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GRAVE 2 OF MAIDLA – THE BURIAL SITE OF A SINGLE FAMILY

Stone grave 2 of Maidla is the largest of the archaeologically and osteologically investigated cemeteries of Läänemaa, and probably also the largest osteologically investigated Iron Age burial site in Estonia. The stone grave was used in the 10th–13th centuries, it contained both cremations and inhumations, and among the latter also several complete skeletons were found. The gender and age structure of the people buried in grave 2 of Maidla was estimated and the size and life-cycle of the community was investigated. Data of the Early Iron Age graves 1 and 2 of Poanse as well as of Maidla 1 in Läänemaa were used for comparison.

10.–13. sajandi Maidla II kalme on suurim nii arheoloogiliselt kui ka osteoloogiliselt uuritud Läänemaa kivikalme ja tõenäoliselt suurim osteoloogiliselt uuritud rauaaegne matmispaik Eestis. Kalmes esines nii põletus- kui ka laibamatuseid. Viimaste hulgas esines küll terveid luustikke, kuid peamiselt oli luumaterjal siiski fragmentaarne. On määratud kalmesse maetud inimeste vanus ning sugu ja uuritud kalmet kasutanud kogukonna suurust ja elutsüklit. Võrdluseks on kasutatud vanemasse rauaaega kuuluvate Poanse I ning II ja Maidla I kalme antropoloogilise analüüsi tulemusi.

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Introduction

The Maidla graves of the 5th–7th and 10th–13th centuries have been archaeologically investigated by Mati Mandel, who published the results in a monograph (Mandel 2003). The same volume contains the results of an analysis of the osteological finds from the graves (Allmäe 2003; Maldre 2003). The osteological material is stored in the collections of the Estonian History Museum.

The aim of the present study was to determine the age and sex of the buried people, to estimate the size of the community using the 10th–13th-centuries stone grave of Maidla and to describe the life-cycle of the population. Anthropological data of Poanse stone graves 1 and 2 as well as of Maidla 1 were used for comparison.

Methods

First, the general state of the bones recovered from the grave was assessed, sorting them into cremated and unburned bones. Second, the skull fragments in bone assemblages were counted to discover the possible locations of skulls and, thus, to identify the presumable burial spots inside the grave. Third, the minimum number of individuals buried in the grave was determined, using the method of recurrent bone fragments. In cremation burials as well as in very fragmentary inhumation burials the counting of *pars petrosa* of temporal bone fragments is used. Fourth, the presumable or plausible number of buried individuals was determined on the basis of combined criteria. To determine a presumable burial the larger assemblages of bone fragments of skull and post-cranial skeleton were used, either separately or combined with the find of *pars petrosa* of temporal bone. Note that such assessment of the presumable number of burials is not objective.

Fifth, the gender and age of the buried individuals were determined, if possible, using the generally accepted methods (Gejvall 1948; Miles 1963; Rösing 1977; Recommendations 1980). To determine the age of children the method of development stages of teeth (Ubelaker 1978) and the scale of the length of long bones (Allmäe 1998) were used. Sixth, the possible size of the permanent living population that used the burial ground (Ubelaker 1978), the life-cycle of the population (Acsadi & Nemeskeri 1970), and fertility figures (Bocquet-Appel & Masset 1982; Coale & Demeny 1983) were estimated.

Outline of the material

Grave 2 of Maidla was used in the 10th–13th centuries. During the archaeological excavations of 1984–1990, 674 bone finds were recovered from the area of the grave. This burial ground is the largest of the archaeologically and osteologically investigated ones of Läänemaa, and probably also the largest osteologically investigated Iron Age burial site in Estonia. The stone grave contained both cremations and inhumations; among the latter several complete skeletons were found.

Cremation burials in grave 2 of Maidla

Mati Mandel (2003) has described 24 sooty patches of soil in the area of the grave, identifying these as cremation places. Presumably the bodies of the deceased people were cremated right on the burial site. Thirty-one find assemblages were also discovered in the grave. The finds of larger bone assemblages from the sooty patches were rare and determinable bone fragments even more sparse. The larger bone assemblages are not definitely connected with find complexes either, bones

are usually buried at some distance from them. Thus we were not able to reliably connect burials and bone assemblages neither with cremation patches nor with find complexes (Allmäe 2003). Still, the fact should be mentioned that 42 spear-heads were recovered from the grave (Mandel 2003). The minimum number of estimated cremations is 32, a plausible number is 42.

Inhumations

Inhumation burials were most numerous in the north-western part of the stone grave; apparently this part was especially intensively used in the 12th–13th centuries (Mandel 2003). Only five inhumation burials were discovered in other parts of the grave. Deciding by the number of recurrent bone fragments at least 19 individuals had been buried in grave 2 of Maidla, but very likely their number was 32. The ratio of male and female burials was 5:7. Twenty (62.5%) of the 32 non-cremated burials belonged to children (Allmäe 2003).

Total number of burials and their age structure

The age structure of cremation and inhumation burials is presented in Table 1. The age group 35–65 is a result of the method of determining age on the basis of cremated bones (Gejvall 1948), which allows to distinguish two age groups of adults – 18–44 and 35–64 years – on the basis of the structure of cranial bones. In inhumation burials the age of the deceased can be determined more accurately – adults can be divided into three groups: *adultus* – 20–35 years, *maturus* – 35–55 years, and *senilis* – 55 years and more.

Table 1. Age structure of burials in stone grave 2 of Maidla

Tabel 1. Maidla II kalmesse maetute vanuseline struktuur

Age group	Number of burials	% of the total number of burials
0–1 year	7	9.5
1–6 years (*Infans I*)	12	16.2
7–14 years (*Infans II*)	3	4.0
15–25 years (*Juvenilis-Adultus*)	1	1.4
18–44 years (*Adultus*)	25	33.8
35–64 years (*Maturus-Senilis*)	10	13.5
Over 50 years (S*enilis*)	3	4.0
Adults (*20–69 years*)	13	17.6
Total	74	100

Results and discussion

Age structure of burials in grave 2 of Maidla and the percentage of children's burials – reasons and hypotheses

The total plausible number of burials in the Maidla stone grave was 74, of which 22 were children. The proportion of children's burials in the stone grave Maidla 2 was relatively high – 29.7% of the total number of burials. Moreover, seven (31.8%) of the 22 buried children were below 1 year of age and five of them (22.7% of the total of buried children) had died before they were two months old. This figure can be considered representative for demographic analysis, since the percentage of children is not always as high even in the Late Iron Age and medieval inhumation burials. The proportion of children usually varies between 18.9–58.0%, being most frequently around 30% (Acsadi & Nemeskeri 1970). Among the stone graves of Läänemaa the percentage of children was relatively high also in the Maidla 1 (40%) and Ehmja (30%) stone graves. In the Lihula burial site, contemporaneous with Maidla 1 (5th–6th centuries), the percentage of children's burials was only 14% (Allmäe 2003). Jonathan Kalman (2000) has analyzed (non-cremated) bones from Poanse *tarand*-graves of the Pre-Roman Iron Age in Läänemaa. In both graves of Poanse, the proportion of children's burials was 45.7%.

