LITHUANIAN INSTITUTE OF HISTORY

FROM PAGANISM TO CHRISTIANITY

BURIAL RITES DURING THE TRANSITION PERIOD

Edited by Rytis Jonaitis, Irma Kaplūnaitė

Lietuvos istorijos institutas
Vilnius, 2024

RCL
Research Council of Lithuania

This project has received funding from the Research Council of Lithuania (LMTLT), agreement No S-LIP-24-12

Reviewers:

Prof. Dr. Albinas Kuncevičius (Vilnius University)
Assoc. Prof. Dr. Gintautas Zabiela (Klaipėda University)
Habil. Dr. Tomasz Nowakiewicz (University of Warsaw)

Each article was peer-reviewed by two individual reviewers.

Bibliographical information about this book/publication is available at the Lithuanian Integrated Library Information System (LIBIS) portal ibiblioteka.lt

ISBN 978-609-8314-47-2

Contents

https://doi.org/10.33918/978609831447215

The Anthropology of the 11th-Century Ostriv Cemetery on the River Ros' in Ukraine: The Effects of Migration*

Oleksandra Kozak
Department of Bioarchaeology, Institute of Archaeology
National Academy of Sciences of Ukraine, Kyiv
alexandrakozakpp@gmail.com
ORCID: 0000-0003-2094-4490

The article presents the results of a palaeopathological study of 67 burials from the 11th-century Balt cemetery at Porossya, Ukraine. Recent archaeological studies allow for hypotheses about the peopling of the southern borders of Kievan Rus by groups from northern and northeast Europe. Preliminary anthropological data collected from the Ostriv population suggests some evidence of recent migration. We suggest that migration may have pathological effects on the population, including increased frequency and severity of dental diseases, trauma, and exacerbation of traces of infection.

Keywords: anthropology, palaeopathology, Kievan Rus, 11th century, migration.

Introduction

Migration and disease are essential factors in biological evolution[1] and historical and cultural processes. Population movements transform archaeological cultures and languages.[2] They affect the population's genetic structure and morphology.[3] Furthermore, migration has an impact on the state of human health.[4]

* Funded by the German Research Foundation (DFG) - project number 508078428.

1 C. G. Nicholas Mascie-Taylor, M. Krzyżanowska, Biological Aspects of Human Migration and Mobility, *Annals of Human Biology*, 44, 5: Human Biology of Migration, 2017, pp. 427–440, online: https://doi.org/10.1080/03014460.2017.1313448.

2 P. Bellwood, Human Migrations and the Histories of Major Language Families, *The Global History of Human Migration*, ed. P. Bellwood, 2015, pp. 87–95; P. Manning, *Migration in World History*, London-NY, 2005.

3 C. G. Nicholas Mascie-Taylor, M. Krzyżanowska, Biological Aspects of Human Migration and Mobility, p. 416.

4 M. A. Little, P. T. Baker, Migration and Adaptation, *Biological Aspects of Human Migration*, eds. C.G. Nicholas Mascie-Taylor, G. W. Lasker, New York, 1988, pp. 167–215.

This concerns primarily long-distance migration, with changes in geographical region, climatic conditions, and diet. Such migration provides a mechanism for the transmission and distribution of infectious diseases.[5] On the other hand, migration stimulates the adaptive processes that ensure the survival of human populations in new environmental conditions.[6]

In addition to archaeological markers,[7] there are other indicators of ancient migration. Gene flow,[8] isotopic signatures,[9] and morphological features of bones[10] have been widely used to trace population movements in the past. Extrapolating modern migratory medicine to ancient communities, we can assume that some traces of disease and trauma found in archaeological bones may result from individual adaptation to environments or social conditions in a new place.[11]

Therefore, the distribution of such signs in a palaeopopulation might serve as an additional marker of migration processes in prehistory.[12]

In the late Middle Ages, the development of trade and long military campaigns encouraged various types of population movement. According to chronicles, relocating large groups of people was a common practice in ancient Rus'. The purpose of such replacements was to develop the land or settle the frontiers, to guard and protect them.[13] At the end of the tenth and the beginning of the 11th century, the princes of Kyiv, Volodymyr Rurikovitch, and his heir, Yaroslav the Wise, started to form a defensive line on the southern border of the principality. This line included towns, fortresses and settlements on the River Ros', which were inhabited by 'best men',[14] nomads in the service of princes, mercenaries, and migrants from the Kievan state and beyond. Probably one such settlement was discovered on the bank of the River Ros', nearly 80 kilometres south of Kyiv.[15]

The excavation of the Ostriv cemetery, dating from the 11th and 12th centuries, and apparently belonging to this 'frontier' settlement, has been going on since 2017. Burials are represented by ground pits with inhumations, rich in inventory not typical of the cultural tradition of Kievan Rus'. The graves contain weapons (axes, swords, spearheads), jewellery (necklaces, brooches), and other objects that can be associated with the West Balts: Prussians, Curonians, Scalvians and Yatvingians.[16]

During the three-year excavations (2017 to 2019), conducted by the Institute of Archaeology of the National Academy of Sciences of Ukraine, 67 burials were anthropologically studied. A pilot genetic and isotopic analysis suggested that some of

5 B. A. Kaplan, Migration and Disease, *Biological Aspects of Human Migration*, eds. C.G. Nicholas Mascie-Taylor, G. W. Lasker, New York, 1988, pp. 216–245; S. M. Soto, Human Migration and Infectious Diseases, *Clinical Microbiology and Infection* 15, Supplement 1, 2009, pp. 26–28; L. V. Gromashevskiy, Obshchaya epidemiologiya, Moskva, 1965.

6 M. A. Little, P. T. Baker, Migration and Adaptation.

7 L. S. Klein, Migratsiya: arkheologicheskiye priznaki, *Stratum plus*, 1, 1999, pp. 52–71.

8 D. C. Meiggs, C. Freiwald, Human Migration: Bioarchaeological Approaches, *Encyclopedia of Global Archaeology*, ed. C. Smith, New York, 2014, pp. 3538–3545.

9 M. Ann Katzenberg, The Ecological Approach: Understanding Past Diet and the Relationship between Diet and Disease, *A Companion to Paleopathology*, ed. Anne L. Grauer, Oxford, 2011, pp. 97–113.

10 E.g. M. A. Balabanova, «Rol' migratsiy v formirovanii naseleniya sarmatskoy i savromatskoy kultur,» *Chelovek v kul'turnoy i prirodnoy srede*, ed. T. Alekseeva, Moskva, 2007, pp. 147–154..

11 M. A. Little, P. T. Baker, Migration and Adaptation.

12 O. Kozak, "Patolohichni oznaky na skeleti yak markery mihratsiy," *Arkheolohiya* 1, 2019, pp. 14–27.

13 *Povest' vremennykh let,* Ch. 1. Edited by D. S. Likhachev and B. A. Romanov. Text and translation. Moskva-Leningrad, 1950, p. 83.

14 *Povest' vremennykh let*, pp. 83, 282.

15 V. Ivakin et al., „Novovyiyavlenyy balts'kyy mohyl'nyk XI st. na Porossi," *Tezy dopovidey uchasnykiv mizhnarodnoyi naukovoyi konferentsiyi «Mihratsiyi ta inovatsiyi: u poshukakh pervynnosti idey, rechey i lyudey»*, 8–11 lystopada 2017 r. L'viv-Vynnyky, 2017, pp. 5–7.

16 R. Shiroukhov et al., Baltic Migrants in the Middle Dnipro Region: A Comparative Study of the Late Viking Age Archaeological Complex of Ostriv, Ukraine, *Medieval Archaeology* 66, No 2, 2022, p. 221, online: https://doi.org/10.1080/00766097.2022.2118419.

the people in the cemetery may have been migrants from the northern regions, namely the east Baltic.[17] The aim of the anthropological research programme is to determine the demographic structure and state of health of the population. The paper presents the preliminary results of the study of palaeopathological markers observed on individuals buried in the relatively small excavated area.

Materials and methods

The remains of 67 individuals unearthed during the 2017 to 2019 campaign at the Ostriv cemetery, conducted by the IA NAN of Ukraine archaeological team,[18] were anthropologically analysed.

