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Kom El-Dikka 2005-2009 : Selectes Anthropological Reseach

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KOM EL-DIKKA 2005–2009: SELECTED ANTHROPOLOGICAL RESEARCH

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Abstract: Remains of 373 human skeletons collected from 114 graves of the medieval Islamic cemetery on Kom el-Dikka were subjected to thorough anthropological examination. Over 87% of the identified remains came from the Upper Necropolis, which is dated to the 11th–12th century. A brief discussion of sex, age and stature patterns gives an overall idea of the investigations on site between 2005 and 2009. Stature estimation techniques were evaluated provisionally and Pearson's regression formula was employed, giving reliable results for 104 individuals. The reliability of the data is discussed, taking into account both cultural and environmental factors.

Keywords: anthropology, osteology, stature, sex, age, medieval, Islamic, cemetery, Kom el-Dikka, Alexandria, Egypt

The human skeletal material collected in the course of archaeological excavations carried out by a PCMA team on the site of Kom el-Dikka in Alexandria in Egypt between 2002 and 2009 was subjected to a thorough anthropological examination.[1] The present report covers seasons 2005 through 2009, seasons from 2002 to 2004 having been reported on earlier in this journal (Mahler 2007). All the bones were recovered from a medieval Islamic cemetery, which had three phases of intensified used in the course of at least 600 years (Meyza 2000; Dąbrowski 1966). The burial ground was superimposed on the ruins of a late Roman academic complex (Majcherek 2007) as well as the adjoining baths and villa architecture.

An examination of human remains from 114 graves[2] yielded a minimal number of 373 burials. Most of the examined skeletons originated from the Upper Necropolis (dated to the 11th-12th century). The analysis distinguished 325 individuals (87.1% of the total examined) from 85 graves of that phase. Six tombs of the so-called Middle Necropolis (9th–10th century) contained six skeletons, whereas 16 graves of the Lower Necropolis (7th–8th century) yielded 26 burials. In the remaining seven unstratified graves 16 individuals were distinguished. The groups of individuals from the Middle Necropolis and from unstratified graves were too low in number for reliable analysis results, yet they have been included in the current presentation for the sake of consistency.

[1] For methods employed in determination of sex and age as well as a brief discussion of a stature estimation techniques, see relevant subsections.

[2] The number includes also burials from earth pits without superstructures and bone assemblages which could not be attributed securely to one or to a number of separate graves.

SEX

The sex of individuals examined was determined using a set of morphological methods (Buikstra, Ubelaker 1994; Piontek 1996; White 2006). The poor condition of the bone remains has resulted in a part of the sex determinations being uncertain (32 skeletons determined to be female and 20 male).

An examination of the assemblage distinguished 139 females, 125 males and 89 adolescents. In 20 cases sex could not be determined. The number of females constituted 52.7% of the total number of skeletons with secondary sex traits permitting reliable determination of the sex, the number of males by the same was 47.3%. The proportions, considered by necropolis phase, were respectively: 55.4% women to 44.6% men for the Upper Necropolis, 40% women to 60% men for the Middle Necropolis, 50% women to 50% men for the Lower Necropolis and 33.3% women to 66.7% men in the unstratified group.

Of the total of examined bones, 37.3% were found to be women, 33.5% men, 23.9% children; 5.3% constituted adults whose gender could not be determined by means of the applied methodology. The proportions, divided by chronological phases, are as follows [***Table 1***]:

- Upper Necropolis: 39.4% women (128 individuals), 31.7% men (103 individuals), 24.3% children (79 individuals), and the remaining 4.6% sex indeterminate (15 individuals),
- Middle Necropolis: 33.3% women (2 individuals), 50% men (3 individuals), 16.7% children (1 individual), with all adults determined securely by sex,
- Lower Necropolis: 30.8% women (8 individuals), 30.8% men (8 individuals), 26.9% children (7 individuals), 11.5% sex indeterminate (3 individuals),
- Unstratified graves: 25% women (4 individuals), 50% men (8 individuals), 12.5% children (2 individuals), 12.5% sex indeterminate (2 individuals).