It is essential to mention that only two cremations of children were discovered in the Maidla 2 stone grave, while in Maidla 1 the remains of 8 children and juveniles were buried (Allmäe 2003). Among the cremations of the Maidla 2 burial ground the percentage of children was only 4.8%. The latter result is similar to that of the Iron Age burial ground at North Spanga, Sweden, where the percentage of children among the cremations was 5% (Sigvallius 1994).

Why is the percentage of children so low among the cremation burials? Different answers have been offered to this question. One of these rests on the poor preservation of cremated bones: burnt bones of children tend to crumble in the soil after quite a short period (Holck 1995). Probably in the stone graves of Läänemaa, where cremated bones were scattered over the area of the burial ground, most of the cremated remains of children and particularly of infants are not preserved. Moreover, if the bones were deliberately crushed before being buried in the grave, children's skeletons must have been destroyed almost entirely.

An opinion has also been expressed that children and adults were not always buried in the same burial ground. A fine example of such a custom can be found at Kaseküla, Läänemaa, where it was mainly children that were buried in a Late Bronze Age stone-cist grave (20 burials of the total of 23) (Kalman 2000).

Another possibility presents itself in the case of stone grave 2 of Maidla, where children could have been buried uncremated. Per Holck (1995) has carried out an experiment, which proved that cremating the bodies of children was a process three times as time-taking and power-consuming as cremating adult bodies. Did our ancestors avoid cremating children's bodies because it was inconvenient?

Thus we can build three different hypotheses to explain the age composition of the people buried in stone grave 2 of Maidla by virtue of the time of validity of the burial place and the nuances of burial customs.

Hypothesis 1. Stone grave 2 of Maidla was continuously used by one single community/family in the 10th–13th centuries, while children were buried in the grave usually uncremated. The percentage of children in the burials was 29.7%. In this case I suggest that all dead children were buried in the grave. Assumption: the mortality rate of children was relatively low.

Hypothesis 2. A new family/community started to bury their dead uncremated into the Maidla 2 stone grave at the late 12th century. Of the 32 inhumation burials, 12 belonged to adults and 20 to children. The proportion of children in the burials was 62.5%. 35% of the children had died younger than one year of age. In the preceding period children were either buried at some other place or the remains of children have got lost in the soil and their presence in the grave is impossible to prove. Hypothesis 2 is, in a way, a perfect case concerning the later inhumation burials – in this case all children were buried in the burial ground. Mati Mandel (2003), however, does not consider it possible that the 32 individuals were buried only during the final 50 years of the exploitation of the burial site. He estimates the time of exploitation of the Maidla stone grave 2 at 250 years (Mandel 2003). Assumption: in the earlier period children were buried both ways, cremated and uncremated; all cremation burials of children cannot, however, be identified and thus the percentage of children in the grave is too low.

Hypothesis 3. One family/community continuously buried in the stone grave 2 of Maidla; in the beginning of the use of the burial site cremation prevailed, but in the late 12th century the burial customs changed and inhumation became dominant. Most of the cremations of children could not be identified – either they have perished in the ground, or their burnt bones were so carefully crushed, or most children may have been buried at some other place. Consequently, children must be under-represented among the burials.

From the anthropological investigations of other Estonian burial grounds we know that in the Pre-Roman Iron Age graves of Poanse the percentage of children was 45.7%, in the Tääksi cemetery of the 14th–18th centuries it was 49.1% and in the 13th–14th century burials in St. John's church of Tartu it was 54.8% (Kalman 2000; Kalling 1997; Allmäe 1998). Presuming that among the burials in the stone grave Maidla 2 the percentage of children should also be 40–50%, we may state that about 20 cremation burials of children in this grave could not be identified.

Life cycle and fertility of the population

The method of demographic life tables has been seriously criticized in recent years and several new complicated mathematic models have been elaborated to describe the life cycles of ancient communities/populations. The latest of these is the theorem of Bayes (Bocquet-Appel & Bacro 1997; Hoppa & Vaupel 2002). The application of this method, however, necessitates the existence of a perfect

and adequate reference series, and it cannot be used to describe the life cycles of small populations. In Estonia cemeteries and other burial grounds frequently belong to single families and therefore the refined and complicated methods need not provide considerably more objective results than classical ones.

Another quite widespread method, comparing the mortality rates of palaeo-populations by virtue of model life tables compiled on the basis of demographic data collected by the UNO in the third world countries, has also been criticized. Modern communities based on agriculture, which have high mortality figures, are not comparable to prehistoric farming cultures (Hill & Hurtado 1996), because mortality curves are drastically different in prehistoric and modern populations (Bocquet-Appel & Bacro 1997). One of the reasons of the incompatibility of the method is also the limited nature of the methods typically used for age determination – an individual's age at death cannot be determined with sufficient accuracy on the basis of skeletal series (McCaa 1998). The author of the present paper is convinced that on the basis of skeletons it is possible to determine only the individuals' biological age but not their chronological age. In everyday life we can often see cases where biological age is not synchronous with the chronological one. Palaeo-anthropologists should only agree upon the criteria of age determination on the basis of skeletal series. Today several different methods are used, leading to considerable discrepancies in age determinations of different researchers.

Jonathan Kalman (2000) has compared modern and prehistoric populations on the basis of mortality figures. We believe that, of the above mentioned two "not good" demographic methods – demographic life-tables and a comparison of the mortality curves of ancient and modern communities – the latter is more confusing.

First, the comparisons with life cycles of third world countries, calculated on the basis of mortality figures, always lead one to the conclusion that the remains of children in burial grounds, particularly of infants and children under five years of age, are too few. Is this comparison not misleading in a way? Are we sure that a considerable part of children has always been buried elsewhere and not in the burial site of their community or family?

