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## **Jebel Sahaba Revisited**

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Jebel Sahaba (Site 117), a cemetery near the 2nd Cataract, was excavated in the 1960's, under the direction of Fred Wendorf during the UNESCO salvage years. The skeletal remains, artefacts, and organic samples were shipped to Southern Methodist University (SMU) in Texas where they were housed for nearly 40 years. Following his retirement, Professor Wendorf generously donated these collections and his extensive archive to The British Museum in 2001; the skeletal collection arrived at the museum in March 2002. The skeletal collection, dated to 13,740 +/- 600 BP (Pta-116), basks in the notoriety of representing the earliest evidence of collective violence due to the presence of cutmarks, embedded and associated lithics, and parry fractures. Because of these observations, it was thought that living conditions in Nubian society were particularly violent and stressful during this period, perhaps due to environmental pressures caused by climatic change.

Since Anderson's original skeletal assessment in 1968, new methods of developing the osteological profile have emerged, as have methods of epidemiological and paleopathological evaluation. Upon arrival at The British Museum, the skeletal collection was inventoried and reassessed using current macroscopic standards. This paper summarizes the results of the reanalysis.

### **The Context**

Site 117 was a cemetery site located 3 km north of Wadi Halfa, about 1 km east of the Nile, near a sandstone inselberg called Jebel Sahaba, a much more memorable name than Site 117 (Fig. 1). The burial pits were fairly close to the surface, as deep as 35 cm, and the majority were covered with stone slabs. Burials were discrete or multiple interments and most individuals were laid on the left side, head to the east, facing south; the hands were to the face and the body flexed. AMS dating was attempted to refine the earlier date obtained from

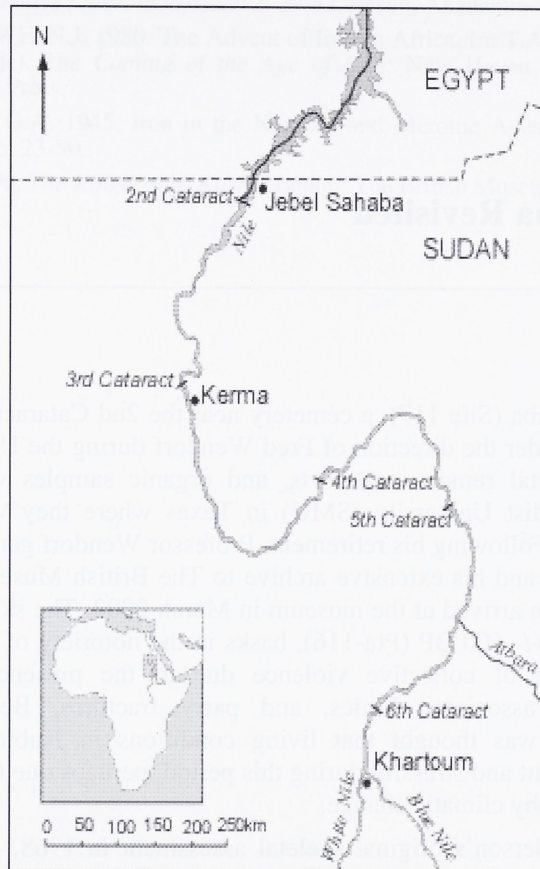


Figure 1: Map of Nile Valley showing location of Jebel Sahaba.

the first carbon sample, but was unsuccessful due to the interference of the consolidants used in the original reconstructions.

### **Inventory of Individuals**

In general the bones were in 'fair' condition with some weathering (Judd 2001). Most of the long bone epiphyses were broken or damaged, as were those of the metacarpals and metatarsals. Very few small bones of the skull, hands or feet survived, while the ribs and vertebral columns were fragmentary at best. More than one individual was interred in eight of the Jebel Sahaba burials and in many cases, the small bones of the vertebrae, hands, feet, ribs or fragmented long



bones of the single and multiple interments were commingled. Individuals that were interred together were laid out simultaneously to ascertain whether any bones were mismatched or whether segments of one individual conjoined with that of another. In most cases the commingled bones were easily sorted as the individuals were distinct with respect to robusticity and age (e.g., 117-13, 14). When additional individuals were identified, they were treated as a separate entity and a letter was used to differentiate the skeletons in each burial context. For example, in Burial 11 the bones of two additional individuals were discovered: the original identified burial became Burial 11A and the other two burials were coded Burial 11B and 11C.