Table 1. Sex of the individuals divided by chronology of the burials

		F	M	Ch	?	Σ
Upper Necropolis	**n**	128	103	79	15	325
	(%)	(39.4)	(31.7)	(24.3)	(4.6)	(87.1)
Middle Necropolis	**n**	2	3	1	0	6
	(%)	(33.3)	(50.0)	(16.7)	(0.0)	(1.6)
Lower Necropolis	**n**	8	8	7	3	26
	(%)	(30.8)	(30.8)	(26.9)	(11.5)	(7.0)
Phase n.d.	**n**	4	8	2	2	16
	(%)	(25.0)	(50.0)	(12.5)	(12.5)	(4.3)
Σ	**n**	139	125	89	20	373
	(%)	(37.3)	(33.5)	(23.9)	(5.4)	(100.0)

AGE

Age at death of the examined individuals was evaluated by commonly applied methods. For the adult skeletons age determination was carried out, wherever applicable, owing to the condition of the bones, based on the following parameters:

- Degree of obliteration of skull sutures (Buikstra, Ubelaker 1994: 32–35),
- Degree of tooth wear using tables prepared by C.O. Lovejoy (Piontek 1996: 172),
- Changes on the surface of the pubic symphysis, according to T.W. Todd (Piontek 1996: 168–169) and J.M. Suchey and S.T. Brooks (Buikstra, Ubelaker 1994: 23–24),
- Changes of the auricular surface of the os coxae, according to C.O. Lovejoy and others (White 2000: 355–359)
- Overall appraisal of bone morphology.

Age of infant skeletons was determined primarily based on tooth eruption, compared to tables constructed by D.H. Ubelaker (Piontek 1996: 144–145). In cases where the alveoli and teeth were not available, measurements of the shafts of long bones were used for the purpose of age determination, comparing the values to tables constructed by M. Stloukal and H. Hanákova (Piontek 1996: 143), P.S. Gindhart (Piontek 1996: 146) and L.A. Dmitrienko (Piontek 1996: 147). Tables of bone growth and ossification by T. Marciniak (Piontek 1996: 147) were applied in doubtful cases. Age determinations of the juvenile skeletons were based on the degree of ossification of cartilaginous elements (Piontek 1996: 148).

Determinations of the age at death of the interred individuals were put on a scale with six categories reflecting the ontogenetic pattern of human life (Malinowski, Bożiłow 1997: 303) [***Table 2***].[3] For assessments covering more than one category, each constituent was assigned a value which was an estimate of the probability of the individual's death at the indicated age.[4] Frequencies resulting from this procedure are not whole numbers. Ranges of particular categories in years owing to their biological nature have been given in parentheses for the purpose of general orientation only. Frequencies of particular age groups in the context of the sex of the deceased were analyzed with regard to individuals from the Upper Necropolis, this being the most numerous of all the groups in the assemblage [***Fig. 1***]. High mortality rates among the youngest children *Infans* I (19.7%) is not surprising. Considering that the delicate bones of juvenile skeletons tend to disintegrate the most quickly, this percentage of child skeletons can be assumed to be even higher. In the case of the necropolis from Kom el-Dikka it was most probably understated furthermore, due to exceptionally unfavorable soil conditions.

Skeletons representing *Infans* II (2.9%) and *Juvenis* (5.9%) were the least numerous categories, while *Adultus* (36.2%) turned out to be the most numerous with

[3] Categories of age-at-death employed: *Infans* I (0–7 yrs), *Infans* II (7–14 yrs), *Juvenis* (14–20 yrs), *Adultus* (20–35 yrs), *Maturus* (35-55 yrs), *Senilis* (55-x yrs).

[4] A multiplication of 1/6 was assumed as a significance indicator, the sum of all age indicators for an individual in this way always being equal to 1.

