

Epidemiological Analysis of tomb complexes from the necropolis of Thebes-West

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Abstract

In the necropolis of Thebes-West, Upper Egypt, individuals from various time periods are buried, comprising the Middle Kingdom, the New Kingdom and the Late Period. Previously the bodies had been examined paleopathologically and data of more than 800 individuals had been entered into a data base. We analyzed the data in respect to age distribution, sex, social status and several symptoms that are indicators for distinct disease entities.

We identified statistically significant associations of social status with the prevalence of caries. Degenerative diseases and traumas are significantly more frequent in later time periods, whereas severe infectious diseases occur nearby only in the Middle Kingdom. The odds ratio of signs of anaemia for children versus adults was about 3.1 (95% confidence interval 2.2- 4.3), independently of social status and epoch. No differences among time periods, social status and age distribution were found for the occurrence of scurvy and osteopenia. Despite the obstacles of missing data, selection bias through selective burial practices and information bias by contamination of later burials, our results give an insight on disease distribution in ancient Egypt by population based data

Introduction

There is considerable knowledge on diseases in Ancient Egypt. By the means of modern techniques in radiology and molecular biology we are steadily deepening our understanding of the health status of individuals like the

great Pharaohs. However, little is known about the frequency of diseases and their distribution across ancient society. Only few investigations report on public health in Ancient Egypt (Rösing 1990).

Since the Egyptians had a strong belief in a life in a next world similar to their mundane life, their burial practices are – to some extent – a mirror of their living society. The aim of this study was to describe disease frequencies and to detect associations of diseases with population characteristics such as gender, age or social status.

Methods

Sites of excavation

Human remains were collected during the excavation campaigns at the necropolis of Thebes-West, Upper Egypt (Nerlich et al., 2000). Tomb complexes under investigation belonged to high royal officials and comprised the following tombs: Theban tomb (TT) -84, TT-85, TT-95, TT-183, TT-196 and Dabu-AI-Nagra (DAN)-01, DAN-91, DAN-93, DAN-94, DAN-95, DAN-97). The tombs were dated by Archeologists. Some tombs were established in the Middle Kingdom (MK) (2100-1650 BC) like TT 196, others in the New Kingdom (NK) (1450-1350 BC), and few burial places were only used during the 3rd Intermediate Period (1070-700 BC) or during the Late Period (after 700 BC). The tombs are generally composed of burial chambers, sloping passages, shafts, longitudinal and transversal halls and fore courts. Of note, some parts of the tombs like the halls have only been used for burials in later time periods.

Human remains and morphologic diagnosis

Besides entire mummies, also skeletons and singular bones were found. Traces of disease with osseous components were registered: severe infections with bone involvement (sinusitis, otitis, mastoiditis), metabolic diseases as discerned by rarefaction of compact bone (osteopenia), new bone apposition on long bones probably due to subperiosteal bleeding as a consequence of vitamin malnutrition (e.g. scurvy) and presence of cribra orbitalia interpreted as a probable sign of anaemia. For the investigation of dental health, status of each tooth attached to jaws was documented in respect to intravital loss,

postmortem loss, presence of milk teeth, caries, abscesses with closed or drained abscess cavities. Sex was determined for skulls and pelvises and the bones attached to them. Age was estimated in ranges of decades by the use of the well established recommendations suggested by Ferembach et al. (1979).

Statistical analysis

Individuals were defined by singular bones (e.g. axis, mandible) or one side of paired bones (e.g. right femurs).

An individual was regarded caries-positive or abscess-positive, when at least one tooth had signs of caries or abscess, respectively. Individuals buried in tomb chambers were coded as high social status. The historic epochs were dichotomized into MK versus NK (and later periods). Further differentiation was not feasible, since frequencies in later periods were too low. Means of age ranges were used as continuous variable. Age was also used dichotomized into child / adolescent versus adult, cut-off value was 20 years. Associations of disease prevalences with sex, age, social status and epoch were assessed by Pearson's chi-square test or in multivariable logistic regression models.

individuals		810	100%
high social status	yes	457	56%
	no	353	44%
sex	not determined	554	68%
	male	126	16%
	female	124	15%
age class	infantile	84	10%
	juvenile	29	4%
	adult	691	85%
epoch	MK	307	38%
	NK	201	25%
	3rd intermediate period	85	10%
	late period	131	16%

diseases	tissue	N	n
lost teeth	skull	810	184
caries	skull	810	53
dental abscess	skull	810	31
infection with bone involvement	skull	810	18
anaemia	skull	810	182
cranial trauma	skull	810	18
arthrosis	femur	838	26
probable scurvy	tibia	589	27
degenerative diseases (vertebrae)	axis	250	18
osteopenia	tibia	589	22
	late period	131	16%