The representation of the remains in the graves varied from a single bone to a complete skeleton. Bone surface preservation ranged from total erosion of the outer layer of the compacta to brilliantly preserved bone tissue. Bone preservation in this cemetery may depend on the presence of organic or metallic objects in the inhumation, the location of the grave (on a slope or a plateau), and the destruction of the grave by modern cultivation. According to our current observations, the presence of axes, sword fragments and spearheads correlates with very poor bone condition. Metallic corrosion may have caused the rapid destruction of skeletal remains. Materials that were not preserved in the grave, such as wood, leather, fabrics, textile paints and other organic remains of animal or plant origin possibly contributed to the rapid decomposition of the body and the diagenesis of the bones. The wet or warm season of burial should be considered as a decomposition intensity factor. Furthermore, the poor preservation of skeletons can be explained by the extensive looting of graves.

Conventional morphological criteria were used to determine sex and age.[19] Measurements of the long bones were made according to the technique of R. Martin,[20] and the stature of adult females and males was calculated from the length of the long bones according to Pearson, Trotter and Gleser, Breitinger, Bach, and Gerhardt.[21] Pathological conditions for the Ostriv population were recorded according to protocols used by the Göttingen Medical University Paleopathology Group.[22] So far, only morphological and macroscopic techniques have been used for the diagnosis of disease.

17 R. Shiroukhov et al., Baltic Migrants, p. 259.

18 V. Ivakin et al., „Novovyiyavlenyy balts′kyy mohyl′nyk, pp. 5–7.

19 D. Brothwell, *Digging up Bones*, Oxford,1981; J. Buikstra, D. Ubelaker, *Standards for Data Collection from Human Skeletal Remain*, Arkansas, 1994; L. Scheuer, S. Black, *Developmental Juvenile Osteology*, San Diego, 2000; I. Schour, M. Massler, Development of Human Dentition, *Journal of the American Dental Association* 20, 1941.

20 R. Martin, K. Seeler, *Lehrbuch der Anthropologie, in systematischer Darstellung. Bd.1.* Dritte, völlig umgearbeitete und erweiterte Auflage, Stuttgart, 1957; G. Bräuer, Osteometrie, *Anthropologie, Handbuch des vergleichenden Biologie des Menschen*, ed. R. Knussmann, Bd 1, Stuttgart, 1988, pp. 160–232.

21 K. Pearson, Mathematical Contributions to the Theory of Evolution. On the Reconstruction of the Stature of Prehistoric Races, *Philosophical Transactions of the Royal Society London* 192, 1899, pp. 169–244; M. Trotter, G. Gleser, A Re-evaluation of Estimation of Stature Based on Measurements of Stature Taken during Life and Long Bones after Death, *American Journal of Physical Anthropology* 16, No 1, 1958, pp. 79–123; E. Breitinger, Zur Berechnung der Körperhöhe aus den langen Gliedmaßenknochen, *Anthropologischer Anzeiger* 14, 1938, pp. 249–274; H. Bach, Zur Berechnung der Körperhöhe aus den langen Gliedmaßenknochen weiblicher Skelette, *Anthropologischer Anzeiger* 29, 1965, pp. 12–21; G. Gerhards, Secular Variations in the Body Stature of the Inhabitants of Latvia (7th millennium BC – 20th c. AD), *Acta Medica Lituanica* 12, No 1, 2005, pp. 33–39.

22 M. Schultz, Paläopathologische Diagnostik, *Anthropologie: Handbuch der vergleichenden Biologie des Menschen, hrgb. von R. Knussmann, Bd. 1 (1): Wesen und Methoden der Anthropologie*, Stuttgart, 1988, pp. 480–496; M. Schultz, Paleohistopathology of Bone. A New Approach to the Study of Ancient Diseases, *American Journal of Physical Anthropology* 116, issue S33, 2001, pp. 106– 147.

Results

Among the 67 individuals, 17 were classified as subadults younger than 14 years. Most of them belong to the category of infants I (from birth up to six years of age). Of the juveniles, three were identified as males, one as a female, and two could not be sexed. Among the adults, 26 were classified as males, and 17 as females (Table 1).

More than a quarter of the graves (25.8%) belong to subadults, not exceeding the ratio in the rest of the Medieval population.[23] In the cemetery of Ostriv this phenomenon is most likely related to taphonomic processes, or/and to the superficial location of the graves. The male to female ratio in this group is 1.53 : 1 (29 : 19 individuals). The ratio is relatively stable for adults: there were more males than females in each age group from 16 to 50.

The majority of the males died before the age of 30 (17 out of 29 individuals). Similarly, most of the females (12 out of 19) were deceased during adolescence or young adulthood. Together, this makes 43.2% of the whole group. There were only three persons in the sample who were found to have died aged over 50, two of them were female. For women in ancient populations, as in Medieval communities, the period between 15 and 30 years was considered the most dangerous, because of the early onset of multiple pregnancies, childbirth and its complications.[24] For men, it was the age of greatest activity and trauma, especially in frontier areas. It could not be excluded that, in addition to the listed causes, infections played a significant role in the mortality of this group.

The average age of death for adults in the excavated area was estimated as 34.0 years for males, and 32.6 years for females. The defined indicators are lower in comparison to the urban population of the Middle Dnipro region, but do not significantly differ from the rural population (Table 2).[25]

Stature. Skeletal morphology is characterised by relative gracility and medium variety. The average stature, calculated from the length of the limb bones of 28 males according to K. Pearson, was 168.8 ± 2.66 cm; the stature of 11 females was calculated as 162.3 ± 3.03 cm.[26] A total of 50% of the males fall into the categories of tall and medium height,[27] while the proportion of tall females is significantly higher than the proportion of medium-height females (73% versus 27%). Different sources of the male and female groups may explain this diversity. The indicator was calculated using different methods (Table 3) in order to provide a wider range of comparisons. The stature of both males and females appeared to be within the

23 T. I. Alekseeva, D. V. Bogatenkov, G. V. Lebedinskaya, *Vlakhi. Antropo-ekologicheskoe issledovanie (po materialam srednevekovogo nekropolya Mistikhali)*, Moskva, 2003, p. 48; P. von Caselitz, Die menschlichen Skelettreste aus dem Dominikanerkloster zu Schleswig, *Ausgrabungen in Schleswig. Berichte und Studien* 1, Neumünster, 1983, pp. 112–216; J. Cox Russell, *The Control of Late Ancient and Medieval Populations*, Philadelphia, 1985, p. 84; T. Waldron, *Counting the Dead: The Epidemiology of Skeletal Populations*, Chichester, England and New York, 1994.

24 J. Cox Russell, *The Control of Late Ancient and Medieval Populations*, p. 65.

25 O. Kozak, Antropologichniy sklad ta morfofiziologichni rysy davn′orus′kogo naselennya Seredn′ogo Podniprov'ya, *Arkheologiya* 1, 2000, p. 68; A. Kozak, K voprosu o rekonstruktivnykh vozmozhnostyakh diagnostiki zabolevaniy u drevnego naseleniya Ukrainy (na primere Kieva i Pereyaslava), *Vestnik antropologii 15 (2)*, 2007, p. 394; O. Kozak, *Kiyany knyazhoyi doby. Bioarkheologichni studiyi*, Kyiv, 2010, p. 247; O. Kozak ta Vsevolod Ivakin, Mohylnyky Kyyivs′kogo Podolu XI–XIII st. za danymy paleoantropolohichnykh doslidzhen′, *Funeralia Lednickie* 14, 2012, p. 457

26 The data are not complete for the population, cover only a limited group, and differ slightly from previously published data (R. Shiroukhov et al., Baltic Migrants, p. 235) due to different numbers of individuals sampled.

27 R. Marti, *Lehrbuch der Anthropologie, in systematischer Darstellung*, Mit besonderer Berücksichtigung der anthropologischen Methoden. Für Studierende Ärzte und Forschungsreisende, Jena, 1914, p. 208.