### **Demographic Profile**

Anderson's (1968) skeletal analysis adhered to methods recommended in Montagu's (1960) introductory text for physical anthropology. Biological sex was determined from the skull, pelvis and long bones. The age of subadults was attributed by dentition, but no alternative methods were mentioned for children lacking teeth. The age categories for adults were young, middle and old, but the range of these ages was not stated. Anderson (1968: 996) mentioned that methods of aging were unreliable and that the pubic symphyses were too damaged to be useful in age assessment; a dental wear scheme created by Anderson (1968: 1021) may have been employed to assign age-at-death. Anderson estimated stature from formulae created by Pearson as well as Trotter and Gleser, but no references were referred to.

### **Biological Sex**

Ideally the pelvis is the preferred bone with which to establish the individual's biological sex, however, in this collection no complete innominates survived and relatively few diagnostic features were retained on the broken fragments. Fortunately, many of the skulls were intact, which allowed for a reliable sex assessment. The more ambiguous long bone dimensions and a subjective robusticity evaluation determined biological sex in the absence of the skull and pelvis.

Sexually dimorphic characteristics of the skull and innominate suggested by Buikstra and Ubelaker (1994: 16-21) were scored. The pelvic diagnostic features consisted of the identification of a ventral arc, the concavity of the subpubic concavity, the breadth of the ischiopubic ramus, the angle of the sciatic notch and the intensity of the preauricular sulcus. The diagnostic features of the skull are associated with size, that is, the more robust the feature, the more likely the individual is male. Features examined included the nuchal crest, the mastoid, supraorbital ridge, glabella and mental eminence. Each feature was scored out of '5' with '1' denoting a female and '5' being male. An average score was calcu-

lated for each element, and then the elements were averaged. Generally, individuals scoring '2.5' or less were assigned as female, and those scoring greater than '3.5' were assessed as male.

Metrical measurements defined by Olivier (1969) and Bass (1995) were taken from the femoral head, bicondylar width of the distal femur, humeral head and radial head to augment the more reliable data or to suggest the biological sex in the absence of the skull and innominate.

### **Age-at-death**

The determination of the adult age-at-death was similarly complex as the diagnostic features that degenerate with age were poorly preserved. When possible an age category was assigned based on the deterioration of the sternal rib end (Loth & Iscan 1989), auricular surface of the innominate (Lovejoy et al. 1985), and pubis (Suchey et al. 1986; Todd 1921a, b). The sternal rib end method is preferred by forensic anthropologists as there is little weight-bearing and activity on the ribs that may facilitate joint degeneration and deceptively overage the individual. Archival images revealed that ribs were observed during when the skeleton was exposed, but only a few fragments survived excavation and shipping. Therefore, age-at-death was determined primarily by the degeneration of the pelvic auricular surface and pubic symphysis. The age categories were assigned as follows:

Youth	<25 years
Young adult	25-35 years
Middle adult	35-50 years
Old adult	50+ years
Adult	undetermined

Aging by dental wear has been controversial in the past as genetic factors, diet, environment, and cultural activity influence the wear pattern between cultures. Mays (2002) has shown that dental wear is an effective method of assessing the relative age within British populations and in many cases dental wear aging was found to be equally as reliable as the degenerative techniques associated with the ribs and innominate. In order to assign an age category to individuals who did not retain diagnostic postcrania, correlations between postcranial aging and dental wear were developed. In this skeletal collection, the age category was established from the postcrania of 24 adults who also retained dentition. The maximum dental wear scores calculated for the first molars (Smith 1984) were sorted into a continuum of individuals exhibiting lowest to highest



