



## • Original Scientific Paper •

### **A Study of Human Osseal Remains from the “Cholera Cemetery” Archaeological Site (Tver, Russia)**

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#### **Introduction**

While digging a foundation pit for a new mall on the left bank of Lazar' river (city of Tver), construction workers discovered part of an 18th century cemetery, designated on 19th century maps as “Cholera Cemetery”. A few skeletons in an overall good state of preservation are presented in our study. This osseous material is more recent (approx. end of 19th – beginning of 20th centuries: A.S. Ivanova, pers.com.) than the material from previous studies (1-3), and provides a glimpse into the anthropology of the Tver population at the turn of the 19th century.

#### **Materials and methods**

We have studied 15 skeletons in a primarily good state of preservation. Due to the restrictions of the foundation pit's borders, not all the skeletons have been completely excavated. However, this did not significantly influence the precision of sex or age determination. Pelvic bones were available in all the cases but one (burial №1). Sex was not determined for the juvenile of  $18 \pm 3$  months, since we do not have methods for the precise determination of sex at this early age.

Due to the overall well-preserved state of the skeletons, their age at time of death has been determined with relatively high accuracy. Besides determining it using traditional methods (4), we have utilized some additional ones (5-15). Preserved skulls brought the most accurate results in age determination (16-22), especially for children, where tooth eruption time is a good age indicator (23-25).

To calculate the height of the buried individuals we applied a number of methods, utilizing the length of the so-called long tubular bones (4). Equations have been selected for specific types of proportions, determined by intermembral and tibiofemoral indices. The most universally applicable equation turned out to be that of Debets (26). Some recent methods have also been used to make the height determination more accurate (27-36).

All of the calculations and diagrams were processed in the Statistica 6.0 analysis program.

## Results

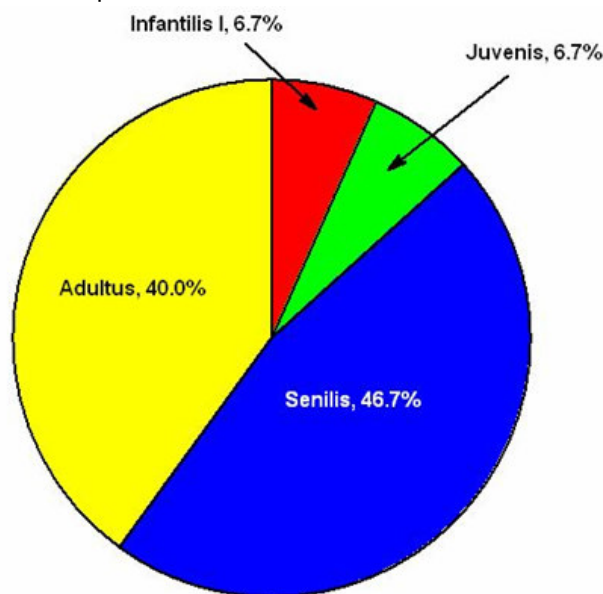
The following table shows basic data for individuals, based on their osseous remains:

Number of burial	Sex	Age (years, unless other is indicated)	Age group	Height (cm.)
1	-	18±3 month	Infantilis I	-
2	Female	30-32	Adultus	154,0±1,5
3	Male	63-66	Senilis	167,1±0,5
4	Male	32-35	Adultus	161,9±0,7
4?	Male	60-62	Senilis	173,6±1,5
5	Female	25-26	Adultus	150,0±0,5
6	Male	26-28	Adultus	160,3±0,7
7	Male	58-62	Senilis	164,3±1,5
8	Male	60-70	Senilis	169,4±0,5
9	Male	65-70	Senilis	167,7±0,5
10	Male	65-70	Senilis	154,4±1,5
11	Male	14-15	Juvenis	-
12	Male	25-30	Adultus	167,40,7
13	Male	18-20	Adultus	174,0±1,5
14	Male	24-25	Adultus	168,6±1,5

We kept the numbers assigned to burial sites during excavation.

## Discussion

Although the osseous material is not rich enough to form a good statistical series, it is nevertheless a valuable component for future demographic and anthropological research into the Tver population at the turn of the 19th century. There is no doubt that the high rate of recent building activities in Tver will soon bring forth further material from this period.



**Diagram.** Shares of various age groups in material from "Cholera Cemetery"

The segments in Diagram 1 show various age groups in the material from "Cholera Cemetery" (*infantilis I* - < 7; *juvenis* - 15-18; *adultus* - 19-35, *senilis* - > 55 years). The *senilis* group takes first place, the *adultus* comes in second, followed by *infantilis I* and *juvenis*. *Infantilis II* (7-14) and *maturus* (36-55) are absent. The dominance of the *senilis* group is generally typical for cemeteries, which might indicate that the name "Cholera Cemetery" is only partially true unto itself, and the regular burial ground has been occasionally used as a burial ground for those deceased from cholera. The lack of *infantilis II* and *maturus* is obviously due to the small size of the series. Although quite small, nevertheless it shows the dominance of masculine burials (12) versus feminine (2). That is typical for other cemeteries of Tver studied (1-3).