Table 1. Sex and age distribution of the individuals from the Ostriv cemetery

Sex / Age	Birth-2 years	2–6 years	6–14 years	14–18 years	(18) 20–30 years	30–40 years	40–50 years	50–60 years	60–70 years	**Summa**
Males	–	–	–	3	14	6	5	1		**29**
Females	–	–	–	1	11	5	0	1	1	**19**
Undetermined	6	8	3	2	–	–	–	–	–	**19**
Total	**6**	**8**	**3**	**6**	**24**	**11**	**5**	**1**	**1**	**67**

Table 2. The average age at death of populations of Medieval Rus', in years

Cemetery. n=male/ female	Ostriv, n=29/19	Kyiv, Upper Town, n=46/18	Kyiv, Shchekavytzia, n=40/17	Kyiv, Podil, n=29/25	Perejaslav, n=11/18	Grigorivka, n=16/10
References		Козак 2010	Козак 2010	Козак, Івакін 2012	Козак	Козак 2000
Males	34.0	39.7	41.9	38.5	40.5	29.7
Females	32.6	46.1	44.9	35.3	35.7	32.0

Table 3. Stature of males and females in the Ostriv population, calculated by different methods

Technics	**Males**			**Females**		
	m	n	s	m	n	S
Pearson	168.8	28	2.66	162.3	11	3.03
Trotter & Gleser	173.6	21	4.51	160.1	11	4.58
Bach / Breitinger	170.2	20	3.62	159.8	12	3.47
Gerhards	172.7	21	3.22	157.3	12	5.24

limits assessed for the populations of a Medieval town in Rus', such as Kyiv, Perejaslav, Ljubech or Vitachiv,[28] or the populations of the territory of the Medieval Polish and Baltic region. For example, a male's stature from Pomorze (Gdansk tenth to 13th century/Cieple 11th to 12th century) ranged from 166.4 to 168.8 centimetres, and the same indices were calculated for Bodzia in the tenth and 11th centuries.[29] The

28 O. Kozak, *Kiyany knyazhoyi doby*, p. 44; O. Kozak, Zakhvoryuvannya zhyteleiv Pereyaslava XI–XII st. ta mozhlyvosti bio-sotsial'nykh rekonstruktsiy, *Naukovyy zapysky z ukrayins'koyi istoriyi 20*, ed. V. Kotsur, Pereyaslav-Khmel'nyts'kyy, 2008, p. 106; A. P. Buzhilova, Otsenka paleopatologicheskikh kharakteristik u drevnerusskogo gorodskogo i selskoho naseleniya (v sravnitel'nom aspekte), *Ekologicheskie problemy v issledovaniyakh srednevekovogo naseleniya Vostochnoy Evropy,* ed. T. Alekseyevoy, Moskva, 1993, p. 118.

29 A. Pudło, Charakterystyka paleodemograficzna i morfologiczna, *Ciepłe. Elitarna nekropola wczesnośredniowieczna na Pomorzu Wschodnim*, ed. S. Wadyl, Gdansk, p. 401; A. Pudło, *Mieszkańcy średniowiecznego Gdańska w świetle wyników badań antropologicznych*, Fontes Commentationesque ad Res Gestas Gedani et PomeRaniae, V., Gdansk, 2016, p. 47; A. Drozd-Lipinska, T. Kozlowski, Analysis of the Skeletal Population from the Cemetery of Bodzia, *Bodzia. A Late Viking-Age Elite Cemetery in Central Poland*, ed. Andrzej Buko, series East Central and Eastern Europe in the Middle Ages, 27, Leiden, 2015, pp. 149–150; G. Gerhards, Secular variations, p. 37.

male stature calculated for Ostriv according to the method of M. Trotter and G. Gleser lies in the limits of town population indicators, but the female stature is higher and corresponds to that of two females from tenth-century Kyiv noble graves (Table 4).

Nonmetric traits. A number of non-metric traits of the skull and postcranial skeleton can be explained as heritable genetic anomalies,[30] or more generally as indicators of physiological population stress. Among these features, the most easily visible and most frequently mentioned are the metopic suture and the Wormian bones in the cranial sutures (Table 5). The metopic suture persistence in adulthood had a medium frequency in the studied group (two out of 27 individuals, or 7.4%). The trait was found only in females and in two children older than three years. The frequency of the other features is high, with 64.4% of 25 individuals having a Wormian or suture bones in the lambda suture, and 26.1% of 23 adult individuals having a posterior fontanel bone. Genetic abnormalities such as a division of the occipital bone into three and four parts (in three individuals), cervical rib (in one female), *spina bifida* (in three males) were also found.

Dental diseases. Calculus of different intensity was found in the deciduous molars of three children aged four to five and seven to nine years, in the permanent dentition of two children ages ten to 14 years, and in all the adults. The concrete varied in colour and consistency from white to grey-cream, and from dense to loose, depending on the individual. This difference, as a possible sign of a change in the area of habitation of the group, should be carefully studied in the future.

Caries were present in 65.8% of the 38 adults, slightly more often in females than in males (11/14 versus 14/24). It was also found in the deciduous teeth of two subadults of three to four and seven to nine years at death. Complications of dental disease, such as abscesses, granuloma formation and antemortal tooth loss, were as common in females and in males (seven/13 versus 11/22). A total of 12 out of 13 females and 16 out of 19 males showed signs of chronic and recurrent alveolar margin inflammation. In five subadults (three of the infants-I and two of the infants-II) the same changes may be a sign of difficult teething.

Inflammation of the periodontium in adults can be considered a consequence of the non-physiological habitual use of the teeth. These changes are accompanied by increased wear of the incisors and canines, and by numerous micro-fractures in the enamel. In males, the enamel damage is related to the consumption of hard and dry foods[31] (nuts, crackers), and to the phenomenon of teeth clenching, due to stress, sharp pain, or carrying heavy loads.[32]

Children's diseases. One of the possible causes of alveolar bone inflammation in older children and adults is vitamin C deficiency.[33] In younger children, the condition manifests as layers of newly built bone

30 T. Sjøvold, A Report on the Heritability of some Cranialmeasurements and Non-Metric Traits, *Multivariate Statistical Methods in Physicalanthropology*, ed. G.N. Van Vark, W.W. Howells, Dordrecht, 1984, pp. 236, 238.

31 G. Richard Scott, J.R. Winn, Dental Chipping: Contrasting Patterns of Microtrauma in Inuit and European Populations, *International Journal of Osteoarchaeology 21(6)*, 2011, pp. 723–731, online: https://doi.org/10.1002/oa.1184.

32 A. J. Foley, The Daily Grind: Assessing Bruxism as a Potential Indicator of Stress in Archaeological Human Remains, *Journal of Archaeological Science*, 117, 2020, pp. 105–117, online: https://doi.org/10.1016/j.jas.2020.105117.

33 G. J. R. Maat, Scurvy in Dutch Whalers Buried at Spitsbergen, *Proceedings of the Fourth European Members Meeting of the Paleopathology Association*, Middelburg-Antwerpen, 16–19 September, Utrecht, 1982, pp. 82–93; S. Živanovič, *Ancient Diseases: The Elements of Palaeopathology*, New York, 1982; A. L. Aschoff, W. K. Koch, *Skorbut; eine pathologisch-anatomische Studie*, Jena, 1919, p. 30.