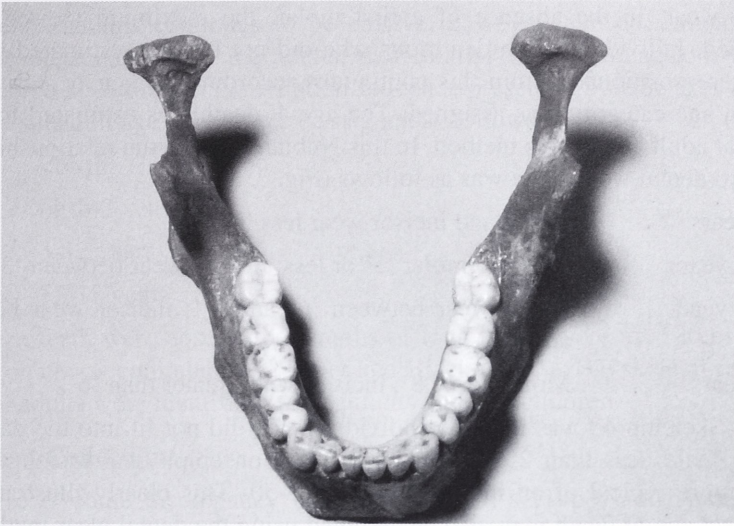


Fig. 2: The dental wear of an individual less than 25 years of age shows slight dentin exposure on the first molar dental cusps and anterior teeth.



Fig. 3: The dental wear of a male individual between 35-50 years of age shows complete removal of first molar cusps to expose the dentin, but enamel rim remains. The anterior teeth are similarly worn.

dental wear; in the absence of a first molar, the maximum incisor wear was recorded. Individuals with dentitions who did not have an estimated postcranial age were positioned within this continuum according to their dental wear score and an age category was assigned. The age-at-death was estimated for nine additional adults using this method. In this Nubian sample, the relationship between age and dental wear score was as follows (Fig. 2, 3):

<25 years	Molar and incisor wear less than '3'
25-35 years	Wear on molar '5' or less; incisor wear between '3' and '5'
35-50 years	Molar wear between '6' and '7'; incisor wear between '5' and '7'
50+ years	Molar wear '8'; incisor wear greater than '6'.

Skeleton 48 was the only individual who did not fit into the pattern. This young male, less than 25 years of age based on epiphyseal fusion, had dental wear more typical of an individual aged 35-50. This clearly illustrates that an incorrect age-at-death may also be assigned using the dental wear method, but as Mays (2002) argues, the other standard methods used to determine skeletal age are equally problematic.

### Stature

It is preferred that stature be calculated from the leg bones, preferably the femur and tibia if both are present (Trotter 1970). Though not as reliable, the bones of the arm or fibula can also be used, in the absence of those of the lower body. Stature was calculated using the regression formulae created by Trotter (1970) for Afro-American males and females. In some cases complete long bones were absent and other less conventional methods were implemented. Steele (1970) devised formulae that determined the stature of individuals from fragmentary portions of bone defined by specific landmarks. In this investigation humeral segments 1 and 2, according to Steele (1970), were measured in the absence of the complete long bone and the regression formulae for Afro-American males and females were applied. When long bones or their appropriate segments were unavailable, stature was determined from the metacarpals (Meadows & Jantz 1992) and metatarsals (Byers et al. 1989). Stature was established for 42 adults, while Anderson's (1968: 1024) previous assessment presented a mean stature for nine males and three females only, which was 176.9 cm (range 168-184.8 cm) and 167.5 cm (range 162.8-174.3 cm) respectively.

### Sub-adults

The sub-adult remains were extremely fragmentary and very few complete bones were present. A reliable macroscopic method to determine a child's sex



from skeletal remains continues to be elusive, however, age determination is much more dependable than the adults, particularly from the dentition. Dental age was scored according to the eruption sequence presented by Ubelaker (1978: 47) and the subadult age cohorts were assigned as follows:

Foetal	<birth
Infant	birth-3 years
Child	3-12 years
Adolescent	12-18 years

When teeth were absent, the lengths of long bones were used to estimate age based on charts compiled in Scheuer and Black (2000). The skeletal remains of eight subadults were identified: three infants and five children.

### The Current Collection

There is some discrepancy between Wendorf's (1968) and Anderson's (1968) reports concerning the presence of skeletal remains. Wendorf reported the presence of skeletons in the field, but Anderson did not assess all of these individuals during his analysis. It is likely that the bones were in such dismal condition that they were not shipped back to SMU or were lost between their excavation and analysis the following year, as Anderson offers no comments concerning these individuals. These skeletons were:

8905-1	Bones not favourable for study (Anderson 1968: 1008).
8905-13	No material recovered (Anderson 1968: 1008).
8905-15	No comments.
8905-16	No comments.
8905-17	No comments.