In the United States of America a 19th-century cemetery was demographically investigated, using both the data of archaeological excavations and entries about deaths in church registers. The comparison of church records and bio-archaeological evidence proved the frequent statement of archaeologists and anthropologists about children's burials being under-represented in cemeteries to be untrue. The number of children buried in the cemetery was rather larger than mentioned in the registers or on tombstone or crosses (Saunders *et al.* 1995). It also appeared that the life expectancy of the population, calculated on the basis of the skeletal series – 19.4 years – considerably underrated the real one, which was 36.4 (McCaa 1998).

Second, we cannot presume that fertility in Nordic countries, including Estonia, and of the populations of tropical and subtropical territories is always equal. Human physiology and fertility depends, to a higher or lower degree, on the geographical latitude, length of day and sporadically also on the average temperatures (Barber 2002; Bronson 2004). On higher latitudes people are sensitive to the light regime, it influences the hormone level of their system and thus also their fertility

(Bronson 2004). Human fertility studies in 187 countries have established that at the latitudes of 33º and more fertility is considerably lower ($r_{average} = 1.83$) than at lower latitudes, where the average fertility indicator is 4.31 (Barber 2002). Fertility is highest when the average winter temperature is 21º C, but declines considerably when it is higher or lower. Studies prove that low temperatures and short days suppress human fertility (Barber 2002).

In Estonian prehistoric populations (as well as later ones) fertility was dependent on seasons as well as on environment and cultural background, especially on food supplies and quality, and the duration of the nursing period. Heldur Palli (1996) has investigated the recurrence of the number of fecundations on the basis of parish records. He associates it with the seasonal nature of farming and engaging in marriage. Thereby the cultural origins of reproductive strategies can be observed.

The length of the nursing period (Sillen & Smith 1984; Katzenberg *et al.* 1996; Dittmann & Grupe 2000) and the intervals of births, closely connected with it (Siven 1991; Iregren 1992), have received considerable attention in recent years. Different authors have established that most likely women used to nurse babies at least up to the age of 1.0–3.5 years and thus did not quite often conceive for biological reasons. Conception necessitates certain preparedness of the body, hormonal as well as energetic, but nursing and the accompanying increase in energy consumption, combined with short rations, heavy physical work, severe climatic conditions or some other environmental factors, depleted the women's system and from time to time could have limited their capability of conception. Certainly the fertility of women, as well as men, also depends on their hereditary features and general state of health. According to Robert McCaa (1993) women in prehistoric Mexico gave birth every 3–4 years; in Scandinavia, in early medieval Westerhus the average interval of deliveries was three years (Siven 1991).

Third, the reproductive strategies of species depend on the level of stress in populations. Human reproductive strategies change under the influence or interaction of several social and biological factors. For example war, famine and drought periods may increase fertility figures, although mortality figures are also high at the same time. A species' instinctive will to survive starts up in a hope that at least some of the descendants would survive. Robert McCaa claims that populations have not lived at the same demographic regime throughout all periods – stress level differs in different populations. He suggests, for example, that in America populations lived under low pressure from 7000 to 1500 BC, i.e. their fertility was low and life expectancy at birth was high. During the period 1500–500 BC the demographic regime changed – bringing about a decrease in life expectancy while fertility substantially increased. In Estonia we cannot make such generalizations on the basis of the anthropological material at hand, but we may presume that some changes in the demographic regime took place here at the end of the prehistoric period.

Fourth, the mortality rate of children is not the same in all populations and depends on a large variety of factors. The relations of the mortality rate of children with climate and seasons have been verified by demographic studies of skeletal population (Keller & Nugent 1983; Saunders *et al.* 1995). According to the

statistics of USA premature births and death of neonates occur more frequently during summer months (Keller & Nugent 1983). Climate and seasons influence the death rate of infants through the way of their feeding – the mortality rate of infants at the age of 1–12 months is lower if they are breast fed. In the 19th century in Belleville, Ontario, 39% of infants' deaths occurred during summer months – from June to August – when the reproduction of bacteria and other microorganisms is faster. Neonatal (concerning infants younger than one month) and stillbirth mortality was rather related to physiological and organic weakness formed already during the mother's pregnancy. The death rate of infants older than one month (post-neonatal mortality) is substantially influenced by environmental and sanitary conditions (Saunders *et al.* 1995). The length of the nursing period is crucial here; babies who are breast fed are more likely to survive their first year of life than those who are fed artificially. During the weaning period additional food is given to children. If the weaning period (beginning of artificial or mixed feeding of infants) will fall on summer months, the risk of death from bacterial infection is high. What happens to children below one year of age in tropical and subtropical climate, where the reproduction of dangerous bacteria causing intestine infections is many times faster than in moderate climates? Unfortunately I have not been able to find any references to investigations on this subject.

It is also interesting to mention that the survival of children is dependent on the composition of the family, while especially important seems to be their living together with their mother's or father's parents. If the maternal grandmother lived with the family infant mortality at the age of 6–12 months was considerably lower. It is a good example in support of grandmothers' hypothesis. Maternal grandmother seems to have helped to increase the reproductive success of her offspring and enhanced grand-offspring survival. On the other hand, the fertility of women and death rate of infants were higher in the families living with the paternal grandmother (Voland & Beise 2002; Beise & Voland 2002). Children's mortality is also dependent on the density of population: the higher the density (e.g. in medieval towns) the higher were the morbidity and mortality.

Since the stone grave 2 of Maidla, as well as graves 1 and 2 of Poanse, were probably each used by one family, their skeletal finds do not reflect a high death rate for children, since most likely the birth rate was not very high in these small and stable communities. On the one hand, small populations, incl. single families, are of a very steady nature, living in a relatively close and secluded community where the risk of infection and contagion is much lower than in towns or other areas with a higher density of population. On the other hand, the survival of small populations is doubtful in abrupt changes – wars, invasion of dangerous contagions, famine, unexpected environmental factors, etc.

Model of a stationary population: age structure and life expectancy

Notwithstanding the criticism of the method of life tables in palaeodemographic studies, it is still used in the present article as one of the methods for establishing

the life expectancy and describing the mortality figures of a population, although we know that this way we underestimate the population's life expectancy at birth (Meindl *et al.* 2001). In certain circumstances the method of life tables and the presumption that the population was stationary are suitable starting points. Since life tables can be compiled only supposing that the population in question was stationary, neither increasing nor decreasing, and migration did not occur, the model is rather stiff, but still applicable for describing a small and closed community.