Table 4. Stature of males and females from Ostriv and other Kievan Rus' populations, according to the method of Trotter and Gleser (1956)

Cemetery, data, n=m/f	Ostriv, n=22/12	Kyiv, Upper Town, 10th c. n=2/2	Kyiv, Upper Town, 11–13th c. n=29/15	Kyiv, Shekavytzia 10–11th c. n=24/10	Kyiv, Podil, 11–13th c. n=29/25	Perejaslav, 11–12th c. n=11/18	Grigorivka, 11–13th c. n=16/10
method		Козак 2010	Козак 2010	Козак 2010	Козак, Івакін 2012	Козак	Козак 2000
Males	173.6	178.5	171.3–174.0	168.9	172.3	170.6	167.0
Females	160.1	167.5	158.7–161.2	158.7	159.9	160.6	157.0

Table 5. Frequency of traits and diseases in the Ostriv population

Groups / Features	Subadults			Adult females			Adult males			Total adult		
	n	N	%	n	N	%	n	N	%	n	N	%
Metopic suture	2	10	**20**	2	13	15.4	0	14	0.0	2	27	**7.4**
Suture bones	3	7	**42.9**	8	11	72.7	8	14	57.1	16	25	**64.4**
Fontanelle bones	7	9	**77.8**	6	11	54,5	0	12	0.0	6	23	**26.1**
Caries (frequency)	2	7	**28.6**	11	14	78.6	14	24	58.3	25	38	**65.8**
Caries (intensity)	3	52	**5.8**	45	262	17.2	29	385	7.5	74	647	**11.4**
Enamel chipping	1	5	**20.0**	4	14	28.6	15	22	68.2	19	36	**52.8**
Tranversal enamel hypoplasia	6	10	**60.0**	13	17	76.5	18	23	75.0	31	40	**77.5**
Sinusitis maxillaris	1	6	**16.7**	7	10	70.1	8	12	66.7	15	22	**68.2**
Frontitis	–	–	–	0	10	0.0	7	12	58.3	7	22	**31.8**
Sphenoiditis	–	–	–	4	6	66.7	1	5	20.0	5	11	**45.5**
Otitis media	2	10	**20.0**	6	16	37.5	6	12	50.0	12	28	**42.9**
Mastoiditis	0	3	**0.0**	1	11	9.1	5	12	41.7	6	23	**26.1**
External auditory exostoses	0	12	**0.0**	9	16	56.3	6	14	42.9	15	30	**50.0**
Meningial reaction (unspesific)	6	11	**54.5**	3	15	20.0	4	17	23.5	7	32	**21.9**
Meningitis tuberculosa	2	11	**18.2**	4	15	26.7	3	16	18.8	7	31	**22.6**
Periosteal reaction on the visceral ribs surface	2	9	**22.2**	4	9	44.4	3	11	27.3	7	20	**35.0**
Periosteal reaction on the tibia shaft	1	7	**14.3**	7	14	50.0	11	18	61.1	18	32	**56.3**

due to remodelled hemorrhages and porosity in characteristic areas of the long bones and skull.[34] Of the 13 subadults aged between one month and six years, six were found to have various hemorrhagic and porotic changes associated with scurvy. Similar features were seen in one of the three children aged seven to 14. Other age groups (juvenile and adults) did not demonstrate any indications which could be associated with this deficiency, aside from periodontal disease.

Only one infant aged one to three months at death had traces of rickets on the bones. The disease may be related to some internal causes (e.g. genetic disorders of calcium metabolism).[35] However, evidence of osteomalacia was found in two adolescents/young adults. No lesions caused by childhood anemia were seen in this sample.

In six out of 11 subadults aged between one month and 14 years at death, meningeal reaction (newly built bone formation in the digital impressions on the inner table of the skull vault) was seen as the probable consequence of meningitis.[36] Proliferative changes as newly built tiny (one to three millimetres) bone exostoses and bridges, as well as unevenly thickened bone surface, and porosity on the medial wall of the tympanic cavity wall, as probable features of otitis media were observed in two individuals aged four to seven years at death (Table 5). Signs of chronic inflammation in the nasal cavity and paranasal sinuses were noticed in four older children. In two individuals under 14 years at death a newly formed bone layer at various stages of organisation was identified on the visceral surface of the ribs as a sign of possible pleural inflammation.

Linear transverse enamel hypoplasia was observed in 75.0% (18/23) of the males and 76.5% (13/17) of the females. It was also seen in the permanent teeth of six subadults. No hypoplasia was found in the primary dentition. On average, one or two lines of moderate intensity were present on the incisors and canines. The mean age of the onset of hypoplasia was 4.3 years in boys and 3.6 years in girls. There was no difference in the frequency or intensity of the lesion between subadults, young adults and adult individuals.

Inflammation and infections. Bone plaque on the visceral surface of the ribs in various stages of healing was found in seven out of 20 adults. Traces of inflammation in the paranasal sinuses and middle ear region were the most common in this group. The localisation of the lesions showed a difference between males and females. In the males, chronic and subacute changes are most commonly found in the maxillary and frontal sinuses, in the mastoid cells (Fig. 1), and the middle ear cavity (Fig. 2). In females, the most common changes are as a result of sphenoiditis, maxillary sinusitis, and otitis media (Table 5).

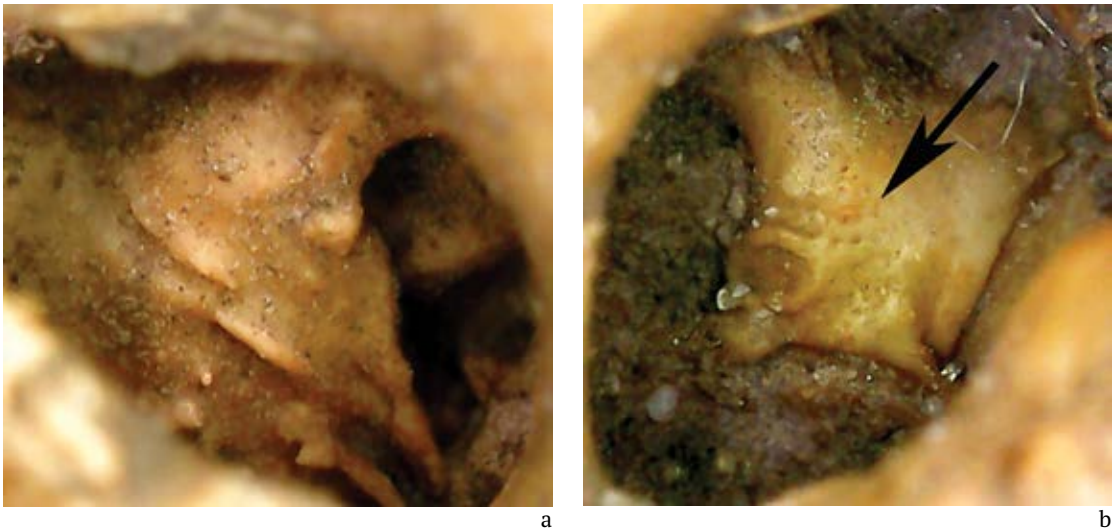
Along with evidence of chronic middle ear inflammation, exostoses in the external auditory canal (EAE) were common in the study group (Fig. 3). This sign was seen in 15 adults: it occurred in six out of 14 males, and nine out of 16 females. It was not found in children and juveniles younger than 18 to 20 years at death (Table 5).

34 D. J. Ortner, M. F. Ericksen, Bone Changes in the Human Skull Probably Resulting from Scurvy in Infancy and Childhood, *International Journal of Osteoarchaeology* 7, iss.3, 1997, pp. 212–220, online: https://doi.org/10.1002/(SICI)1099-1212(199705)7:3<212::AID-OA346>3.0.CO;2-5; M. Schultz, Paleohistopathology of Bone; A. Marie E. Snoddy et al., Macroscopic Features of Scurvy in Human Skeletal Remains: A Literature Synthesis and Diagnostic Guide, *American Journal of Physical Anthropology* 167, No 4, December 2018, p. 876–895.

35 M. Brickley, R. Ives, *The Bioarchaeology of Metabolic Bone Disease*, 2008, pp. 97–100.

36 M. Shults, A. Kozak, Morfologiya i klassifikatsiya sledov meningial'nykh reaktsiy na drevnikh cherepakh (problemy diagnostiki na primere srednevekovykh populyatsiy Kieva), OPUS: *Mezhdistsiplinarnye issledovaniya v arkheologii 6,* 2008, p. 278.

Fig. 1. Traces of chronic inflammation in the mastoid cells of the temporal bone of a 25 to 30-year-old female (?), grave 57: the sclerotic spherical osteoma (long arrow) and the partly organised bone plaque on the walls of the cells (small arrows). Photograph by A. Kozak.



a b

Fig. 2. Traces of chronic otitis media on the medial wall of the promontory of the tympanic cavity: a – the left temporal bone of a 50 to 60-year-old female, tomb 2; b – the right temporal bone of a 35 to 45-year-old male, grave 20. Photograph by A. Kozak.