Table 2. Age at death of individuals divided by the chronology of the burials

		Infans I (0–7 yrs)	Infans II (7–14 yrs)	Juvenis (14–20 yrs)				Adultus (20–35 yrs)			
				F	M	?	Σ	F	M	?	Σ
Upper Necropolis	n	64.00	9.33	6.50	3.50	9.00	19.00	63.00	49.33	5.17	117.50
	(%)	(19.7)	(2.9)	(2.0)	(1.1)	(2.8)	(5.9)	(19.4)	(15.2)	(1.6)	(36.2)
Middle Necropolis	n	1.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	0.00	3.00
	(%)	(16.7)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(16.7)	(33.3)	(0.0)	(50.0)
Lower Necropolis	n	4.17	2.83	0.00	1.50	0.67	2.17	5.17	2.00	2.33	9.50
	(%)	(16.0)	(10.9)	(0.0)	(5.8)	(2.6)	(8.4)	(19.9)	(7.7)	(9.0)	(36.6)
Phase n.d.	n	1.00	0.00	0.00	0.00	1.00	1.00	2.00	0.50	1.00	3.50
	(%)	(6.3)	(0.0)	(0.0)	(0.0)	(6.3)	(6.3)	(12.5)	(3.1)	(6.3)	(21.9)
Σ	n	70.17	12.16	6.50	5.00	10.67	22.17	71.17	53.83	8.50	133.50
	(%)	(18.8)	(3.3)	(1.7)	(1.3)	(2.9)	(5.9)	(19.1)	(14.4)	(2.3)	(35.8)

		Maturus (35–55 yrs)				Senilis (55–x yrs)				Sum
		F	M	?	Σ	F	M	?	Σ	
Upper Necropolis	n	45.00	40.33	5.00	90.33	11.50	11.83	1.50	24.83	325
	(%)	(13.8)	(12.4)	(1.5)	(27.7)	(3.5)	(3.6)	(0.5)	(7.6)	(100)
Middle Necropolis	n	1.00	1.00	0.00	2.00	0.00	0.00	0.00	0.00	6
	(%)	(16.7)	(16.7)	(0.0)	(33.4)	(0.0)	(0.0)	(0.0)	(0.0)	(100)
Lower Necropolis	n	2.50	4.17	0.00	6.67	0.33	0.33	0.00	0.66	26
	(%)	(9.6)	(16.0)	(0.0)	(25.6)	(1.3)	(1.3)	(0.0)	(2.6)	(100)
Phase n.d.	n	1.00	5.00	1.00	7.00	1.00	2.50	0.00	3.50	16
	(%)	(6.3)	(31.3)	(6.3)	(43.9)	(6.3)	(15.6)	(0.0)	(21.9)	(100)
Σ	n	49.50	50.50	6.00	106.00	12.83	14.66	1.50	28.99	373
	(%)	(13.3)	(13.5)	(1.6)	(28.4)	(3.4)	(3.9)	(0.4)	(7.7)	(100)

a distinct predominance of individuals classified as *Maturus* (27.7%). A small group of individuals aged *Senilis* (7.6%) complemented the picture.

The dead aged *Adultus* were primarily female (63 compared to 49.33 male individuals),[5] but allowing for their overall superiority in the skeletal material from the Upper Necropolis [***Table 3***], it was determined that the relative share of the sexes in this age group was almost even (50.7% females to 49.3% males). The slight numerical superiority of males in the *Maturus* category (47.3% females to 52.7% males) and a more significant one among individuals living to a more advanced age, complemented by the evidently higher mortality rate among women in the *Juvenis* category,[6] can be an indication of higher mortality among women due to pregnancy, birth and puerperium risks.

