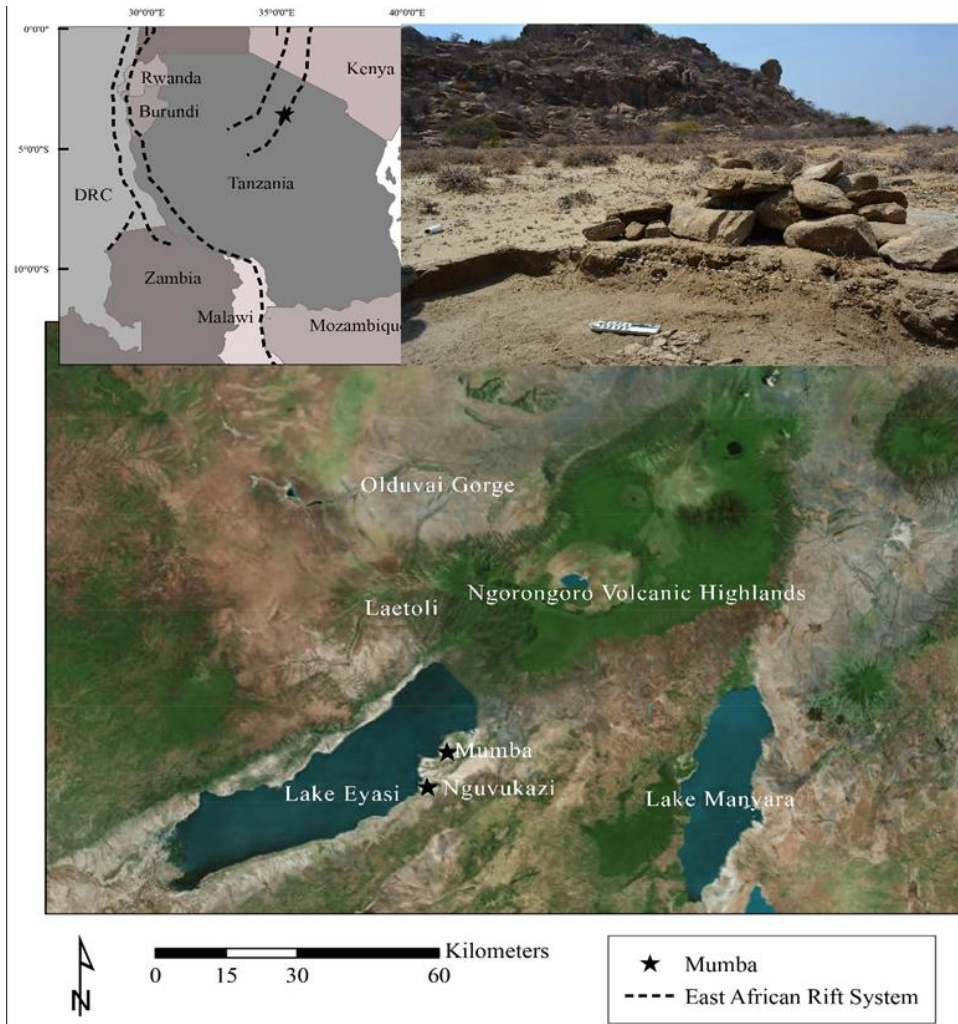
Figure 1. Map of northern Tanzania indicating the location of the exhumed burial cairns at Nguvu-Kazi and Mumba rock-shelter in Lake Eyasi Basin.

The exhumed burial cairns of Nguvu-Kazi give an impression of being related to the burial mounds at Ngorongoro Creator (Sasson 1968; Mturi, 1978), and other Pastoral Neolithic sites and Iron Age sites across the Lake Eyasi Basin (Kohl-Larsen, 1958). They are represented by a cluster of graves piled with stone slabs up to a half meter in height (Kohl-Larsen, 1958; Mehlman, 1989). Most burial cairns are irregular, circular, and clustered together. In each instance, concentrated burials seem to have been simply placed on the circular hole of about 20-30 cm below the surface and piled with gneiss slabs on top (Kohl-Larsen, 1958; Mehlman, 1989). The enclosing boundary of a circle covers a mean diameter of 1.5 m (Ikeda &

Hayana, 1982). What is especially noteworthy is that buried individuals in the Lake Eyasi Basin can be held to determine postmortem trauma from burial practices and geomorphologic processes. Evidence from Nguvu-Kazi indicates that archaeological undertakings resemble systematic procedures for investigating crime scenes (Koen & Goetz, 2017).