Fig. 3. External auditory exostosis: a – the right temporal bone of a 35 to 45-year-old male, grave 20; b – a close-up of (a); c – the right temporal bone of a 25 to 30-year-old female, grave 12. Photograph by A. Kozak.

Periosteal reaction on long bones, particularly the tibia, fibula and femur, is caused by a systemic bacterial or viral infection, or other causes such as intoxication or systemic hemorrhage. Without histological or microbiological testing, it is considered a non-specific marker of stress in the group. More than half of the adults (18 out of 32) had evidence of such a reaction on tibia diaphysis. Non-healed or poorly organised changes were often seen in individuals under 30, whereas in older females and males, the traces of periosteal reaction were healed and integrated.

Bony signs of meningeal reaction[37] were found on the inner surface of the bones of the cranial vault in seven out of 32 adults. The reaction may be associated with non-specific viral and bacterial infections, trauma, or hormonal disorders in older females and males.[38]

In some cases, however, the lesions could be related to a specific infection, namely tuberculosis.

37 M. Schultz, Paleohistopathology of Bone, p. 128.
38 M. Shults, A. Kozak, Morfologiya i klassifikatsiya sledov meningial'nykh reaktsiy, pp. 278–280.

a b c

Fig. 4. Traces of probable tuberculosis on the postcranial skeleton of a 20 to 25-year-old female, grave 42: a – periosteal new bone formation on the abdominal surface of the sacrum; b – periosteal reaction on the anterior surface of the right femur; c – a close-up of (b). Photograph by A. Kozak.

These lesions include confluent clusters of tiny shallow intravital impressions ('granulation pits',[39] '*Grübchen*'[40]) on the inner surface of the skull base;[41] irregular porosity of the ventral surface of the vertebral body, diffuse periosteal reaction on the visceral surface of the ribs,[42] and fine porous striation on the diaphysis of the long bones.[43] A diagnosis of tuberculosis was considered when cranial signs (confluent impressions) were seen together with other meningeal lesions, or with postcranial alterations (e.g. Fig. 4). Traces of the disease were found in ten adults and three children (Table 5). Up to now, there is no evidence of advanced joint or spinal disease in the group.

Traumatic lesions. In one adult male buried in the excavated part of Ostriv cemetery, an unhealed penetrating wound to the skull vault was discovered (Fig. 5). The healed surface injuries of the cranial bones were seen in one other male and one female.

39 O. Spekker et al., Tracking down the White Plague: The Skeletal Evidence of Tuberculous Meningitis in the Robert J. Terry Anatomical Skeletal Collection, PLoS ONE 15(3), 2020, e0230418, pp. 7/20, online: https://doi.org/10.1371/journal.pone.0230418.

40 O. Templin, M. Schultz, Evidence of Tuberculosis in the Medieval Infant Population from Bettingen (Switzerland), *HOMO* 45 Supplement, 1994, p. 130; M. Schultz, The Role of Tuberculosis in Infancy and Childhood in Prehistoric and Historic Populations, *Tuberculosis: Past and Present*, eds. G. Palfi, O. Dutour, J. Deak, I. Hutas, Budapest, Szeged, 1999), pp. 503–507; R. Jankauskas, Tuberculosis in Lithuania: Paleopathological and Historical Correlations, *Tuberculosis: Past and Present*, eds. G. Palfi, O. Dutour, J. Deak, I. Hutas, Budapest, Szeged, 1999, pp. 551–558.

41 M. Schultz, The Role of Tuberculosis, p. 503; O. Spekker et al., Tracking down the White Plague, p. 7/20.

42 G. Lovász et al., Skeletal Manifestation of Tuberculosis in a Late Medieval Anthropological Series from Serbia, *Acta Biologica Szegediensis* 54, No 2, 2010, pp. 83–91.

43 M. Schultz, T. H. Schmidt-Schultz, Is it Possible to Diagnose TB in Ancient Bone using Microscopy?, *Tuberculosis* 95, 2015, pp. 82– 85.

a b

Fig. 5. Perimortal penetrating injuries of the right parietal bone of a 30 to 40-year-old male from grave 18: a – external table; b – internal table of the skull. Photograph by A. Kozak.

Fig. 6. Fracture of the head of the right fibula with subsequent ankylosis of part of the bone with the shaft of the tibia in a 20 to 25-year-old male, grave 10. Photograph by A. Kozak.

However, almost half the individuals had traces of healed injuries in the postcranial skeleton: 18 of 26 adult males, and ten out of 21 females exhibited traumatic lesions in the ribs, vertebra and lower limbs. A total of 47.6% of females demonstrated traces of one to three healed injuries per person. The defects were mainly located in the chest (rib fractures and vertebral injuries). Three females each had healed hand and foot fractures, one adult female had healed mandibular fracture, and one female exhibited post-traumatic arthritis and osteomyelitis of the hip joint. More often, injuries were found on the bones of the postcranial skeleton in males. Out of the 26 individuals, 18 (69.2%) had suffered one to four traumas per individual. The majority of males had healed injuries of the chest: compression fractures of the vertebral

body (two cases), splitting of the vertebral joints (two cases), and possible traumatic spondylolysis (two cases). Rib body fractures were detected in two cases, but it is probable that the poor preservation of the ribs might suggest a much higher frequency of such injuries. Long bone traumas were located on the clavicle shaft (three individuals), and 11 persons had 14 injuries in the knee and ankle region (Fig 6).

Discussion

Before the start of the palaeopathological and morphological studies, the migration hypothesis was proposed for the population buried in the Ostriv cemetery. This hypothesis was based on the archaeological data of the burial rite and the grave goods, which were not entirely common in the Kievan Rus' tradition. Isotopic analyses, aDNA, and preliminary assumptions based on morphological studies affirmed a 'non-local' origin of the selected sample. Pilot biochemical analyses and archaeological findings indicate a northern (Baltic, Finno-Ugrian and Scandinavian) origin of at least some of the individuals.[44] The migration hypothesis of the site's origin is also supported by written records. During the tenth and 11th centuries, a variety of groups, including some from the Baltic region, claimed to have resettled the southern borders of Rus' to construct fortifications and protect the frontiers.[45]

Since the initial hypothesis was based on data from different sources, this study aimed to determine whether migration had any effect on the population, and what other factors might have influenced the biological characteristics of the group studied. There are some important limitations to be noted which significantly affect the possibilities and accuracy of interpreting the results of palaeopathological studies of the migrant groups.

The social status of most of the settlements, which could be used for comparative analyses, cannot be precisely determined from an archaeological and historical point of view. The inhabitants of the town were not only members or descendants of the substrate rural population, but also the court of princes, the army, and traders. Settlements on the southern borders of the state could also consist of local inhabitants, as well as relocated troops and peasants' families from other parts of the land, mercenaries, prisoners, etc. Samples from Kievan Rus' were selected as the probable substrate population. So far, only single samples from settlements of the territory of southern Rus' have been analysed using methods and programmes comparable to those used in Ostriv. These include inhabitants of the towns of Kyiv[46] and Perejaslav,[47] as well as residents of the small settlement of Gryhorivka on the banks of the Dnipro north of Ostriv. Research on samples from the presumed territory of origin of the Ostriv group (Baltic area) will be conducted in the future.

As previously mentioned, the Medieval town's population cannot be deemed entirely 'indigenous'. During the tenth to the 12th centuries, Kyiv was partly populated by settlers from various regions. The same could be true of southern settlements or towns like Perejaslav and Yuriev. Nonetheless, we need to acknowledge the intricate demographic and political situation in Rus'. It is possible that the suburban areas of Perejaslav and Kyiv, as well as Grigorivka, could have been settled by rural and indigenous populations.

Another potential caveat affecting the credibility of the assessment results relates to the different

44 R. Shiroukhov et al., Baltic Migrants, p. 241.
45 *Povest' vremennyh let,* p. 83, 282.
46 O. Kozak, Kijani knjazhoï dobi.
47 O. Kozak, Zahvorjuvannja zhiteliv Perejaslava.

interpretations of the reasons for variations in the frequency of each trait. It is only possible to speculate that the observations as a whole could be linked to the population's migration or adaptation to the new environment.

