Craniometric Variation in Ancient Egypt and Influences from the East

Alexandra R. Klales, PhD
Mercyhurst University

Jonathan P. Elias, PhD
Akhmim Mummy Studies Consortium

Robert D. Hoppa, PhD
University of Manitoba

INTRODUCTION

- The population affinity of Ancient Egyptians has been studied for over a century and is heavily debated
- Historically, debates have focused on ancestry and the effects of migration from:
  - Nubian Corridor
  - Red Sea Littoral
  - Eastern Mediterranean
- Few studies have examined the possibility that morphometric data might imply wider gene flow into these areas

RESEARCH QUESTION

What might the "local data" from the city of Akhmim indicate about the broader implications of diverse morphometric expression in Ancient Egypt?

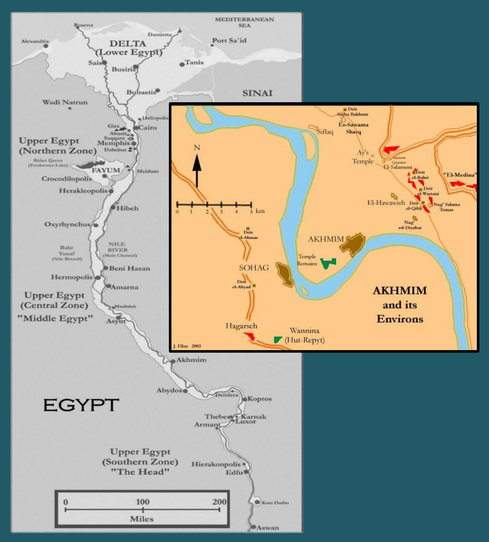

Figure 1. Egypt with detail showing the Akhmim region (inset).

AKHMIM, EGYPT

- Located in Upper Egypt, near to the boundary with Middle Egypt along the Nile River (Figure 1)
- Continuous occupation from Predynastic to modern times
- Importance of city changed through time:
  - Provincial center and capitol of ninth nome
  - Dominant administrative center
  - Religious center (dedicated to the god Min)
- Considered a highly cosmopolitan city

MATERIALS & METHODS

- Computed tomography (CT) scans of Egyptian mummies from Akhmim
  - Collected by the Akhmim Mummy Studies Consortium
  - Most date to the Ptolemaic Period
  - n=25 used in this research
  - CT scans volume rendered (3DCT) in MIMICS
- Craniometric data
  - 22 measurements were generated from 15 landmarks collected for each individual (Table 1) (Figure 2)
- Statistics
  - Classified using linear discriminant function analysis (LDFA) and cluster analysis
  - Compared to the Howells' worldwide craniometric database (*AJPA* 1996) (Figure 3)

Table 1. Craniometrics and the landmarks used for each measurement.

Abbrv.	Measurement	Landmarks
AUB	Biauricular Breadth	au-au
BBH	Basion Bregma Height	ba-b
BNL	Cranial Base Length	ba-n
BPL	Basion Prosthion Length	ba-pr
GOG	Bigonial Width	go-go
GNI	Chin Height	id-gn
DKB	Interorbital Breadth	d-d
EKB	Biorbital Breadth	ec-ec
FOB	Foramen Magnum Breadth	fmb(L)-fmb(R)
FOL	Foramen Magnum Length	ba-o
FRC	Frontal Chord	n-b
GOL	Maximum Cranial Length	g-op
NLB	Nasal Breadth	al-al
NLH	Nasal Height	n-ns
OBB	Orbital Breadth (left)	d-ec
OCC	Occipital Chord	l-o
PAC	Parietal Chord	b-l
UFB	Upper Facial Breadth	fmt-fmt
UFH	Upper Facial Height	n-pr
WFB	Minimum Frontal Breadth	ft-ft
XCB	Maximum Cranial Breadth	eu-eu
ZYB	Bizygomatic Breadth	zy-zy

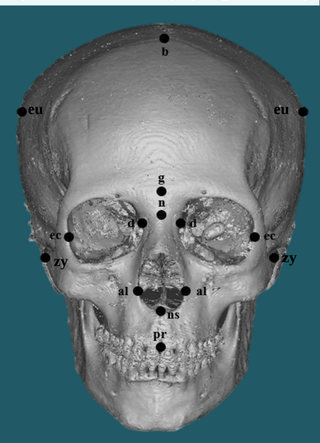

Figure 2. Anterior skull view showing the landmarks used in this study for measurements.

Figure 3. Populations contained within the Howells' worldwide craniometric database. Source: http://www.artofanderson.com/

RESULTS

- Classification into Howells' Database using LDFA (Table 2)
  - Egyptian (n=7)
    - Date to Late and Ptolemaic periods
    - Most atypical
  - Other African group (n=3)
  - Japanese groups (n=9)
  - Other groups (n=6)
- Cluster analysis (Figure 3)
  - Most grouped with Howells' Egyptians
  - Except: AMSC 29 (c. 2100BC); AMSC 12 (Ptol.)