Study area and methodological procedures
Nguvu-Kazi burial cairns (3ͦ 55'29" S, 35° 26'95" E) are situated 3 kilometers southeast of Mumba on the sloping edge of the Laghangarer-Ishimjega Hills that run parallel along the north-south eastern littoral (Figure, 1). The Hill is part of the diorite and gneiss horst outcrop 1050 meters above the sea level. Previous and recent excavations at Nguvu-Kazi reveal fragmentary human remains and cultural ruminants underneath the piled stone cobbles combined to express ancient funeral practices and associated personalities (Kohl-Larsen, 1958; Mehlman, 1989). The intention to examine the burial graves in this place was drawn from the previous studies (Kohl-Larsen, 1958; Ikeda & Hayama, 1982; Maturi, 1978; Mehlman, 1989), in order to attain a better understanding of their chronology, cultural affiliations and postmortem trauma. All the graves were systematically mapped using Total Station and Global Position System (GPS) devices in which a total of 43 piled cairns were recorded. Associated artefacts such as stone tools, potsherds, shell fragments, beads, ficus fruits, and crown eggs were mapped out before being collected for further analyses (Eren et al., 2014).

Human remains presented in this article were collected during excavations carried out in 2019 at Nguvu-Kazi burial cairns (Figure 2). Like other burial cairns across the region, the Nguvu-Kazi burial cairns exist in circular and tightly clustered forms (Figure 2). They are covered with large slabs with a radius of a mean diameter of 1.5 m. linear measurement of the cairns' heights measured reached about half a meter above the surface. Human remains were apparently well fragmented, probably due to burial procedures and practices. It seems that the human remains were not interred so much from the ground and were covered over with piled stones.

Figure 2. A mound of rough stones piled together as a landmark of burial cairns at Nguvu-Kazi in the Lake Eyasi Basin

The excavation procedures followed both cultural and natural strata whereby cultural sequences were subdivided into 5 centimeters (cm) spits and went down almost 60-100 cm below the surface. Vertical and horizontal excavations procedures were used to exhaust buried individuals. The exhausted burial cairns were mapped in two meter transections. The trench was further extended in different directions depending on the orientation of buried individuals (Fulginiti, 2014). The excavation processes involved a detailed description of sedimentary deposits, reassessment of burial practices, and collection of all associated archaeological materials, including reliable samples for radiocarbon dating.

Sediment samples for lithological description, archaeological artefacts, human remains and samples for radiometric dating were collected within clear stratigraphic contexts to permit the development of an accurate chronology (Bushozi et al., 2017). All potential cultural and human remains were plotted using the Total Station device, and soil samples for lithological analysis were collected from all units to assess the burial processes. Sediments were sieved in a 5 mm wire mesh to recover small bones, cultural objects and other micro-remains that could pave the way to a better understanding of the causes of death and other geomorphologic processes.

All collected samples were bagged separately to permit adequate and satisfactory interpretations.

In the course of excavation, all identifiable archaeological materials, including human remains, stone artefacts, charcoal, mollusk fragments, cowrie eggs and beads made on stones and ostrich eggshells, were carefully measured and plotted across the trench before being collected. They were further sorted then bagged separately—such attempts aimed at giving an excellent resolution for recovery data. Margins of the excavated graves were routinely enlarged to recover the interred parts of human remains in primary contexts. Four graves were test-excavated; one of which was found to contain remains of two individuals oriented in eastern and southern directions. The rest contained a single person. Two burials were found associated with cowrie eggs placed underneath the body at the proximal and distal end of the grave. The cowrie eggs were also found in the burial cairns in Ngorongoro (Sasson, 1968; Mturi, 1978), giving an impression that cowries had cultural connotations to the ancient inhabitant of Lake Eyasi Basin. Two remains were found situated in a contracted sitting position with the face towards the east. The rest were flexed and placed on their sides oriented towards the east. All excavated burials were associated with archaeological artefacts buried alongside human remains. Archaeological materials in burial scenes have been considered consequences of the burial infill (Mehlman, 1989), but sometimes they represent cross-domain cultural traits such as wealth, respect, or devotion to corpses.