Long-distance migration is associated with changes in a number of key environmental factors, to which the human body must adapt.[48] The migration of groups from the Baltic Sea region to the Middle Dnieper region was expected to result in significant changes to the climatic and geophysical environment of the migrants. This, in turn, may lead to a transformation in their prevalent economy, altered dietary habits, and unusual physical activity. Therefore, certain pathological features, which rely on the factors mentioned, may show changes in their average spatial or temporal distribution. These features include dental pathologies, markers of general stress, and subacute traumatic and inflammatory lesions of bones and joints.

The distribution of sex and age in the Ostriv necropolis reflects the early death of young males. This discrepancy may suggest that some males in the population might not have been part of family units. Similar demographic features were observed in the town of Upper Kiev, where the male-to-female ratio fluctuates from 1.3:1 to 4.9:1 in all age groups in most monastic graveyards and town cemeteries.[49] The situation was quite different in the suburban cemetery of Perejaslav, where mostly females and children, and elderly males, were buried. The ratio of males to females buried in this cemetery was estimated to be 0.6:1.[50] The lack of young males may be related to emigration from the site, probably due to a period of border wars.

Most male graves in Ostriv cemetery contained weaponry, which is considered to be one of the funeral traditions of early Rus'.[51] The discovery of axes in burials of children over three years of age confirmed the possible association of burial weapons with belonging to the warrior social group. This is further supported by the discovery of an axe in the burial of an adolescent male with signs of osteomalacia on the bones. However, our study suggests that both weapon-buried and weaponless individuals had osteological 'military' complexes,[52] indicating that they may have been professional warriors.[53] If we adhere to the tradition of written records, this part of the sample could have represented the 'best men' of the prince's troop or mercenaries.

However, the observed disparity between male and female mortality rates may also be responsible for this demographic pattern.

It is expected that a community residing on the border of a state that inters its deceased with various weapons[54] as grave goods would exhibit a significant number of perimortal or healed intravital traumatic lesions due to armed conflict and interpersonal violence. Contrary to expectations, only one young male showed double skull penetrating trauma, caused by a weapon with a pointed, rectangular cross-section. No evidence of perimortal postcranial injuries was found in any of the 67 skeletons examined.

48 M. A. Little, P. T. Baker, Migration and Adaptation.
49 O. Kozak, Kijani knjazhoï dobi., p. 245.
50 O. Kozak, Zahvorjuvannja zhiteliv Perejaslava, p. 104.
51 V. Baranov, V. Ivakin, Burials with Weaponry in the Ostriv Baltic Graveyard in the Middle Dnieper Area (Excavated in 2017–2018). Medieval Warriors in the Slavic and Baltic Area, *Acta Historica Universitatis Klaipedensis* 37, 2018, pp. 99–127.
52 Methods of 'osteological complexes' determination are widely published in palaeopathological literature, e.g. C. S. Hirst, R. J. Gilmour, K. A. Plomp, F. A. Cardoso, *Behaviour in our Bones. How human Behavior Influences Skeletal Morphology*, Elsevier, 2023.
53 At the moment, we are in the process of preparing a paper on military osteological complexes in Ostriv males.
54 V. Baranov, V. Ivakin, Burials with Weaponry, pp. 99–127.

There is no significant difference in the occurrence of traumatic healed lesions between males buried with and without weapons. Most injuries in males are on the lower legs and feet, which is apparently indicative of activities like prolonged walking or, in a few cases, horse riding.[55] It is plausible that the use of heavy instruments or weapons, like an axe, spear or sword, led to injuries to the joints, and bones of the shoulder girdle. All traumas on the males' skeletons appear to be either occasional or occupational. The same phenomenon was observed in females as well. Most joint, vertebrae or muscle insertion injuries are likely to have occurred as a result of prolonged, excessive or unusual physical activity.[56]

If it is assumed that most young males died in armed conflict, the absence of perimortal bone injuries could be related to fatal soft tissue wounds from arrows or other small weapons. Potential blind spots in detecting traumas must be considered due to the insufficient preservation of bones, especially in graves with weapons. An alternative explanation could be that individuals buried in the uncovered section of the cemetery did not have time to face potential physical danger. Given the percentage of changes associated with subacute infectious diseases on the studied bones, it is likely that some of these individuals died from an epidemic they encountered, as newcomers on the River Ros'.

Traces of inflammatory processes were detected in all adults of the group, affecting the paranasal sinuses, middle ear, meninges, pleura and periosteum of the long bones, due to unspecific or unspecified infections. Subacute and chronic infections, which potentially could be associated with hypothermia, such as frontal sinusitis, otitis media and mastoiditis, were more frequent among males. Females showed a higher incidence of chronic inflammation. Associations were found between respiratory infections and dental diseases. They could also be caused by an irritation of the mucous membranes of the upper respiratory tract due to exposure to herd smoke, probably one of the most common causes of sinusitis in females.[57] The distribution of the frequency of these unspecific conditions does not exceed their rate in the background Rus' samples (Table 6).

The Ostriv population shows a significantly higher incidence of symptoms of tuberculosis, a specific infectious disease, even compared to the densely populated trading town of Kyiv. This figure, however, is comparable to that observed in the lower part of Kyiv, Podil (Table 6), where the lower social classes lived in poor sanitary conditions, dense housing, and high humidity.[58] It should be noted that all of the lesions detected in the Ostriv sample are latent, subacute, or are seen in their early stages. The number of children and adults displaying these features is the same. Most cases were observed in older children and individuals up to 30 years at death. It is currently unclear whether the source of this disease was the local population or possible migrants. But it should be noted that 12 out of the 24 adults from Grigorivka, a small settlement dating back to the end of the tenth to the beginning of the 13th century AD,[59] had grape-like impressions in the region

55 Ju. Ushkova, Do pitannja pro oznaki vershnictva na antropologichnomu materiali, *Istorichna antropologija ta bioarheologija Ukraïni* II, 2020, pp. 140–153.

56 N. Volkovich, *Povrezhdenija kostej i sustavov*, Kiev, 1928; A. V. Grinberg, *Rentgenodiagnostika professional'nyh zabolevanij kostej i sustavov*, Leningrad, 1962.

57 R. Panhuysen, V. Coenen, T. Bruintjes, Chronic Maxillary Sinusitis in Medieval Maastricht, the Netherlands, *International Journal of Osteoarchaeology* 7, No 6, 1997, pp. 610–614.

58 O. Kozak, V. Ivakin, Mogil'niki Kiïvs'kogo Podolu, p. 463.

59 V. A. Petrashenko, *Drevnerusskoe seloju po materialam poselenij u s. Grigorovka*, Kiev, 2005, p. 29.

Table 6. Traces of disease on adult skeletons at Ostriv compared with other Rus' samples

Cemetery	Ostriv, 11th–12th c	Kyiv, Upper Town 10th–13th c	Kyiv, Shchekavytzia 10th–12th c	Kyiv, Podil 11th–13th c	Perejaslav 11th–12th c	Grigorivka, 11th–13th c
	–	Козак 2010	Козак 2010	Козак and Івакін 2012	Козак 2005	Козак 2000
Maxillary sinusitis	68.2 (22)	60.0 (40)	54.8 (31)	52.0 (34)	85.7 (23)	30.0 (23)
Otitis media	42.9 (28)	32.6 (46)	61.5 (52)	54.8 (36)	59.0 (22)	–
Periosteal reaction on the ribs visceral surface	35.0 (20)	67.6 (37)	27.3 (11)	69.2 (26)	–	–
Periosteal reaction of the tibia shaft	56.3 (32)	64.6 (48)	52.5 (40)	–	56.5 (23)	–
Meningitis tuberculosa	22.6 (31)	12.3 (46)	12.9 (62)	21.6 (34)	13.3 (30)	–
Meningeal reaction	21.9 (32)	48.6 (58)	48/4 (62)	–	62.5 (24)	35.0 (23)

of the skull base.[60] These impressions resemble the lesions caused by meningitis tuberculosis.[61] Further examination of samples from Ostriv and the surrounding regions would aid in determining the occurrence of tuberculosis-related symptoms in the population preceding the influx of migrants to the Porossya region.