Here are the basic data for the following discussion and demographic calculations:

- Hypothesis 1. Grave 2 of Maidla was continuously used by one single community/family in the 10th–13th centuries, and children were buried in the grave usually uncremated. The percentage of children in the burials was 29.7%.
- In demographic calculations we proceed from the plausible number of buried individuals, i.e. from 74 as the maximum possible number.
- The number of adult burials (over 20 years of age) in grave 2 of Maidla was 52. Twelve of them were inhumations and 40 were cremation burials.
- The gender of the deceased could be determined in rare cases: 13 burials belonged to men and 17 to women. In cremation burials the ratio of men to women was 8:10, in inhumation burials it was 5:7.
- 22 of the burials belonged to children, 2 of them were cremation burials.
- The period of exploitation of the stone grave was 250 years.
- The population was stationary, there was no migration, the number of births and deaths were equal.

As could be expected, the death rate in the population of Maidla 2 increased after the age of 30. The higher mortality rate of children in the age group of 5–9 years, compared to other age groups (Tab. 2), is also noteworthy. Life expectancy at birth, i.e. the average lifetime in the Maidla community was 28.16 years, which can be considered quite high and may suggest either a low-pressure demographic regime or under-representation of children in the material. The latter cannot be excluded, since the identification of children's skeletons among cremated bones is often impossible. At the same time the occurrence of a low-pressure demographic regime cannot be excluded either; anyway, the birth rate as well as the death rate of children was low.

Life expectancy in the Maidla community was 28.16, which is higher than in the communities of Poanse 1 and 2 (life expectancy 22.3 and 25.1 years respectively). The age structure of the living populations, which buried in grave 2 of Maidla and graves 1 and 2 of Poanse is described in Fig. 1. It is well observable that the percentages of children and elderly people were almost equal in all three communities, but the proportion of people aged 15–40 was considerably higher in Maidla, which may refer to under-representation of children's remains in the burial site, but also to different demographic regimes of the comparable samples.

Figure 2 represents the mortality in different age groups of the populations of the three burial sites. The mortality figures for juveniles and young adults are surprisingly high in the community of Poanse 1, in Maidla 2 the death rate of

Table 2. Life table for stone grave 2 of Maidla

Tabel 2. Maidla II kalmesse matnud kogukonna elutabel

	n	dx	Lx	qx	Lx	Tx	Ex
0	7.00	9.46	100.00	0.09	95.27	2816.13	28.16
1–4	5.83	7.88	90.54	0.09	346.40	2720.86	30.05
5–9	8.17	11.04	82.66	0.13	385.71	2374.46	28.73
10–14	1.00	1.35	71.62	0.02	354.74	1988.75	27.77
15–19	1.81	2.45	70.27	0.03	345.23	1634.01	23.25
20–24	6.70	9.06	67.82	0.13	316.46	1288.78	19.00
25–29	8.20	11.09	58.76	0.19	266.09	972.32	16.55
30–34	8.70	11.76	47.68	0.25	208.98	706.23	14.81
35–39	6.70	9.06	35.91	0.25	156.93	497.25	13.85
40–44	5.45	7.37	26.86	0.27	115.85	340.33	12.67
45–49	3.17	4.28	19.49	0.22	86.73	224.47	11.52
50–54	3.17	4.28	15.21	0.28	65.34	137.74	9.06
55–59	3.17	4.28	10.93	0.39	43.94	72.40	6.63
60–64	3.17	4.28	6.65	0.64	22.55	28.46	4.28
65–69	1.75	2.36	2.37	1.00	5.91	5.91	2.49
	74.00	100.00			2816.13		

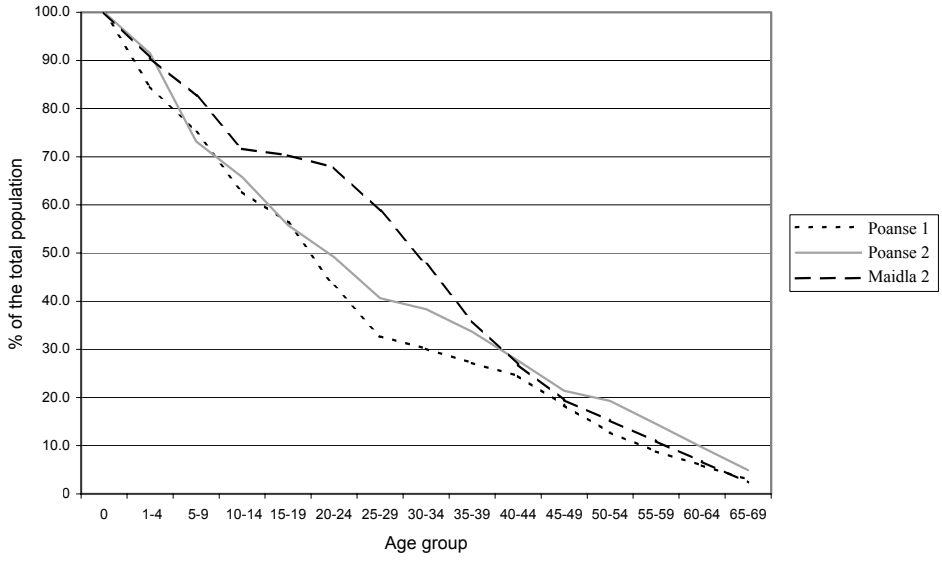

Fig. 1. Survival curves of populations.

Joon 1. Ellujäänud erinevates vanuserühmades.

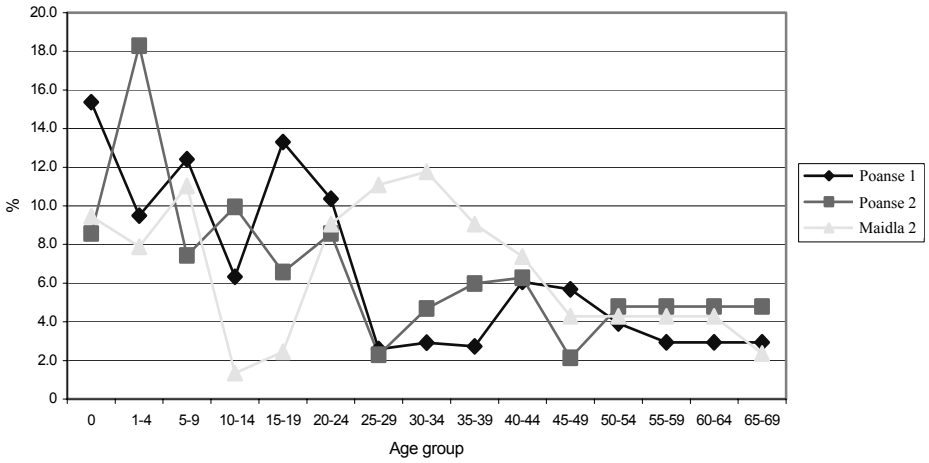

Fig. 2. Mortality in different age groups.