In the course of excavations, the researchers also collected soil samples for lithological identification and geochemical analysis (Bushozi et al., 2017, 2020). Lithological contexts associated with burials were examined based on soil colour, matrix, textures, and anthropogenic actions. Sedimentary deposits are typically characterized by fine Aeolian silt sand and loamy alluvium sediments mingled with anthropogenic deposits with abundant cultural materials indicating the intensity of human occupation. Datable materials found in direct association with human remains such as charcoal, bones, shell fragments and beads were collected for radiocarbon dating. The ostrich eggshell bead found associated with human remains in Grave I was radiocarbon dated at 350 ± 30 BP (Lab no Poz-124303). In contrast, the ostrich shell fragment from Grave III was radiocarbon dated at 105 ± 30 (Lab no124295), suggesting that the Nguvu-Kazi burial was in use about 400 years ago. As noted before, excessive number of burials have been exhumed at different places in the Lake Eyasi Basin, in particular at Mumba rock-shelter, Eshigesh Hill, Gishimageda also termed as Kisimangeda and Bwana Mganga (Kohl-Larsen, 1958; Fosbrook, 1950; Ikeda & Hayama,

1982) and other places of northern Tanzania such as Ngorongoro creator (Sasson 1968; Mturi, 1978). Such burial practices give the impression that piled cairns burying system was popular across the East African Rift Valley (EARV) regions at that period.

At Mumba, a number of human remains were unearthed in Bed III of Mumba cultural sequences; one corpse was found in a crouched sitting position, while the others were flexed and placed on their sides (Mehlman, 1989). One burial was found associated with a series of red ochre, suggesting that red ochre played a significant symbolic expression. Other corpses were associated with pottery remains and charcoal fragments. Radiocarbon dating on associated pottery remains, and shell beads provided an age of about 4,900 BP (Mehlman, 1989:530). Pottery remains (Kansyore ware) found in direct association with human remains suggest clustering burial practices in this region from the Pastoral Neolithic period to the Iron Age periods (Table 1).

Table 1. Summary of human burial practices in the Lake Eyasi Basin and the surroundings

Site name	Number of Individuals	Inclusions	Radiocarbon dates in BP	References
Nguvu-Kazi	5	Bead shells, charcoal, bones, ochre, ostrich eggshells, ficus fruits, and cowrie eggs	350 ±30	The present study
Mumba rock-shelter	9	Bead shells, charcoal, ostrich eggshell beads, Kansyore potsherds, and ficus fruits	4,900	Mehlman, 1989
Eshigesh rock-shelter	5	Potsherds, and bead shells	-	Ikeda, 1967
Gishimangeda rock-shelter	10	Potsherds, stone artefacts, and remains of awl	610 ± 260	Ikeda, 1967; Mehlman, 1989; Ikeda & Hayana, 1982
Bwana-Mganga	11	Ochre, fichus fruits, crown eggshells and cowry shells	140 ± 50	Kohl-Larsen, 1958; Brauer, 1980
Munge River, Ngorongoro Creator	30	Potsherd and bead shells, crown eggshells	2,260 ± 180	Leakey, 1966, Sasson, 1968; Mturi,1978
Rumbe Hill	11	Potsherds and bead shells	270 ± 120	Leakey, 1966