An example of an interdisciplinary approach that could resolve the issue of the origin of infection is illustrated through a case study of the young male buried in grave 31. Based on the results of isotope analysis, it was determined that he had either been a local resident or had lived in the region for an extended period of time.[62] The male displayed evidence of recurrent tuberculosis meningitis, characterised by newly formed bone plaque on the inner table of the skull bones and multiple grape-like impressions on the inner surface of the base of the skull. As it has been posited that the impact of environmental changes on health and adaptation is most acute in the immediate post-migration period,[63] it will be essential to identify any correlation between the distribution of tuberculosis-associated lesions and newcomers who relocated to the Ros' region shortly before their death.

It is widely known that mortality and morbidity of children could be wellbeing indicators of the population. Children of the studied Ostriv sample make up about a third of the individuals, which is considered a common proportion for an average Medieval population.[64] In addition to tuberculosis, signs of other diseases were also observed in this group. Based on our observations, unspecific infections that cause meningitis and pleural inflammation could have been a significant contributor to the subadult mortality in the River Ros' region.

60 O. Kozak, Drevnerusskoe naselenie, p. 233.
61 O. Spekker et al., Tracking down the White Plague.
62 R. Shiroukhov et al., Baltic Migrants, p. 248.
63 M. A. Little, P. T. Baker, Migration and Adaptation, p. 168.
64 T. I. Alekseeva, D. V. Bogatenkov, G. V. Lebedinskaja, *Vlahi*, p. 48; J. Cox Russell, *The Control of Late Ancient and Medieval Populations*, p. 84.

Half of the subadults (from one to three months to 14 years) exhibited indications of long-term vitamin C deficiency. The frequency of such cases was relatively higher than in the surrounding samples.[65] It may have occurred due to malnutrition,[66] insufficient food intake, and metabolic disturbances caused by infections.[67] On examination of children from various populations in the area of southern Rus' during the period from the tenth to the 13th century, it was found that scurvy was mainly associated with complications from infectious diseases.[68]

Vitamin D deficiency manifested itself in one infant aged one to three months. Two adolescents developed osteomalacia, possibly as a result of impaired vitamin D metabolism. The condition may be due to nutritional problems, and is uncommon in the region.[69] Children and young adults from Ostriv showed no clear signs of anemia. Isotopic analysis has shown that the diet of people from the Porosia region included millet.[70] Grains such as millet, oats, rye, wheat and barley are known to be sources of phytate, a natural inhibitor of iron metabolism.[71] Iron deficiency anemia can occur if millet is part of a child's daily diet. However, this does not seem to be the case in the studied sample. The absence of signs of anemia in skeletal remains may be linked to infant mortality caused by diseases that lead to this condition, or may simply be due to the sample size.

The results of the isotope analysis in the Ostriv population allow us, as one of the interpretation options, to talk about a change in the diet during the life of individuals.[72] An increase in the proportion of carbohydrates in the ration theoretically leads to an intensification of dental diseases, in particular caries. Its frequency in the studied group does not exceed the rates reported for synchronous populations of southern Rus'. In the Ostriv population, the transition to a new diet, as well as drinking water with a different chemical composition, may have influenced the incidence of caries. Further research is needed to clarify this thesis.

The presence and high incidence of exostoses in the external auditory canal is one of the most intriguing findings in the Ostriv population. In this case, inflammation in the canal can be considered a plausible marker of migration. Exostoses on the posterior wall of the external auditory canal result from a prolonged periosteal response to the interaction of wind and waterborne dust.[73]

Extensive research has been conducted into this, and a stable and quite significant difference has been found between coastal and continental populations.[74] While the genetic inheritance of these alterations remains open to debate, there is evidence that the exostoses are associated with otitis media and mastoiditis, and that they are absent in children and

65 O. Kozak, Kijani knjazhoï dobi, p. 157; O. Kozak, A. Diachenko, Deficiency diseases in the Kyiv Rus' subadult population: the issue of the small sample effects, *Anthropologischer Anzeiger 4*, 2023, pp. 363–383, online: https://doi.org/10.1127/anthranz/2023/1719.

66 J. Geber, E. Murphy, Scurvy in the Great Irish Famine: evidence of vitamin C deficiency from a mid-19th century skeletal population, *American Journal of Physical Anthropology* 148, No 4, 2012, pp. 512–524.

67 M. B. Davies, D. A. Partridge, J. Austin, *Vitamin C. Its chemistry and biochemistry*, Cambridge, 1991.

68 O. Kozak, A. Diachenko, Deficiency diseases in the Kyiv Rus' subadult population, p. 376.

69 O. Kozak, A. Diachenko, Deficiency diseases in the Kyiv Rus' subadult population, p. 371.

70 R. Shiroukhov et al., Baltic Migrants, p. 246.

71 M. Djurić, P. Milovanović, A. Janović, M. Drašković, K. Đukić, P. Milenković, Porotic lesions in immature skeletons from Stara Torina, late medieval Serbia, *International Journal of Osteoarchaeology* 18, No 5, 2008, pp. 458–475, online: https://doi.org/10.1002/oa.955.

72 R. Shiroukhov et al., Baltic Migrants, p. 246.

73 S. Villotte, S. Stefanović, Ch. J. Knusel, External Auditory Exostoses and Aquatic Activities During the Mesolithic and the Neolithic in Europe: Results From a Large Prehistoric Sample, *Anthropologie* LIII, No 1, 2014, p. 74.

74 S. Villotte, S. Stefanović, Ch. J. Knusel, External Auditory Exostoses, p. 85.

adolescents, suggesting an inflammatory origin. The Ros' is a relatively small river, making it unlikely to be associated with strong winds and breezes. Therefore, it is probable that individuals with exostoses spent a long period of their lives on the shores of larger bodies of water.

Conclusions

Migration can be studied through various approaches: archaeological analysis of burial artefacts, diet and mobility studies based on isotope ratios, analysis of morphological and genetic diversity, or the demographic profile of the population. Most of the findings obtained in our study of the Ostriv cemetery support the migration hypothesis regarding the origins of the population. The examination of injuries and ailments on remains from this burial ground enables the identification of indications of adaptation, potentially linked to migration.

Unsuccessful adaptation to new environmental conditions may have been the cause of death in some of these children and young adults. The presence of inflammatory markers, which are either unhealed or poorly healed, occurs in their bones. A lack of evidence of disease in young adults or children could be a consequence of their death from acute infection or trauma that left no evidence in the bones.

The initial analysis uncovered questions that require further clarification. Were migrants the first settlers in this area? What were the sources and routes of migration? How many waves of migration occurred during Ostriv's existence? What prompted its inhabitants to leave?

Based on the complexity and possibilities of applied methods, the Ostriv burial ground can serve as a point of reference for studying the anthropology and paleopathology of migration. With the limited sample from the area of the cemetery studied so far, anthropological indicators of recent migration are notable amounts of young and adult males, low numbers of children over six years of age, and moderate to high variability in skeletal morphological characteristics. Pathological indicators reflect various aspects of the migration process. These include exacerbation of dental disease and changes in the quality of dental calculus due to alterations in diet and the composition of drinking water; and a high incidence of postcranial skeletal injuries, particularly of the lower limbs, caused by different types of activity during the journey, or by adaptation to the nature of the terrain. Migration may be a pathway for the spread of infection, or it may contribute to the process of adaptation of migrants to a new microbiota, resulting in a high incidence of infectious diseases, or even epidemics. Our preliminary data suggest that tuberculosis or another infectious disease may have played a significant role in the mortality of young people buried in the Ostriv cemetery.

It should be emphasised that the 67 burials examined represent only a small part of the population living in the area. The results will change as the excavations progress and the sample increases. Therefore, we can only trace the trends in morphology and morbidity of the group studied so far. In future, it is planned to expand the information base, and to investigate certain questions in more detail. In particular, we will compare the disease profiles of the population with the autochthonous inhabitants of various regions of Rus', the east Baltic, Pomerania and Scandinavia.