Joon 2. Suremus erinevates vanuserühmades.

juveniles was the lowest. In Poanse 2 remarkably high mortality is observable in early childhood – in the age group of 1–4 years, while mortality rate in infant age does not vary considerably from the respective figure for the Maidla community.

Model of a stationary population: size of the population

M. Mandel (2003) estimates the size of the population which buried in grave 2 of Maidla to be 4.2, considering that the mortality was 40 ‰, but he admits that the size of the community seems too small. Presuming that inhumation burials belong to a later collective (buried during the last 50 years of the use of the grave) the size of the community using the grave should be 16, which, to Mandel's estimation, is evidently too big for one family.

Relying upon the life expectancy calculated with the method of life tables we can also calculate the size of the population which buried in the grave, using the formula

$$P = N \cdot e^0/T = 8.3,$$

where P – living population using the grave, N – total of buried individuals, e^0 – life expectancy at birth and T – duration of the use of the grave.

In this case the average size of the stationary population using grave 2 of Maidla was 8.3 individuals, which corresponds to one family. The family has used the grave during 250 years, the mortality and birth rate of the population

were equal – 36 ‰ proceeding from the model of a stationary population. Relying upon the statement of Valter Lang and Priit Ligi (1991) that the mortality in Early Iron Age could have been 43‰, the size of the population which used the Maidla 2 burial site could be calculated as follows: $P = N/ T \cdot 0.043 = 6.9$. Later, V. Lang (1996) has presumed that mortality in the Late Iron Age might have been somewhere around 30‰, in which case the size of the population would be 9.8 individuals on average.

In principle the resultant size of the community, 7–10 persons, is in accordance with earlier estimations of various authors about the average size of an Estonian family in the 13th century, which is 5–10 persons (Blumfeldt 1937; Ligi 1961; Tarvel 1972). The average size of a family in western Estonia in the 13th–16th centuries was 6–8 persons (Ligi 1961; Palli 1996). At the late 17th and early 18th centuries the birth rate in Estonian villages was about 40‰; the average number of children per marriage was 4.2 (Palli 1996).

J. Kalman (2000) has estimated the sizes of the populations using graves 1 and 2 of Poanse to be 4.4 and 5.5, respectively, on the basis of a life expectancy of 25 years ($e_0 = 25$) and the periods of exploitation of the graves. These family or population sizes seem to be underestimated, particularly as it is suggested that the burial site might have been used by two families. If we calculate the sizes of both Poanse communities by the same formula as we used for the population of Maidla 2, the sizes of the communities using graves 1 and 2 of Poanse would be 4.1 ($e_0 = 22.3$, T = 250 years) and 7.0 ($e_0 = 25.11$, T = 125 years) individuals, respectively. The reasons for the discrepancy might be different estimations of life expectancy, mistakes originating from the demographic model based on mortality figures, disfigured skeletal samples and possibly also certain over-estimation of the period of exploitation of the grave.

Demography based on fertility figures

According to the Coale & Demeny (1983) model (females, Model West) one can determine GRR[1] on the basis of model life tables. I presume the population of Maidla was stationary and their life expectancy at birth was 28.16 years on the basis of life table calculations. Crude birth and death rates are equally – 36 ‰. The GRR for the Maidla community was 2.0–2.5 and the TFR[2] was 4.1–5.1. On the assumption that the Poanse communities were also stationary we can calculate the following fertility figures: Poanse 1: life expectancy at birth was 22.3 years, the mortality rate was 45‰, GRR = 2.95; TFR = 6.15; Poanse 2: $e_0 = 25.11$, the mortality rate was 40‰, GRR = 2.5; TFR = 5.13. According to Robert McCaa (2000), fertility figures describe a life cycle of a population better than mortality

[1] GRR – gross reproduction rate – the number of female descendants per one woman in reproductive age.

[2] TFR – total reproduction rate – number of descendants per one woman in reproductive age.

figures, although both are based on model life tables. Fertility is calculated directly from the age structure of a skeletal series, but to calculate mortality figures we must first know the growth rate of the population. If the growth of the population equals zero, the population is stationary and life expectancy can be established from the number of births in the population. In principle, the births/deaths, fertility and life expectancy of a population can be calculated on the basis of various aggregated ratios (Bocquet-Appel & Masset 1982; Buikstra *et al.* 1986).

Bocquet-Apple & Masset (1982) have suggested a simple method that offers unique advantages for analyzing skeletal data. The Bocquet-Appel and Masset Ratio (d5-14/d20+) is the number of individuals aged 5–14 divided by the number of individuals aged 20 or more. The Bocquet-Appel and Masset Ratio for each archaeological site and the corresponding gross reproduction for three levels of mortality according to model life table calibrations are presented in Robert McCaa's paper (1998).

The Bocquet-Appel and Masset Ratio for Maidla population is 18.3, which corresponds to 3.1 female descendants per woman, if life expectancy at birth was 30 or 40 years. If the life expectancy at birth was 20 years, the number of female descendants per woman would have been 3.5. The women in the Maidla family gave birth to 6–7 children during their reproductive age. In Poanse families women

Table 3. Reproduction figures, life expectancy and size of populations

Tabel 3. Populatsiooni viljakusnäitajad, eeldatav eluiga ja populatsiooni suurus

Name of burial site	Maidla 2	Poanse 1	Poanse 2
Time of use of the burial site in years	250	200–300	100–150
Number of burials	74	46	35
Bocquet-Apple & Masset: 5–14/20+	18.3	35.0	43.5
e_0		40	
GRR	3.1	4.8	5.8
TFR	6.35	9.84	11.89
P	11.84	7.35	11.2
e_0		30	
GRR	3.1	5.0	6.0
TFR	6.35	10.25	12.3
P	8.9	5.52	8.4
e_0		20	
GRR	3.5	5.8	7
TFR	7.18	11.9	14.35
P	5.92	3.68	5.6

gave birth to a notably bigger number of offspring (Tab. 3). The size of the community/family using the Poanse 1 burial site was not over 7 individuals. The population size is too small according to this model, probably indicating material disfigured by the number of children and juveniles being too high in the skeletal sample. The sizes of the communities/families of Poanse 2 and Maidla 2 were rather similar, but the fertility figures are quite different (Tab. 3), indicating either a disfigurement or a decreasing community for the Poanse 2 sample, as the population size is too small for the fertility figures. Neither can we ignore the fact that the ratio proposed by Bocquet-Appel and Masset (1982) does not suit very well for the description of small populations (McCaa 1998).