Evidence from the Lake Eyasi Basin and the surroundings suggest that burial cairns practices in this region range from the Neolithic to historical periods (Prendergast et al., 2007; Mwitondi et al., 2021). They represent a

wide range of burial practices, and they are not of the same antiquity. Most of the graves located in rock-shelter were not piled with stone slabs, and are older than those in open-air sites burial in rock-shelters dating far back to about 4,900 BP (Table, 1; Mehlman, 1989:530). Piled graves are frequently found in open-air localities; the majority of them existed for decades between 2,400 and 200 years ago (Table, 1). Piled burial cairns have been often proclaimed to be related to complex agricultural practices. Evidence for early agricultural activities has been recorded in Olpiro, Endamaga and Engaruka along the sloping edge of Oldean Mountain and Ngorongoro highlands (Mehlman, 1989; Sutton, 1998). Variation in age estimates of burial cairns (Table, 1) may perhaps imply limited dating options because most of them were dated through radiocarbon dating methods that can easily be wedged by groundwater system or reservoir. Nevertheless, cairn burial systems have a long history in the EARV regions dating back from the Neolithic to early Iron Age periods.

Experimental and skeletal analysis
Collected human remains were analyzed in detail to establish skeletal landmarks and biological profiles such as age, sex, race, stature and even the cause of death by looking at stressful events, physical injuries or traumas. The age estimates of collected remains were examined on the bases of the degree of epiphysis development of the clavicles and phalanges (Scheuer & Black, 2000). The sex determination followed Walker's (2008) scheme where occipital crest, mastoid epiphysis, supra-orbital margin, glabella and shape of chin were used as a distinctive character in identifying male and female individuals. The revealed data were supplemented by identifying fundamental features on the pelvic bones, particularly parts of the subpubic angle, ventral arch, and subpubic concavity (Phenice, 1969; Jilala et al., 2021). Bräuer (1982) analytical scheme of ethnic identification based on variations in facial and adenoidal orientations such as the nasal height, nasal breadth, midsagittal plane (nasospinale), and the lateral point of the noise or alare was not fully employed due to the fragmentary nature of the studied samples. The scheme was also challenged in previous studies for putting much weight towards racial identifications (Mehlman, 1989: 541).

Instead, visually skeletal landmarks were used to check the presence of antemortem, perimortem, postmortem trauma and other paleopathological anomalies. To reconstruct their dietary preferences and attain information of ancient lifestyle, digital microscope tooth cavities and wearing patterns were assessed (White, 1997). Such procedures involved the assessment of plant biomarkers, phytoliths, and starch grains cemented within the dental

calculus during food consumption. Such approaches are intended to attain a general information subsistence economy and standard of living.

Results

A total of five individuals were found in the four exhausted graves. One grave comprised two adult females, one grave had a juvenile male, and two had adult males (Table, 2). As it was mentioned in previous sections, two graves were found associated with individuals encroached in sitting positions and directed towards the East. Analogous burial practices were also revealed at Mumba and Gishimangeda rock-shelters (Kohl-Larsen, 1958; Ikeda & Hayama, 1982) and along the Runge River in the Ngorongoro creator (Leakey, 1966; Mturi, 1978). Although the majority of the exhausted graves buried individuals were found associated with personal possessions (Table, 1 & 2), some items, such as lithic artefacts, were probably from backfilling processes (Mehlman, 1989). However, it is evident that the presence of ochre (Kohl-Larsen, 1958), ficus fruits, crown eggs, and beads underneath the body at the proximal and distal ends in two graves symbolizes prosperity, destiny and explicit cultural orientation (Figure, 3). Elsewhere, crown eggs and cowry shells in burial scenes were also reported in the Ngorongoro creator, Gisimangeda, Kwa-Mganga and Mumba rock-shelter (Kohl-Larsen, 1958; Ikeda & Hayama, 1982; Melman, 1989). They all represent a unique cultural orientation, religious expressions, prosperity and sumptuousness.