Acknowledgements

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For a list of references or a copy of the poster, contact: Alexandra.Klales@gmail.com or scan the QR code provided

Table 2. Group classification using linear discriminant function analysis. Individual classified into the bolded population. M: Male / F: Female

AMSC	# Variables	CV % Correct	Populations	Post. Prob.	R Typicality	
1	6	59.8	AINF, EASF, GUAF, NJAF, **ZALF**	0.48	0.543	(21/26)
2	3	91.9	**EGYF**, EGYM	0.556	0.111	(48/54)
3	3	51.6	HAIF, **NJAF**, SJAF, ZULF	0.447	0.727	(9/33)
4	6	71.1	**EGYF**, EGYM, HAIF, SJAF	0.476	0.0	(54/54)
5	6	54.4	ANYM, ATAM, **GUAF**, PHIM	0.365	0.321	(19/28)
6	9	65.7	AINF, **DOGF**, NJAF, SJAF, TASF, ZULF	0.486	0.113	(47/53)
7	6	57.3	ANYF, GUAF, HAIM, **SJAF**	0.463	0.765	(12/15)
8	7	67.3	**EGYM**, MORM, NORM, ZALM	0.647	0.119	(52/59)
9	5	70.9	AINF, BUSM, DOGF, EGYF, **ZULF**	0.516	0.511	(23/47)
10	5	72.3	**AINF**, EGYM, ZALM, ZULF	0.551	0.538	(18/39)
11	5	77.4	**EGYM**, EGYF, ZALM	0.639	0.898	(6/59)
12	5	66.8	**EGYF**, EGYM, NORF, ZALF	0.83	0.296	(38/54)
13	8	73.2	**EGYF**, EGYM, AINF, ZALF	0.566	0.037	(52/54)
14	5	71.1	EGYM, AINM, **AINF**, ZALM	0.652	0.385	(24/39)
15	5	63	AINM, EGYM, **NJAM**, ZALM	0.515	0.25	(42/56)
16	8	79.4	**AINF**, AINM, ZALM, ZULM	0.705	0.333	(26/39
17	7	68.9	**AINF**, DOGF, DOGM, ZULF, ZULM	0.698	0.256	(29/39)
18	4	65.6	EGYM, **MORF**, MORM, NORM	0.332	0.192	(42/52)
19	9	70.9	AINF, TEIM, ZULF, **ZULM**	0.454	0.964	(2/56)
20	8	58.1	**AINF**, ANYM, HAIM, NJAF, NJAM, PERM, SJAF	0.726	0.077	(36/39)
23	4	81.5	**EGYF**, NORF	0.796	0.833	(9/54)
25	6	64	**AINF**, EGYF, NJAF, SJAF	0.508	0.051	(37/39)
27	7	70.3	EGYM, **ESKM**, NORM, ZALM	0.718	0.481	(28/54)
29	13	46	**MORM**, all groups	0.948	0.0	(58/58)
30	10	59.8	AINF, ANDM, EGYM, **MOKF**, NJAM, SJAM, ZALM	0.775	0.26	(37/50)

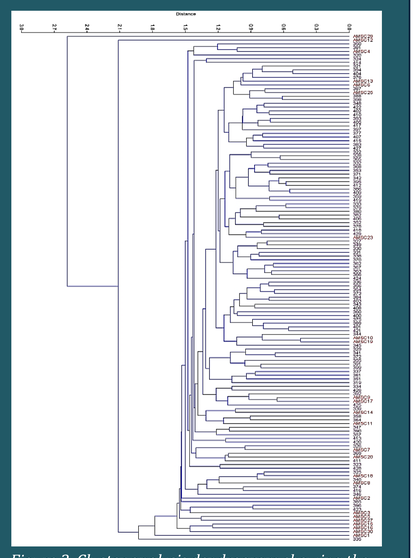

Figure 3. Cluster analysis dendrogram showing the clustering of the Howells' Egyptians and the individuals within the AMSC sample. Generated in PAST version 2.17c (Hammer et al. 2001).

DISCUSSION & CONCLUSIONS

- High degree of heterogeneity in sample
  - 25 individuals classified into 11 different populations
  - Akhmim likely very cosmopolitan through time
- Howells' sample is Late period (660-340BC) from Gizeh
  - Temporal and regional variation may explain why many of the Akhmim individuals did not classify into the Howells' Egyptians
  - Low typicalities when classified (i.e. atypical of that group)
- Complex population history with influences from many regions
  - High classification into Asian pops. (36%) speaks to influences from the East, which have largely been ignored in the literature