Consequently, in the 10th–13th centuries a family lived in Maidla, with a likely size of 8–9 individuals (according to the model of stationary populations). The women in Maidla most likely gave birth to 4–5 children, the mortality rate was 36‰ and the living family/community probably consisted of 3–4 children and 4–5 adults. Relying upon the statement of Robert McCaa (2000) about different demographic regimes, we may assert that the community/family which used the Maidla 2 stone grave in the 10th–13th centuries can be characterized as a low-pressure regime with low fertility, low child mortality and high life expectancy at birth. The communities/families using graves 1 and 2 of Poanse were probably larger, or the time of the exploitation of the graves has been overestimated, as has been presumed by J. Kalman (2000). As the fertility figures of the Poanse families were higher in comparison to those of Maidla their mortality is also likely to be higher.

Conclusions and directions for further investigations

- Several researchers (Lang & Ligi 1991; Lang 1996; Kalman 2000; Mägi 2002) have established Estonian stone graves as burial places of a single family. Anthropological investigation of the skeletal remains of stone grave 2 of Maidla confirms this statement.
- We cannot assert that there are always too few children's burials in the burial places and that children were not buried in their family graveyard. Reasons vary as to why children's remains are so few in some graves. On the basis of the preserved skeletal remains we may assume that a part of children's cremations may not have been identified, but we cannot firmly declare it. After all, 29.7% of the total number of Maidla burials were children's ones, which number is quite representative, and there are no facts to prove that the demographic situation in Maidla was significantly different than in any other sites. In the case of Poanse graves there is even less reason to presume the absence of children's remains, so the proportion of children's burials 45,7% is quite realistic.
- From time to time a family (household), could include some additional adult members, who were not direct members of the nuclear family but who participated in the activities of the farm. These could have been closer or more

distant relatives of the owners of the farm, or why not, hired or enslaved workers (Lang & Ligi 1991; Lang 1996; Mägi 2002). Possibly it could be one reason for the unexpectedly small number of children's remains in the burial sites of a family/household – all people living in the household did not bear young. Such, maybe periodically extended family/household may substantially disfigure anthropological data, particularly the age structure and demographic pattern of a small community, one family or household, exploiting a burial site during a long period. The subject certainly requires more detailed investigations.

- Further investigations should be connected with cremation burials and the osteological material of prehistoric burial sites in general, with an aim to describe geographical and temporal differences in burial customs and demographic patterns in Estonia. More interesting results will definitely concern fertility, child mortality and burial customs for children.
- Our second interest of study is the suitability of model life tables and related fertility as well as mortality figures in palaeodemographic analysis. Comparability of modern agricultural populations (in smaller latitudes, warmer climate) and ancient farming populations (in wider latitudes, colder climate) is, indeed, an intriguing issue.

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Raili Allmäe

MAIDLA II KALME – ÜHE PERE MATMISPAIK

Resümee

Maidla 5.–7. ning 10.–13. sajandi kalmeid on Mati Mandel arheoloogiliselt uurinud ja tulemused on esitatud monograafias (Mandel 2003). Samas kogumikus on avaldatud ka Maidla kalmete osteoloogiliste leidude analüüsi tulemused (Allmäe 2003; Maldre 2003). Maidla kalmetest arheoloogiliste kaevamiste käigus kogutud osteoloogiline materjal on talletatud Eesti Ajaloomuuseumi kogudes.

Käesoleva uurimuse eesmärgiks on määrata Maidla II kalmesse (10.–13. sajand) maetud inimeste sooline ning vanuseline struktuur ja uurida kalmet kasutanud kogukonna ehk populatsiooni suurust ja elutsüklit. Võrdluseks on kasutatud Läänemaa vanema rauaaja kalmete – Poanse I ja II – andmeid.

Ülevaade materjalist ja hüpoteesid

Maidla II kalme arheoloogilistel kaevamistel aastatel 1984–1990 koguti 674 luuleidu. Tegu on Läänemaa arheoloogiliselt ja osteoloogiliselt läbi uuritud kalmetest suurimaga, tõenäoliselt üldse kõige suurema osteoloogiliselt läbi uuritud rauaaegse kalmega Eestis. Kalmes esines nii põletus- kui ka laibamatuseid, viimaste hulgas ka terveid luustikke.

Minimaalne põletusmatuste arv kalmes oli 32, oletatavasti aga 42. Põletamata maetud surnuid leiti kõige enam kalme loodeosast, ilmselt kasutati seda matusepaigana eriti intensiivselt 12.–13. sajandil (Mandel 2003), kalme teistest piirkondadest leiti ainult viis laibamatust. Maidla II kalmesse oli põletamata maetud vähemalt 19 inimest (korduvate luukatkendite arvu põhjal), kuid tõenäoliselt siiski 32:

neist mehi 5, naisi 7 ja lapsi 20 (lastematuste osakaal seega 62,5%). Põletus- ja laibamatuste vanuseline struktuur on esitatud tabelis 1. Maetute oletatav koguarv Maidla kalmes on seega 74, neist lapsi 22. Lastematuste osakaal on Maidla II kalmes suhteliselt suur – 29,7% matuste koguarvust. Sealjuures olid 22 maetud lapsest seitse alla aastavanused (31,8% maetud laste koguarvust) ja nendest omakorda viis surid enne kahekuuseks saamist (22,7% laste koguarvust). Seda näitajat võib pidada demograafiliselt esinduslikuks, sest isegi hilisrauaaegsetes ja keskaegsetes laibamatustega matusepaikades ei ole laste osakaal matustes alati nii suur, varieerudes enamasti 18,9–58% vahel, olles tavaliselt 30% lähedal (Acsadi & Nemeskeri 1970). On oluline märkida, et Maidla II kalme alalt leiti ainult kahe lapse põletusmatused. Maidla I kalmesse oli põletatult maetud 8 last ja noorukit (Allmäe 2003). Maidla II kalme põletusmatuste seas on aga laste osakaal ainult 4,8%. Miks on põletusmatuste hulgas laste osakaal nii väike? Sellele probleemile on püütud leida erinevaid selgitusi. Üks nendest tuleneb põlenud luude halvast säilivusest, sest laste põletatud luud murenevad pinnases väga lühikese aja jooksul (Holck 1995). Võimalik, et Läänemaa kalmetes, kus põletatud luud paisati kalmealale laiali, pole säilinudki laste, eriti aga väikelaste põletatud säilmeid. Kui luud purustati tahtlikult enne kalmesse matmist, siis hävinesid laste luustikud peaaegu täielikult.