Table 2. The burial profile and cultural composition of excavated gravels at Nguvu-Kazi in Lake Eyasi Basin

Burial no	Number of individuals	Sexual orientation	Age estimate	Inclusions
NG-I	2	Male	80-90	Beads, eggs, potsherd, stone tools
		Female	83-93	
NG-II	1	Male	64-72	Fruits, stone tools, beads, egg
NG-III	1	Male	17-21	Fruits, beads, potsherds
NG-IV	1	Female	40-46	Beads, stone tools, potsherds, egg

Figure 3. Crown eggshell buried with an adult female at Nguvu-Kazi

As noted in previous sections, corpses at Nguvu-Kazi were buried in varied orientations: two individuals were buried in a crouched sitting position towards the East. The rest were buried in a crouching posture. For the latter, the knees were bent, and the upper body was brought forward in supine position. One corpse was oriented supine, with both hands along with the site and directed towards the East. Two corpses were buried together in different directions, one facing the East and another one facing the West. These interment arrangements often incorporated a number of different elements such as respect to the dead, religious devotions or cultural practices. Objects buried with the bodies had different connotations regarding the corpses, including religious aspects, the wealth of an individual, marital status, personal skills and other values, depending on the community involved (Houck, 2010). They are also significant indicators in crime scene investigations (Merck, 2013). The investigations are normally used by criminal investigators to demonstrate the cultural aspects and exhumation taboos especially in places with different cultural groups. Sometimes, they have been used in establishing the link between suspects and victims (Merck, 2013).

Skeletal landmarks also provided useful information regarding the sexual dimorphism of five individuals. The male mastoids were thicker and longer than those of the females, while the male glabella was noted to have a much higher protrude than that of the female. In terms of sexual orientation, there were three males and two females. Attempt to recognize the stature of these individuals (Trotter & Gleser, 1977) posed severe challenges as many long

bones (humerus, radius and ulna and femur) were highly fragmented, and their proximal and distal ends were almost broken off.

In terms of the age estimates, epiphyses were assessed to see if they were partially or fully fused. The sutures revealed the existence of one sub-adult since the stretches holding together edges of coronal, lambdoid, and squamous sutures were not completely fused, and the proximal and distal ends of the phalanges were not fully stretched together. Closely related characteristics of partially fused epiphysis were recognized on a few long bones with prominent proximal and distal ends, confirming that an adolescent was buried in Grave III. The sutures of adults were fully stretched together, and their epiphyses were fully fused together, indicating that Graves I, II, IV and V were composed of fully grown individuals (Scheuer & Black 2000). Analyzed individuals had very large and robust cranium discriminants, including the nasal aperture, common among African anatomical features (Table, 3; Adams & Byrd, 2008).

Table 3. Cultural materials, pathological traumas and postmortem landmarks allied with corpses at Nguvu-Kazi, and their cultural connotations

	Physical evidence recovered	**Revealed Interpretation**
1	Shell-sampled for Carbon-14 dating	The burial cairns of Nguvu-Kazi were buried between 400 and 150 years ago.
2	A pile of stones	Burial style of piling stones on top of graves aimed to refrain the dead from animals that feed on flesh. It means that the mourners were scared about the carnivores' actions.
3	Stone tools	Stone tools reflect the subsistence economy and devices used to provide services. It is also a symbol of life after death; individuals were buried with foodstuffs
4	Decorated potsherds	They were skilled craftsmen and permanently settled
5	Cowries, necklets and eggshell beads	These are symbolic items for prosperity, wealth, ritual and other religious aspects.
6	Encroachment of dead body, folded arms and legs, then seated or placed on the left arm	Indicates burial custom built on a particular faith; it is still being used by some local ethnic groups in the region
8	Morphological features: large and robust cranium, short nasospinale and wide alare	Five individuals whose bones were exhumed that probably belong to the current ethnic groups recently found in the region
9	Morphological skeletal sexual dimorphic landmarks of the skull; occipital crest, mastoid apophysis, supra-orbital margin, glabella, the shape of the chin and pelvic bone; subpubic angle, ventral arch and subpubic concavity	Determined sex of five individuals whose bones were exhumed: three men and two women
10	Opens, partial fusion, closed or complete fusion epiphysis and features of sternal end of	Determined the age of five individuals whose bones were exhumed: four adults and one

	Physical evidence recovered	**Revealed Interpretation**
	the rib	sub-adult
11	Pathological tooth cavities and wear diseases	Indicate carbohydrate consumption and agriculture food production