Table 1

Table 2

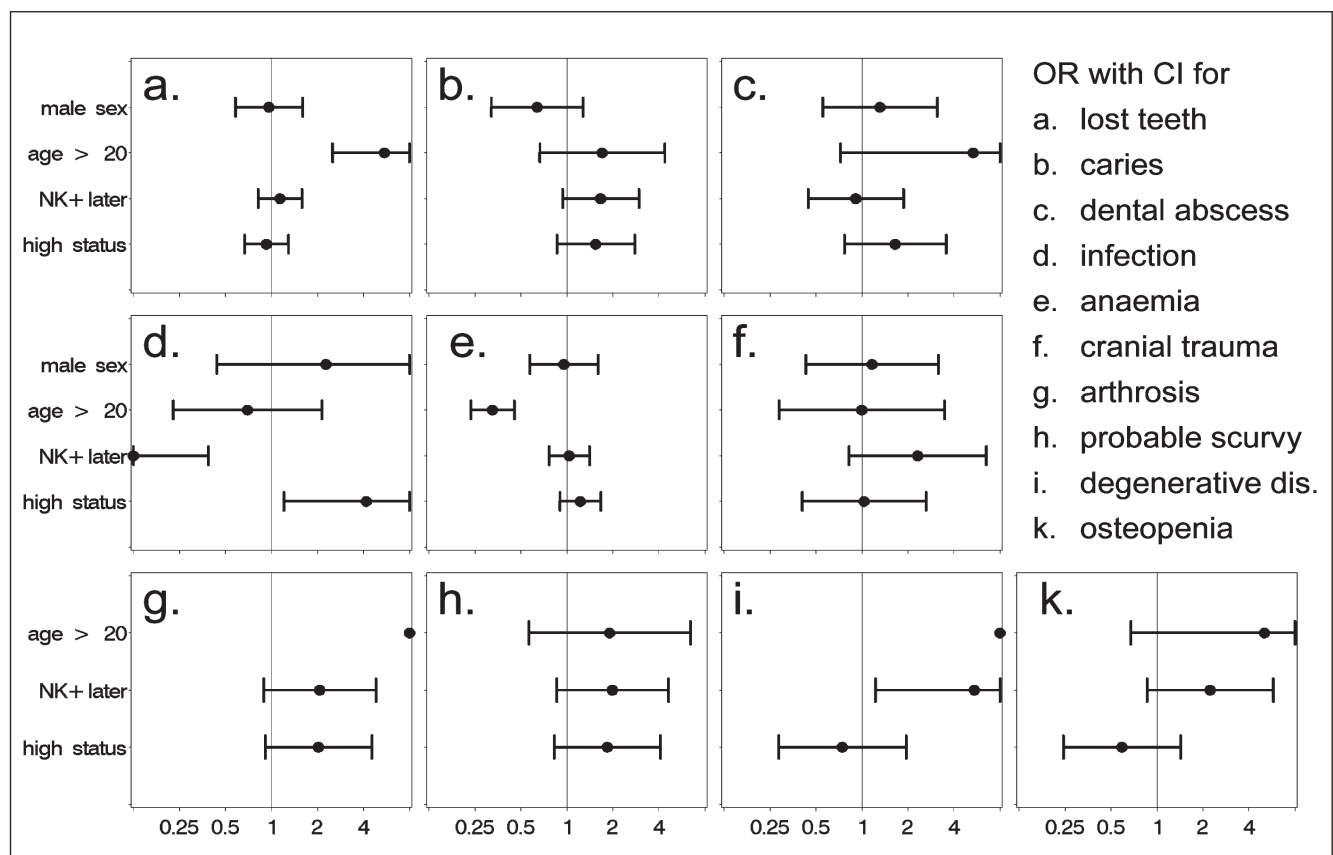


Fig. 1 - OR from bivariate analysis

Odds ratios (OR) are given with 95%-confidence intervals (CI).

Results

Out of about 20,000 bones and tissue parts, 810 individuals could be identified by their skulls. Table 1 gives an overview on population characteristics. Absolute and relative disease frequencies are listed in table 2. The type and number of tissue fragments are also given. Figure 1 shows OR from bivariate analysis. Positive associations are characterised by OR above 1, inverse relations are represented by OR below 1. If the respective 95%-CI does not cover the 1, the association is significant, otherwise trends can be discerned. Multivariable models were established for probable scurvy and caries. When mutually adjusted, the OR of scurvy remained significant for high social status (2.69 [1.15; 6.28]) and the later time period (2.89 [1.18; 7.06]). Similar results were found for caries (high status: OR = 1.75 [0.96; 3.19], later period: OR = 1.86 [1.04; 3.34]). The other variables did not contribute to the model.

Discussion

High social status was identified as a risk factor for dental problems, arthrosis, mal-nutrition and infectious diseases with bone involvement. In later time periods more degenerative diseases, scurvy, osteopenia and traumata were found than in the MK. Severe infections with osseous involvement were seen nearby only in the MK. Children displayed a three times higher chance of anaemia. A major strength of this study was the high sample size of about 20,000 bones representing 810 individuals rendering it to one of largest population based studies in paleopathology to date. This allowed not only for a precise estimation of disease frequency, but also for the identification of significant associations. Furthermore a broad range of a highly hierarchically organized society was represented, as different burial places were included in the study. Selection of higher social strata, however, may have occurred, since individuals of very low social status were likely not buried in rock tombs nor embalmed. On the other hand, natural mummification may have preserved also

the bodies of some poorer subjects. The issue of ancient and recent grave robbery is an important drawback in archaeology. In our study we also found traces of contamination in that e.g. in one tomb chamber a fire had charred the bodies and carbonated bones could also be found in other places outside the chamber. Also secondary burials may have caused misclassification in regard to epoch and social status. This issue, however, could be overcome by a more precise dating of burial situations by archaeological means.

Unequivocally, an association of diseases that we nowadays may address as civilization illnesses with a high social status and later time periods was detected. The predominance of caries in the higher stratum may be explained by a higher consumption of sugars, the more as it is well known that Egyptians were fond of honey and sweets. The higher prevalence of mal-nutrition in regard to vitamins can probably be interpreted by a predilection for meats over vegetables and fruits. Bias by a differential age distribution across social strata is unlikely, since age distribution of the sample is close to that of the known Pharaohs (data not shown).

Of note, prevalence of cranial traumas was independent from age and sex distribution indicating that women and children were similarly to men exposed to accidents or acts of violence. The higher rate of traumas in the NK may reflect social perturbations in an era of radical changes. Despite all precautions of a careful interpretation, these results shed some light on the health status in Ancient Egypt. Further epidemiological studies may help us to elucidate changes of public health over time with more precision and in regard to further diseases.

Literature Cited

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