On ka arvamusi, et lapsi ja täiskasvanuid ei maetud alati ühte ja samasse kalmesse. Selle kohta on hea näide Läänemaalt Kasekülast, kus hilispronksiaegsesse kivikirstkalmesse olid maetud valdavalt lapsed: 23 matusest olid 20 laste säilmed (Kalman 2000).

Maidla II kalme puhul kerkib üles veel üks võimalus: lapsed maeti kalmesse, kuid põletamata. Tulenevalt kalme kasutamise ajast ja matmiskombestiku nüanssidest saab püstitada kolm erinevat hüpoteesi, selgitamaks Maidla II kalmesse maetud inimeste vanuselist koosseisu.

Hüpotees nr 1. Maidla II kalmet kasutas 10.–13. sajandil pidevalt üks populatsioon ja lapsed maeti kalmesse valdavalt põletamata. Laste osakaal matustes oli 29,7%. Sel juhul saab väita, et kõik surnud lapsed maeti kalmesse. Oletus: laste suremus oli suhteliselt väike.

Hüpotees nr 2. Maidla II kalmesse hakkas alates 12. sajandi lõpust surnuid põletamata matma üks uus pere/kogukond. 32 laibamatusest olid 12 täiskasvanute ja 20 lastematused. Laste osakaal matustes oli sel juhul 62,5%. 35% lastest olid alla aastavanused. Väide: varasemal perioodil maeti lapsed mujale või on laste põletusmatused pinnases hävinenud ja nende luustike olemasolu kalmes ei ole võimalik tuvastada. Hüpotees 2 on teatud mõttes täiuslik juhtum hilisemate laibamatuste osas, sest sel juhul maeti kõik lapsed kalmesse. Mandel (2003) ei pea aga võimalikuks, et 32 surnut maeti vaid kalme viimase 50 kasutusaasta jooksul. Maidla II kalme kasutusajaks hindab ta 250 aastat. Oletus: laste surnukehi maeti kalme varasemal kasutusajal nii põletatult kui ka põletamata, kõik laste põletusmatused ei ole aga kalmes tuvastatavad: laste osakaal kalmes on selleks liiga väike.

Hüpotees nr 3. Maidla II kalmesse mattis pidevalt üks pere/kogukond, kalme kasutamise algul oli valdav põletusmatus, alates 12. sajandi lõpust laibamatus – muutus matmistava. Laste põletusmatused jäid enamikus tuvastamata, sest need on kas aja jooksul pinnases hävinenud, nende põlenud luud nii hoolikalt purustatud või on lapsed maetud valdavalt mujale. Seega võib samuti väita, et laste osakaal maetute hulgas on alaesindatud.

Tulemused

Edaspidistes arutlustes ja demograafilistes arvutustes on lähtutud järgmistest eeldustest.

- Hüpotees nr 1. Maidla II kalmet kasutas 10.–13. sajandil pidevalt üks populatsioon ja lapsed maeti kalmesse valdavalt põletamata. Laste osakaal matustes oli 29,7%.
- Demograafilistes arvutustes lähtutakse maetute oletatavast arvust ehk siis maksimaalsest võimalikust arvust – 74.
- Täiskasvanute (vanemad kui 20 eluaastat) matuseid oli Maidla II kalmes 52, neist laibamatuseid 12 ja põletusmatuseid 40.
- Maetute sugu õnnestus harva määrata: mehi oli maetute hulgas 13 ja naisi 17. Põletusmatuste hulgas oli meeste- ja naistematuste suhe 8:10, laibamatustes 5:7.
- Lapsi oli maetute hulgas 22, neist põletusmatuseid 2.
- Kalme kasutusiga oli 250 aastat.
- Populatsioon oli statsionaarne, migratsiooni ei esinenud, sünde ja surmasid tuli ette võrdselt.

Eeldatav eluiga sünnihetkel ehk keskmine eluiga oli Maidlas 28,16 aastat, mis on küllaltki kõrge ja võib viidata ka laste alaesindatusele materjalis. Viimane oletus ei ole võimatu, kuna põlenud materjali puhul on laste luustike tuvastamine sageli raske. Samas ei saa välistada ka võimalust, et tegu on kogukonnaga, kus sündide arv oligi väike, samuti laste suremus.

Võrdluseks võib võtta Poanse I ja II kalme eeldatava eluea sünnihetkel, mis on vastavalt 22,3 ja 25,1 aastat. Maidla II, Poanse I ja II kalmele matnud populatsioonide vanuseline struktuur on esitatud joonisel 1. Graafiliselt on hästi jälgitav, et lapsi ja vanemaid inimesi esines kõigis kolmes kogukonnas suhteliselt võrdselt, kuid 15–35-aastaste osakaal oli märgatavalt suurem Maidlas.

Maidla II kalmet kasutanud statsionaarse populatsiooni keskmiseks suuruseks saame sel juhul 8,3 inimest, mis vastaks ühele liht- või laiendatud perele. Pere kasutas kalmet 250 aasta jooksul. Tulenevalt statsionaarse populatsiooni mudelist oli Maidla kalmesse matnud populatsiooni suremus ja sündimus sel juhul 36‰. Sama valemit kasutades saame Poanse I ja II kalmesse matnud kollektiivide suuruseks vastavalt 4,1 ja 7,0 inimest (kui kalme kasutusajad olid vastavalt 250 ja 125 aastat). Põhimõtteliselt on 7–10 inimesest koosneva kogukonna suurus kooskõlas erinevate autorite varasemate hinnangutega Eesti pere keskmise suuruse

kohta 13. sajandil, mis on vahemikus 5–10 inimest (Blumfeldt 1937; Ligi 1961; Tarvel 1972). Lääne-Eestis oli pere suurus 13.–16. sajandil keskmiselt 6–8 inimest (Ligi 1961; Palli 1996). 17. sajandi lõpul ja 18. sajandi algul oli sündimus Eesti külades 40‰ ümber, laste keskmine arv ühe abiellumise kohta oli keskmiselt 4,2 (Palli 1996). Jonathan Kalman (2000) on Poanse I ja II kalmet kasutanud populatsioonide suuruseks hinnanud – eeldatava keskmise eluea: 25 aastat ($e_0 = 25$) ja kalmete kasutusea põhjal – vastavalt 4,4 ja 5,5. Need pere või populatsiooni suurused on tõenäoliselt alahinnatud, kusjuures räägitakse võimalusest, et kalmet kasutas kaks peret. Eriti puudutab see Poanse II kalmet, sest statsionaarse populatsiooni mudeli põhjal peaks kalmesse matnud kogukonna suurus olema 7 inimest. Põhjusteks on: eeldatava keskmise eluea alahindamine; vead, mis tulenevad nn suremusnäitajatel põhinevast demograafilisest mudelist; võimalik, et ka kalme kasutusaja ülehindamine.