The distinctive post-trauma characteristics indicate that the corpse from the Grave I had a round scar on the frontal bone. The defunct was probably wounded during his lifetime. However, the wound was likely not the actual cause of the death. The trauma was not definitely due to either a sharp or a projectile wound; maybe it was due to a blunt wound. A corpse from Grave III appeared to have a fracture on the innominate bone that had bevels, suggesting that the wound was perimortem trauma. In general, all the corpses excavated had postmortem fractures resulting from compression and tension forces of pile stones. Almost all the long bones were broken three times or more. The skulls were cracked several fractures, a situation that posed a significant challenge during the analysis and the conjoining process as a whole. The actual application of burial procedures revealed at Nguvu-Kazi has been inherited and used by an indigenous group in the Lake Eyasi Basin (Figure 4).

Figure 4. Left is a corpse of an adult female encroached in a supine position and directed toward the East at Nguvu-Kazi; right is a burial ceremony of Datoga adult female encroached in sitting positions, and directed towards the East at Olpiro *(Field data 2019 and 2020)*

Most of the revealed traumas suggest that corpses died through natural causes; they have severe postmortem burial practices trauma. The traumas

include strains, injuries or fractures on long bones resulting from excessive force to encroach the dead body in a sitting position. Severe fractures, fragmentations, and blunt trauma on collected bones resulted from physical stress from stone slabs piled on top of the human bodies. Encountered mode of burial in the Lake Eyasi Basin is most common in the EARV regions, and the burial mounds are regular and marked by piled cairns (Mehlman 1989). Such burial orientations have been associated with ethnic groups such as the Maasai and Datoga (Bräuer, 1976; Mturi, 1978; Ikeda & Hayana, 1982). However, ethnographic evidence favours an affiliation to the Datoga as they carry on with burying the dead bodies in encroached sitting positions, directed towards the East (Figure, 4). However, detailed investigations, including the biochemistry deoxyribonucleic acid (DNA) and ethnographic enquires are encouraged before making a meaningful conclusion.

Preliminary results from tooth cavities and wear patterns suggest that the corpses were exposed to starchy grains with a high amount of carbohydrates, suggesting that the inhabitants of Nguvu-Kazi depended much on starchy foodstuffs. Therefore, they had access to agricultural products (Piperno & Dillehay, 2009). However, more studies on dental calculus analysis (DCA) regarding the tartar accumulations on the corpses may offer a unique compromise on their dietary preferences.

Discussion
The results showed pathological and morphological variations existing among corpses buried at Nguvu-Kazi and in the surroundings. Morphologically, individual corpses who were analysed had short nosospinale and wide alare, suggesting that they belonged to African ethnic groups. Huge morphological variations have been observed between female and male corpses on pelvic bones and skulls. Women's pelvic bones were composed of a ventral arc with a wider angle than males; a subpubic contour well developed from the inferior to symphyseal face and along the entire length of the inferior ramus. The medial aspect of the ischo-pubi ramus was found to be narrow at dorsal and ventral aspects with a sharp ridge protruding from the symphyseal face. The male pelvic bones were composed of large convexity on the subpubic contour; the medial aspects of the ischio-pubic ramus were broad at dorsal and ventral features. Male bones also lacked protruding ridge and on the side of the inferior ventral arc. The researchers also noted variations in skull morphological characteristics between male and female skeletal remains. Females were characterized by a smaller nuchal crest, mastoid and supra-orbital margin than men who had large features and a greater protuberance of mental eminence and glabella. Pathologically, the level of bone fusion was very helpful in determining the

age of corpses. Open and partial fusion appeared on the bones of juveniles, while closed or completely fused bones were revealed among adult corpses. The pathological characterizations also helped detect dentals caries or teeth cavities and wear diseases among corpses. Teeth cavities indicate that they relied heavily on carbohydrate diets, suggesting that they could produce and use beans and corns. These gross anatomy techniques employed in this study, mostly used in bio-archaeology, paleopathology, and crime scene investigation, are required for exhumation, postmortem examination, and medical-legal report presented by forensic anthropologists or pathologists.