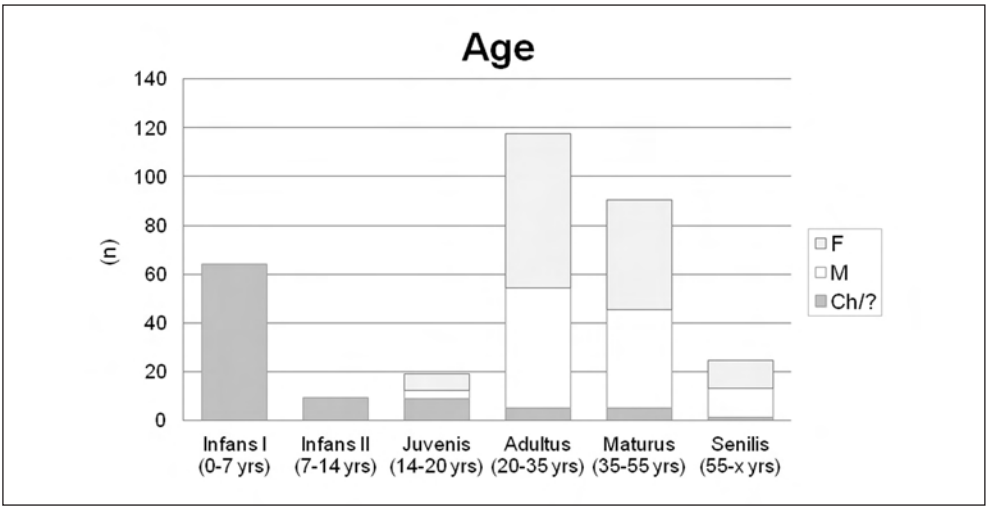

Fig. 1. Distribution of individuals buried in the Upper Necropolis according to sex and age-at-death groups

Table 3. Age at death of individuals of determined sex buried in the Upper Necropolis. The number of females was multiplied by the coefficient of the women-to-men proportions calculated as 0.8047 for the Upper Necropolis

	Juvenis		Adultus		Maturus		Senilis	
	F	M	F	M	F	M	F	M
n	5.23	3.50	50.70	49.33	36.21	40.33	9.25	11.83
(%)	(59.9)	(40.1)	(50.7)	(49.3)	(47.3)	(52.7)	(43.9)	(56.1)

[5] Number of individuals for particular age categories may become fractional owing to counting procedures (described earlier).
[6] Conclusions to be treated with extreme caution due to the small number of sex determinations in the *Juvenis* category.

STATURE

Being a highly ecosensitive trait, stature is an excellent marker of generally understood prosperity of a given human group (Steckel, Rose [eds]: 19–22). A credible reconstruction using bone measurements causes anthropologists much difficulty. Of particular importance in this sphere are methods estimating life stature based on the length of long bones. Proper application of those methods requires only simple routine measurements, unlike measuring of stature right in the grave, which demands a supine skeleton in anatomical arrangement (Petersen 2005; Gralla 1964) — unlikely in most cases — or the much more time-consuming anatomical reconstruction, which requires a very well preserved skeleton (Raxter *et alii* 2006) — also quite rare.

In the case of individuals of indeterminate or largely uncertain morphotype, the least error appears to be involved in a simple ratio of the length of the femur to general body height (Feldesman, Fountain 1996). In view of the overall poor condition of skeletal remains from the graves on Kom el-Dikka, determining the morphotype is impossible in most cases. Nonetheless, calculating individual height using only femural bone measurements does not seem a favorable solution because of the small number of measurements that can actually be made on the poorly preserved bones. In the said series, it was possible to measure the long bones in only 51 cases and 11 of these were burdened by significant measuring error. The decision in view of this was to apply a method, which allows stature to be determined based on measuring the length of a maximally large set of long limb bones, assuming measurement of one of the bones to be sufficient for estimating the stature of an individual.

Despite the small sample K. Pearson's regression equation (Pearson 1899) was applied as the most appropriate in this case, this having been indicated by, among others, M. Giannecchini and J. Moggi-Cecchi (2008) for the territory of Italy and by J. Kozak (1996) for Poland. In both of the said cases, especially in medieval Italy, the most credible results were obtained with this method. However, the indicated conclusions will be true only for a population with a similar, relatively low

Table 4. Mean stature of individuals buried on Kom el-Dikka taking into consideration divisions by sex and chronology

	F				M			
	n	**$\bar{x}$**	**range**	**s**	**n**	**$\bar{x}$**	**range**	**s**
Upper Necropolis	49	154	145–162	3.88	48	166	155–183	5.35
Middle Necropolis	0	–	–	–	0	–	–	–
Lower Necropolis	2	153	153–153	0.00	3	155	153–159	3.46
Phase n.d.	1	164	164–164	–	1	155	164–164	–
Σ	52	155	145–164	4.00	52	165	153–183	5.96

subsistence levels (nutrition status, fresh water availability, healthcare etc.) and comparable morphotype (Strzałko 1971). The population of medieval Alexandria could be treated as comparable, especially with the Italian series, but this intuitive assumption will have to be verified in future research.