One skull, labelled 'X', had no provenience, while the skull of another individual actually was part of neighbouring body. The number of individuals available for research from Jebel Sahaba site now consists of 13 very fragmentary children and 46 adults. This includes two newly identified infants from Burials 11 and 101 and an additional adult from Burial 101. There are 24 females and 19 males over 18 years of age and the biological sex and age of the remaining three adults is questionable.

### Overview of Health

Originally assessed as being perpetually violent and stressed, a systematic analysis of the skeletal material proved quite the contrary. While violence was indeed indicated at the time of death for some of these individuals, that these

people lived in a stressful and violent society remains to be questioned. Evidence of macroscopic skeletal stress is typically found in decreased stature, dental health, infectious disease and trauma.

### **Stature**

In the original assessment, stature was determined for nine males and three females. Since then, stature formulae have been created for partial long bones, the bones of the hands and feet among others as described above. Because very few completely intact long bones survived, these new formulae were utilised to give an estimate with a standard deviation equivalent to that of an intact arm bone or fibula. Stature was calculated for 18 females 25 years of age and older and 17 males. These results were perhaps the most revealing of this investigation to date. During this evaluation, it was observed that the bones were fairly robust - even the females were not particularly gracile. The male and female statures were significantly different for the sample with the average male height at 171 cm and the average female height at 161 cm. When these means were compared to those of skeletal samples from the later Badarian and Dynastic periods, the mean stature of the Sahaba group, far from representing an undernourished, impoverished group, was much greater than the mean stature of the individuals from the following periods presented by Zakrzewski (2003). Had the individuals experienced periods of nutritional stress during growth due to environmental or social factors, the mean stature would be expected to have been much less.

### **Dental health**

Stress experienced by a growing individual can also be observed in the teeth, at least until the individual reaches 12 years of age, when all of the permanent dental crowns are fully formed but not yet erupted. The results of the original dental analysis were upheld - only one individual, Skeleton 35, exhibited dental enamel hypoplasia - linear grooves on the incisors that indicate a disruption in the production of enamel forming material due to a period of stress (Fig. 4). Because enamel does not remodel as bone does, it provides permanent evidence of growth disruption in contrast to the growth disruption lines formed in bone (Harris Lines) that tend to vanish with age due to bone remodelling (Aufderheide & Rodríguez-Martín 1998). It is noteworthy that the stature of this individual was calculated to be 168.6 +/- 5.19 cm (based on the left third metacarpal), which was below the male mean; no other visible pathology was observed.



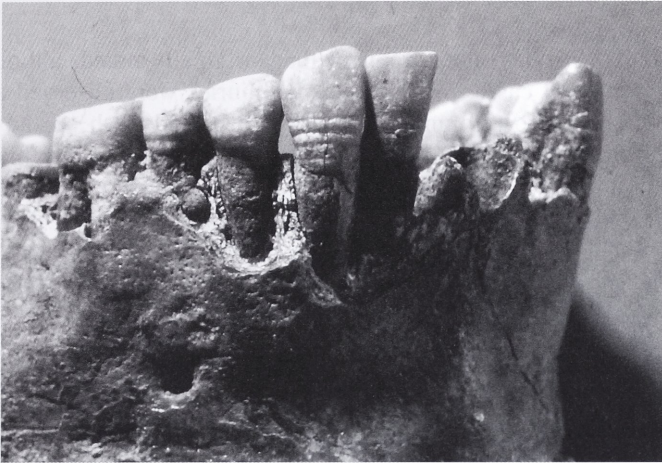


Fig. 4. Thin bands of linear dental enamel hypoplasia are located on the right mandibular second incisor, canine and second premolar.

### Infectious and Metabolic Disease

Acute childhood infectious disease causing death is a standard indicator of poor health, diet, hygiene, living conditions, and sanitation in any society, modern or archaeological. In a cemetery sample we would expect to see a high proportion of infants less than five years of age, similar to the population pyramids of a developing society. In contrast, the demographic distribution of this sample was top heavy, with 12% of the group being five years of age or less. Though remains were scarce, 127 permanent teeth were recovered from the eight older children - there was no evidence of dental enamel effects in any of the dentitions and recent developmental stress among the recovered sample was not indicated.