The overall evidence indicates that the Nguvu-Kazi human remains represent a form of melodious combinations that emerged from different populations that inhabited the Lake Eyasi Basin and surrounding landscape for a long period from about 4, 000 years ago to historic period. Therefore, it is not surprising that accumulated data for burial cairns and mounds represent clusters of varied cultural orientations, most likely the Pastoral Neolithic people who occupied the region in the mid-Holocene at about 4,000 years ago and Iron Age communities who landed at least 2,000 years ago (Mehlman, 1989). Early herds possessed domesticates especially (sheep, goat and cattle), but they also depended, with full trust, on wild animals and plants as part of their subsistence package. The foodstuffs were processed using stone tools and ceramics as part of technological compendiums (Prendergast et al., 2007). It is widely agreed that climatic and demographic pressure after 6,000 years ago pushed Neolithic pastoralists (herders) from the Nile River Basin to eastern African savannah plain in the EARV regions. They moved southwards through the Nile Basin and the Rift Valley system to northern and central Kenya before landing to the Lake Eyasi Basin around 4,000 years ago (Mehlman, 1989; Prendergast et al., 2007). Later, around 2,000 years ago, Early Iron Age communities inhabited the Lake Eyasi Basin and concurrently stayed with herders as it was evidenced at Mumba and Njarasa rock-shelters, Gishimangeda, Bwana Mganga, Olpiro, Oldogom, Barjomajega and Nguvu-Kazi localities (Mehlman, 1989; Sutton, 1998). Both Neolithic and Iron Age communities were engaged in burial practices; they buried bodies piling with granite and volcanic slabs as landmarks of burial cairns mounds (Figure 2).

For that reason, burial cairns revealed at Nguvu-Kazi are part of the frequently encountered mode of burial in EARV regions (Bräuer, 1980; Mtruri, 1978; Ikeda & Hayama, 1982; Melman, 1989; Sutton, 1998). However, the dozens of individuals recovered from excavated mounds provide limited evidence regarding the ethnic affiliations, subsistence economy and ecological adaptability. Therefore, further multidisciplinary

research investigations are recommended to make worthwhile conclusions (Bintliff, 2004). Revealed evidence underscores the trend of flexibilities and adaptation strategies employed by ancient communities to the ever-changing environment from the mid Holocene to the present (Bushozi, 2020). However, ethnographic inferences revealed at Olpiro supports assertions associated with cairns burial practices among the pastoral communities. Often, herders, particularly Datoga people, bury the dead bodies in encroached sitting positions directed toward the east (Figure 4). However, such generalizations should be taken with great precaution; the bulk of evidence of encroached sitting positions have been uncovered from various places in East Africa dating from the terminal Pleistocene at 12,000 years ago (Biittner et al., 2017).

It is difficult to make a brief statement regarding the anatomical structure of buried individuals because of the fragmentary nature of the collected samples. However, evidence from previous research (Mtruri, 1978; Ikada & Hayama, 1982), demonstrated enormous variability in the anatomic structure of corpses exhausted from burial cairns implying that the lake basin has been continuously inhabited by people with varied backgrounds, and with different cultural affiliations. Nevertheless, the burial cairns of the Nguvu-Kazi have an added advantage because they allowed a broad scope of scientific investigations on ancient dietary preferences, human flexibility and adaptability to an ever-changing environment, technological innovations, and the trend of cultural changes over time and space. These realities are of great importance to archaeologists in reconstructing the socio-cultural dynamics, technological innovations trends, economic development models, and the general direction regarding cultural continuity or discontinuity. Such analytical considerations help paleoanthropologists and archaeologists establish how and when human ancestors had the cognitive ability to produce and use material cultures that are equitable in managing the surrounding landscape.

If one ponders deeply, examined procedures of burial exhumation at Nguvu-Kazi, processes are conventional of the same kind in character and eminence agreed to crime scene detectives (Koen & Goetz, 2017). Generated evidence regarding sex profiles, age of individuals, cultural chronology, ancient dietary preferences and postmortem trauma are very useful in the forensic investigation for the crime scene. However, the evidence is beyond the agreed terminal point for the forensic crime investigations relating to the courts of law, which is 75 years in many countries. However, this terminal point may go beyond that limit if supported with other circumstantial evidence (White, 1997; Schrag et al., 2014).