Robert McCaa (2000) arvates kirjeldavad populatsiooni elutsüklit paremini fertiilsus- ehk viljakusnäitajad kui suremusnäitajad. Viljakust arvutatakse otse skeletiseeria vanuselise struktuuri järgi, kuid suremusnäitajate arvutamiseks peame teadma populatsiooni kasvukiirust. Kui populatsiooni kasv võrdub nulliga, st on tegemist statsionaarse populatsiooniga, siis eeldatav eluiga on määratav sündide arvu järgi populatsioonis.

Põhimõtteliselt saab populatsiooni sünde/surmasid, viljakust ja eeldatava eluea pikkust arvutada erinevate suhtarvude põhjal. Bocqueti-Appeli & Masseti (1982) indeks Maidla II kalmet kasutanud populatsioonile on 18,3, millele vastab ühe naise kohta 3,1 sündinud naissoost järeltulijat, kui eeldatav eluiga sünnihetkel oli 30 või ka 40 eluaastat. Kui eeldatav eluiga sünnihetkel on 20 aastat, siis oleks ühe naise kohta sündinud tütarlaste arv 3,5 (tabel 3).

Poanse I ja II populatsiooni reproduktsiooninäitajad on Maidla II populatsiooniga võrreldes kõrgemad, mis oli ka oodatav, sest lastematuste osakaal neis kalmetes oli suurem: 45,7% (tabel 3). Poanse I kalmet kasutanud kollektiivi suurus oli sel juhul umbes 7 inimest, Poanse II kalme puhul 11 inimest. Poanse II ja Maidla II kalmet kasutanud kollektiivid olid ühesuurused, kuid Poanse II viljakusnäitajad olid kõrgemad (tabel 3). Viljakusnäitajad on mõlemal Poanse kollektiivil ebaproportsionaalselt kõrged, võrreldes kalmet kasutanud kollektiivi suurusega. Selline moonutus võib viidata kalme kasutusaja ülehindamisele, materjali vähesele esinduslikkusele või kasutatud mudeli ebasobivusele.

Maidlas elas ajavahemikul 10.–13. sajandini pere, mille suurus oli tõenäoliselt 8–9 inimest, suremus oli 36‰, ühe naise kohta sündinud laste arv võis olla 4–5. Kalmet kasutanud pere/kollektiiv koosnes seega tõenäoliselt 3–4 lapsest ja 4–5 täiskasvanust. Kui toetuda McCaa (2000) väitele, et on olemas erinevad demograafilised režiimid, siis Maidla II kalmet kasutanud kollektiivile/perele on iseloomulik nn madal surve ehk populatsiooni iseloomustab madal viljakus ja kõrge eeldatav eluiga sünnihetkel. Poanse I ja II kalmesse matnud pered ehk kollektiivid olid tõenäoliselt suuremad, kui seda näitavad arvutused kalme oletatud kasutusaegadega.

Järeldused ja edaspidise uurimistöö suunad

- Et Eesti kivikalmed on valdavalt ühe pere matmispaigad, on leidnud mitmed arheoloogid (Lang & Ligi 1991; Lang 1996; Kalman 2000; Mägi 2002). Maidla II kalme luuainese antropoloogiline uuring kinnitab veel kord arheoloogide oletusi.
- Ei saa väita, et lastematuseid on kalmetes alati liiga vähe ja et lapsi ei maetud oma pere kalmesse. Miks laste säilmeid on mõnes kalmes vähe, sõltub väga erinevatest teguritest. Maidla II kalme materjali põhjal võib küll oletada, et osa laste põletusmatustest jäi tuvastamata, kuid Poanse I ja II kalme puhul ei saa kindlalt väita, et lapsi oli kalmesse maetud liialt vähe – osakaal 45,7% alla 15-aastaste kogumatuste arvust on piisavalt representatiivne.
- Peres ehk ühes majapidamises võis elada perioodiliti rohkem täiskasvanud inimesi, kes ei olnud otseselt ühe nukleaarse pere liikmed, kuid kes osalesid talu kui majandusüksuse tegevuses. Need võisid olla pererahva lähisugulased, aga ka kaugemad sugulased, aga miks mitte ka palgatud või orjastatud tööjõud (Lang & Ligi 1991; Lang 1996; Mägi 2002). Võimalik, et siin on peidus ka üks põhjusi, miks ühe pere/majapidamise matmispaikadest leitakse laste säilmeid proportsionaalselt vähem: kõik peres/majapidamises elanud inimesed ei saanud järglasi. Väikese kollektiivi poolt pikaajaliselt kasutusel olnud matmispaiga antropoloogilisi andmeid, eriti vanuselist struktuuri ja demograafilist pilti, võib selline perioodiliselt laiendatud pere/majapidamine oluliselt moonutada. Teema vajab kindlasti palju põhjalikumat uurimistööd.
- Edaspidine uurimistöö on seotud põletusmatustega ja üldse muinasaegsete kalmete osteoloogiliste materjalidega, kirjeldamaks Eestis levinud matmiskombestike geograafilisi ja ajalisi erinevusi. Huvipakkuvamaid tulemusi on kindlasti oodata laste matmiskombestiku osas.
- Intrigeeriv temaatika on ka erinevate mudelite kasutamine Eesti rauaaegsete populatsioonide demograafilisel uurimisel. Kas muistsete põllupidajate populatsioonide elutsüklite rekonstrueerimiseks on üldse võimalik kasutada nn standardmudeleid, mis põhinevad tänapäevaste agraarmaade demograafilistel näitajatel?