An iron poor diet or parasitic infection is manifest in bone as porotic hyperostosis or cribra orbitalia, which are represented as a lacy lesion caused by an increase in the marrow production of red blood cells that causes bone to expand and expose the trabecular bone (Aufderheide & Rodríguez-Martín 1998). While this condition was endemic among children along the Nile River during the much later Meroitic and Christian periods (Judd 2004; Van Gerven et al. 1990), there was no evidence of these lesions among the children or adults. Non-specific infection was minimal on the leg bones of three individuals, and secondary to trauma on the skull of a fourth person.

## Trauma

Trauma was much more frequent than originally noted, although minor and mundane in most cases, for example, 19 injuries were observed among the hands and feet. The most common injury was a healed slash on the head of a second or third hand phalanx, perhaps caused by a slipped lithic blade during faunal butchery. Skull injuries were particularly difficult to evaluate as most of the breaks were reconstructed and the skull finished with clear shellac. Eight individuals bore a small round vault lesion less than 1 cm in diameter, while one person had a healed linear depression - no injuries were observed on the face, but this was the area most frequently repaired. All injuries were well healed and bore no complications. No new injuries to the forearm were found, although a quantitative assessment using diagnostic fracture criteria (Judd 2002) was possible which determined that one of the originally observed injuries, the ulna and radius combination, was due to indirect rather than direct force trauma, likely resulting from a fall. The other seven ulna injuries, three of which belonged to one individual, were the result of direct force trauma, typical of parrying a blow (Fig. 5). The frequency of individuals with forearm parrying fractures was 10.9% (6 out of 46 individuals), which was identical to that of a sample from the Kerma Ancien sample (Judd 2001) and less than that of a sample from Medieval Kulubnarti (Kilgore et al. 1997). Injuries associated with fending off a blow were no more frequent among this sample than among other groups. Because these injuries were well healed, previous interpersonal altercations are indicated well before death and this group was therefore not unfamiliar with physical aggression.

The presence of cut marks and embedded lithic chips found in some of these bones makes the collection unique as it represents the oldest known evidence for collective violence. Small embedded microliths were originally observed in the remains of six individuals. Two new embedded chips were discovered in the right pelvis of Skeleton 21, who previously exhibited two lithic chips in the left pelvis. In all but one case, the lithics were reported to be embedded in the vertebrae or pelvis and with one exception, these individuals also bore one or more cutmarks. Cutmarks were more prevalent, but sometimes dubious, often resembling gnawmarks. As noted in the original assessment, the femur was most frequently affected, likely in order to sever the hamstrings and prevent escape. Cut marks or notches were noted on 12 individuals, five more than previously. Nine of the cases involved the femur (Fig. 6). It is indeed unfortunate that the bones with embedded lithics were not found among the skeletal collection upon arrival at The British Museum; a few archival images and descriptions in the original publications (Anderson 1968; Butler 1968; Wendorf 1968) are the only surviving evidence of these very important injuries.





Fig. 5. This group of ulnae exhibit middle and lower shaft healed 'parry' fractures that are associated with fending a blow. Note that there is little longitudinal deformity along the bone's axis, a typical feature of a transverse fracture line.



Figure 6: The posterior view of a right femur shows a small cut mark below the lesser trochanter. (right)

Every effort was made to locate Anderson's original notes and data collection sheets from the 1968 skeletal analysis by contacting his former students and colleagues who came into possession of his archives and collections, but the search proved to be unsuccessful.

### **Conclusions**

The purpose of this report was to present the Jebel Sahaba skeletal collection in its current state in order to provide potential researchers with information concerning the collection's location, condition, demographic statistics and paleopathological overview. Bioarchaeologists interested in integrating this collection into their research design, and they are encouraged to do so, should contact the Department of Ancient Egypt and Sudan at The British Museum.

### **Acknowledgements**

Claire Thorne and Sandra Marshall of The British Museum are thanked for their graphic illustration and photography, respectively.



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