Although these human remains from Nguvu-Kazi have no forensic interest, methods and procedures used in uncovering human skeletal remains are analogous to crime scene detective methods. The methods include survey, mapping of graves, excavation procedures, documentation processes, and rebelling of the samples. These methods are regularly applied in the crème scene investigations. In principle, methods and procedures for archaeological and indoor or outdoor crime scene investigation are analogous (Houck, 2010). Variations arise on the scope and intentions in respect of generated information. Archaeologists often would like to reinstate scenarios of the ancient community's lifestyles and their adaptability to the natural landscape, but they apply methods and techniques which are fundamental for restoring crime scenes for forensic investigations (Bintliff, 2004).

The laboratory analytical procedures including the establishment of the gender profiles, length of time that diseased have existed, diet preferences based on teeth wear were often documented at Nguvu-Kazi and other archaeological sites in the lake basin (Mehlman, 1989). Again, ways in which collected samples are handled and transported to the laboratory for further analysis are fundamental for crime scene investigations. Procedures like wrapping fragile human remains in cotton wax at Nguvu-Kazi are compulsory in criminal investigators, especially when dealing with fragile materials from a crime scene (Koen & Goetz, 2017). Other analytical procedures like the use of isotopic and geochemical analysis to establish the chronological sequences, ancient diet or the paleopathology inferences are often used by crème scene investigators and forensic experts to establish empirical evidence in criminal investigations (Koen & Goetz, 2017). Thus, paleoanthropological and archaeological methods and approaches are essential for generating reliable information that addresses necessities for legal exhumations. These parameters are instrumental in discussing jurisdiction processes against victims of the crime. They can be incorporated in the existing forensic methods and theories regarding the exhumation of corpses and the types of crimes that took place in the area in an efficacy manner (Koen & Goetz, 2017). This is practical because both disciplines rely on the two types of evidence obtained to reach the conclusion of what happened. The two kinds of evidence are direct, circumstantial or indirect evidence (Koen & Goetz, 2017).

Direct evidence is the kind of information used to establish facts in legal investigations commonly referred to be admissible testimony in a law court, and they are indisputable (Houck, 2010). The type of circumstantial evidence is a kind of information related to an event but not sufficient to

draw conclusions on its own (Houck, 2010). The main theme driven from direct evidence in criminal incidents is based on the premise that the signs for contact between two items will leave inscriptions from cohorts (Gehl & Plecas, 2016). The circumstantial or indirect evidence refers to the indication that does not prove beyond doubt about an assault or a violent event; they need additional supplementary information to be comprehended (Houck, 2010). Such analogies are often used in archaeology to draw conclusions. Existing evidence shows that the majority of effective techniques for crime scene investigations were drawn from the archaeology discipline (Adams & Byrd, 2008; Fulginiti, 2014; Koen & Goetz, 2017).

Conclusions
The evidence accumulated from this study provides reliable information about shared theoretical promises and methodological approaches in archaeological and crime scene investigations. In both disciplines, analytical schemes and information used to establish facts rely on direct and circumstantial evidence. The theories regarding the timing and magnitude of archaeological sites depend much on humankind's socio-cultural dynamics and adaptability, the material remains, and inscriptions from cohorts. These promises are fundamental in developing a highly focused mission regarding crime scene investigations about an event that has already taken place. In places where forensic training is less developed, archaeologists and paleoanthropologists can be used to rescue the situation in crime scene investigations. Professional archaeologists need a brief backup on ethical training and statistical use for reference to maintain a chain of custody issues as a detective. Using Tanzania as an example, it is widely accepted that in most developing countries, archeology is far advanced compared to other disciplines equitable for crime scene investigation. However, many archaeologists have been insufficiently trained to meet the requirements needed for crime scene investigations. Therefore, it is widely recommended that archaeological curricula be improved to meet the requirements of crime scene investigations. Archaeological and crime scene departments need to work closely in order to maintain a chain of guardianship in the detection of the crime at the local and global levels.

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