The poor condition of skeletal remains from Kom el-Dikka did not allow the length of long bones to be measured in keeping with accepted standard procedure (Martin, Saller 1959) on more than 104 adult skeletons (excepting three skeletons where the necessary measurements were taken but sex determination of the individual proved impossible) with 23 sets of data being burdened with considerable measurement error. Mean stature has been presented in ***Table 4*** and frequency distribution has been charted for arbitrarily selected 5-cm divisions separately for the male and female burials from the Upper Necropolis [***Fig. 2***].

A number of factors (some of which have already been discussed above) impacting the precision of the reported results should be taken into consideration when using the results of the examination of the skeletal material from Kom el-Dikka for anthropological analyses. The primary source of error, the extent of which is difficult to estimate, is the generally poor condition of the bones caused by high soil salinity combined with frequent rainfall in this part of Egypt. A common outcome is a complete disintegration of the bones found in the graves (Kulicka 2008), which effectively thwarted any analysis. Erosion of the bones was augmented often by extensive mechanical fragmentation, observable especially in the case of multiple burials in graves of the Upper Necropolis [***Fig. 3***]. Moreover, burials typical of this phase, which is temporally the latest and therefore the best preserved, were severely disturbed as a rule. The structure of the tombs typical of the period were the reason why more

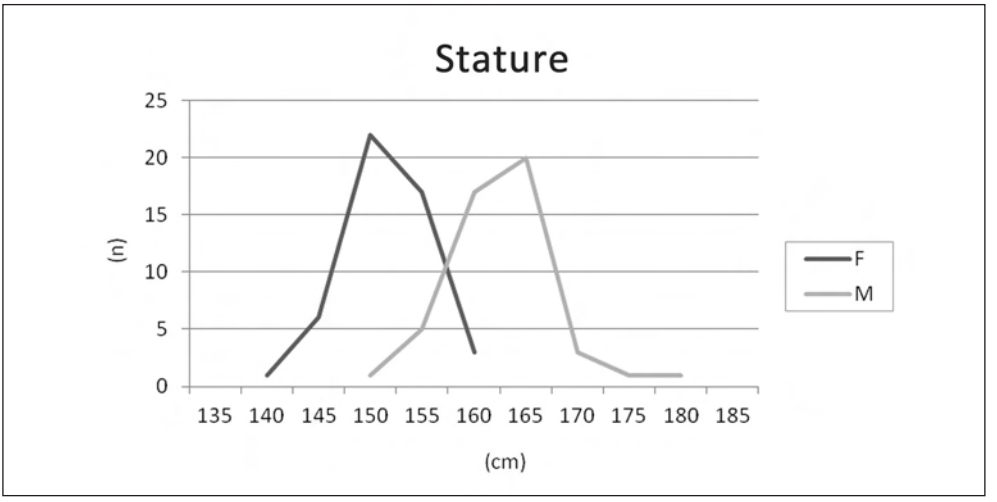

Fig. 2. Frequency distribution of stature of adult individuals buried in graves of the Upper Necropolis presented separately for the two sexes

often than not only the latest burial was preserved in anatomical arrangement. The skeletal remains of previous burials in such cases were broken and moved to the side during successive inhumations (Promińska 1972: 12). Additionally, bones from burials of all phases were crushed and shifted intrinsically by collapsing elements of grave boxes and destructive pits dug under new structures.

In view of the demonstrative character of this presentation, the collected data have been discussed summarily. Conclusions should be considered as preliminary, working theories to be verified in the course of further analyses.

Fig. 3. Exploration of grave CW 35 of the Upper Necropolis: six burials but only one skeleton with the bones in anatomical arrangement (Photo E. Kulicka)

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