Men's average height was  $165,5 \pm 1,3$  cm., whereas women's was  $152 \pm 1,1$  cm. Again, the small amount of material (especially for women) does not allow us to compare it fully with material obtained through earlier studies of 15th-18th century cemeteries. However, the average men's height is almost equal to the previously acquired figure, whereas women appeared to be 2 cm shorter (1).

The highest number of caries cases is recorded for M1dex and M2sin (Figure 1, 2), which belong to the group with the highest risk of caries (1,3). This corresponds to the general predisposition scheme of human teeth to caries (37). In our case, a slightly higher number of carious teeth originated from the left side of jaws.



**Figure 1.** Caries of the medial surface of the crown of M<sub>1sin</sub> (burial № 12)



**Figure 2.** Caries on buccal surfaces of M<sub>1,2dex</sub> (burial № 3)

Dental health is closely related to that of the gums. Four individuals, displaying signs of alveolar bone tissue deterioration, manifested gum inflammation. Starting from gingivitis it reached various degrees of paradontosis (Burials sites № 2, 4, 4?, 5) (Figure 3).

The "normal" absence of third molars is not a rare case in the human population. This state is more frequently appears in women due to the relative shortness of the facial skeleton of their skulls (1,3,38,39). Our case demonstrates the missing M3dex in the woman from burial site №5. The man from burial site №5 lacked both lower M3's, whereas the man from burial site №14 lacked M3dex in addition lacking both lower M3's. Its analogue from the left side was underdeveloped (Figure 4).



**Figure 3.** Signs of mandibular paradontosis (burial № 5)



**Figure 4.** Underdeveloped M<sub>3sin</sub> (burial № 14)



The remains of a 14 or 15-year-old boy show some delay in the eruption of permanent canines.  $C_{sin}$  has just erupted (Figure 5), whereas two deciduous canines are retained in the mandible (Figure 6).

A senior man from the burial site №3 has pronounced prognathism (Figure 7), which is quite rare in Caucasian men. The level of dental hygiene is quite adequately represented through the development of tartar. Most advanced on the lingual surface of incisor teeth, it shows the peak of accumulation by age of 50-60. Well-developed dental tartar has been found in individuals from burial sites №№ 2, 4, 6, 13, and 14. The average age of its pronounced development was 25-30. However, a young man from the burial site №13 shows that it might have developed even earlier, by the age of 18-20. In two cases, so-called accessory or Inca bones have been recorded in *sut. lambdaidea*. Both cases show the most widespread configuration among the historical population of Tver (1), where an accessory bone is located at the meeting point of the *sut. lambdaidea* and *sut. sagittalis* (Figure 8, 9).



**Figure 5.** Delay in  $C_{sin}$  eruption in boy 14-15-years old (burial № 11)



**Figure 6.** Delay in  $C_{sin\ et\ dex}$  eruption (arrow shows permanent canine; deciduous canines have been lost post-mortem (burial № 11)



**Figure 7.** A pronounced maxillary prognathism in senior Caucasian man (burial № 3)



**Figure 8.** Accessory bone in the skull of man (burial № 4)

Osteochondrotic changes in vertebral columns are the most wide-spread feature among those buried at "Cholera Cemetery". These changes had become especially pronounced by the age 60, which is demonstrated on men's remains from burial sites №№ 3, 7, 8 and 10 (Figure 10, 11). Two of them also showed traces of *arthrosis senilis*: the man from the burial site №8 –in the area of distal joint surface of the right humerus (Figure 12), the man from burial site №8 – on the distal joint surface of the right femur (Figure 13).



**Figure 9.** Accessory bone in the skull of man (burial № 14)

Although quite small, the collection of human osseous remains from the former “Cholera Cemetery” supports the results of our previous demographic and anthropometric studies of medieval and post-medieval population of the city of Tver. It also serves as a starting point for future studies of the Tver population at the turn of 19th century.

### Acknowledgements

I am very grateful to A.N Khokhlov (Tver Research and Restoration Center, Tver, Russia) for the access to the collection. I also would like to thank T.M. Nikiforova (Tver Research and Restoration Center, Tver, Russia), who provided the maximum of comfort on the course of the research. Marin Vodanovich (University of Zagreb, School of Dental Medicine, Croatia) encouraged publishing these results. ■



**Figure 10.** Osteochondrotic changes in lumbar vertebra of senior man (burial № 8)



**Figure 11.** Osteochondrotic changes in lumbar vertebra of senior man (burial № 10)

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**Figure 12.** Traces of *arthrosis semilis* on the distal joint surface of right humerus of a senior man (burial № 8)



**Figure 13.** Traces of *arthrosis semilis* on the distal joint surface of right femur of a senior man (burial № 10)

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