Bibliography

Alekseeva, Tat'jana I.; Bogatenkov, Dmitrij V.; Lebedinskaja, Galina V. *Vlahi. Antropo-jekologicheskoe issledovanie (po materialam srednevekovogo nekropolja Mistihali)*. Moskva: Nauchnyj mir, 2003.

Aschoff, Albert Ludwig; Walter, Karl Koch. *Skorbut; eine pathologisch-anatomische Studie.* Jena: Gustav Fischer, 1919.

Baranov,v Vyacheslav; Vsevolod Ivakin. "Burials with Weaponry in the Ostriv Baltic Graveyard in the Middle Dnieper Area (Excavated in 2017–2018). Medieval Warriors in the Slavic and Baltic Area". *Acta Historica Universitatis Klaipedensis* 37 (2018), pp. 99–127.

Bellwood, Peter. "Human Migrations and the Histories of Major Language Families". *The Global History of Human Migration*, ed. Peter Bellwood. Wiley-Blackwell, 2015, pp. 87–95.

Bach, Herbert. "Zur Berechnung der Körperhöhe aus den langen Gliedmaßenknochen weiblicher Skelette". *Anthropologischer Anzeiger* 29 (1965), pp. 12–21.

Balabanova Marija A. Rol' migracij v formirovanii naselenija sarmatskoj i savromatskoj kul'tur. *Chelovek v kul'turnoj i prirodnoj srede*, red. Tat'jana Alekseeva, Moskva, 2007, pp. 147–154.

Bräuer, Günter. "Osteometrie". i*Anthropologie, Handbuch des vergleichenden Biologie des Menschen*, ed. R. Knussmann, Bd 1. Gustav Fischer Verlag, Stuttgart, 1988, pp. 160–232.

Breitinger, Emil. "Zur Berechnung der Körperhöhe aus den langen Gliedmaßenknochen". *Anthropologischer Anzeiger* 14 (1938), pp. 249–274.

Brickley, Megan; Rachel Ives. *The Bioarchaeology of Metabolic Bone Disease*. Academic Press, 2008.

Brothwell, Don. R. *Digging up Bones*. Oxford: Oxford University Press, British Museum (Natural History), 1981.

Buikstra, Jane E.; Douglas, H. Ubelaker (eds). *Standards for Data Collection from Human Skeletal Remains*: Proceedings of a Seminar at the Field Museum of Natural History, Organized by Jonathan Haas. Arkansas Archeological Survey, 1994.

Buzhilova, Aleksandra P. Ocenka paleopatologicheskih harakteristik u drevnerusskogo gorodskogo i sel'skogo naselenija (v sravnitel'nom aspekte). *Jekologicheskie problemy v issledovanijah srednevekovogo naselenija Vostochnoj Evropy*, red. Tat'jana Alekseeva, Moskva: IA RAN, 1993, pp. 110–122.

Caselitz, Peter von. "Die menschlichen Skelettreste aus dem Dominikanerkloster zu Schleswig". *Ausgrabungen in Schleswig. Berichte und Studien* 1. Neumünster, 1983, pp. 112–216.

Davies, Michael B.; David A., Partridge; John, Austin. *Vitamin C. Its Chemistry and Biochemistry*. Cambridge: Royal Society of Chemistry, 1991.

Drozd-Lipinska, Alicja; Tomasz, Kozlowski. "Analysis of the Skeletal Population from the Cemetery of Bodzia". *Bodzia. A Late Viking-Age Elite Cemetery in Central Poland*, ed. Andrzej Buko. Series: East Central and Eastern Europe in the Middle Ages, 27. Leiden: Koninklijke Brill NV, 2015, pp. 143–59.

Djurić, Marija; Petar, Milovanović; Aleksa, Janović; Marko, Drašković; Ksenija, Đukić; Petar, Milenković. "Porotic Lesions in Immature Skeletons from Stara Torina, Late Medieval Serbia". *International Journal of Osteoarchaeology*, 18, No 5 (2008), pp. 458–475, <https://doi.org/10.1002/oa.955>.

Foley, Allison J. "The Daily Grind: Assessing Bruxism as a Potential Indicator of Stress in Archaeological Human Remains". *Journal of Archaeological Science*, 117 (2020), pp. 105–117, <https://doi.org/10.1016/j.jas.2020.105117>.

Grinberg, Aleksandr V. *Rentgenodiagnostika professional'nyh zabolevanij kostej i sustavov*. Leningrad: Medgiz, 1962.

Gromashevskij, Lev V. *Obshhaja jepidemiologija*. Moskva, 1965.

Hirst, Cara Stella; Gilmour, Rebecca J.; Kimberly A. Plomp; Alves Cardoso Francisca. *Behaviour in our Bones. How Human Behavior Influences Skeletal Morphology*. Elsevier, 2023.

Ivakin, Vsevolod; Baranov, Vjacheslav; Bibikov, Dmitro; ta Gnera, Volodimir. Novovijavlenij balts'kij mogil'nik HI st na Porossi. *Tezi dopovidej uchasnikiv mizhnarodnoï naukovoï konferenciï "Migraciï ta inovaciï: u poshukah pervinnosti idej, rechej i ljudej"*, 8–11 listopada 2017r. L'viv-Vinniki, 2017, pp. 5–7.

Jankauskas, Rimantas. "Tuberculosis in Lithuania: Paleopathological and Historical Correlations". *Tuberculosis: Past and Present*, eds. Györgi Palfi, Olivie Dutour, J. Deak, I. Hutas. Budapest, Szeged: Golden Book and Tuberculosis Foundation, 1999, pp. 551–558.

Geber, Jonny; Murphy, Eileen. "Scurvy in the Great Irish Famine: Evidence of Vitamin C Deficiency from a Mid-19th Century Skeletal Population". *American Journal of Physical Anthropology* 148, No 4 (2012), pp. 512–524.

Gerhards, Guntis. "Secular Variations in the Body Stature of the Inhabitants of Latvia (7th Millennium BC – 20th C. AD)". *Acta Medica Lituanica* 12, No 1 (2005), pp. 33–39.

Kaplan, Bernice A. "Migration and Disease". *Biological Aspects of Human Migration*, eds. C.G. Nicholas Mascie-Taylor, Gabriel W. Lasker. New York: Cambridge University Press, 1988, pp. 216–245.

Klejn, Lev S. "Migracija: arheologicheskie priznak". *Stratum plus* 1 (1999), pp. 52–71.

Kozak, Oleksandra D. ta Ivakin; Vsevolod G. "Mogilʻniki Kiïvsʻkogo Podolu XI–XIII st. za danimi paleoantropologichnih doslidzhen". *Funeralia Lednickie* 14 (2012), pp. 457–467.

Kozak, Oleksandra D. "Antropologichnij sklad ta morfofiziologichni risi davnʻorusʻkogo naselennja Serednʻogo Podniprov'ja". *Arheologija 1* (2000), pp. 67–81.

Kozak, Oleksandra. Drevnerusskoe naselenie Grigorovki po materialam mogilʻnika. Valentina Petrashenko. *Drevnerusskoe selo po materialam poselenij u s. Grigorovka*. Kiev: Institut arheologii NAN Ukrainy, 2005, pp. 226–241.

Kozak, Oleksandra D. "Patologichni oznaki na skeleti jak markeri migracij". *Arheologija 1* (2019), pp. 14–27.

Kozak, Oleksandra. Zahvorjuvannja zhiteliv Perejaslava HI–HII st. ta mozhlivosti bio-socialʻnih rekonstrukcij. *Naukovi zapiski z ukraïnsʻkoï istoriï 20, ed. V. Kocur, Perejaslav-Hmelʻnicʻkij, 2008,* pp. 104–116.

Kozak, Oleksandra. K voprosu o rekonstruktivnyh vozmozhnostjah diagnostiki zabolevanij u drevnego naselenija Ukrainy (na primere Kieva i Perejaslava), Vestnik antropologii 15, # 2, (2007).

Kozak, Oleksandra. Kijani knjazhoï dobi. *Bioarheologichni studiï*. Kiïv: Akademperiodika, 2010.

Kozak, Oleksandra; Diachenko, Aleksandr. "Deficiency Diseases in the Kyiv Rus' Subadult Population: The Issue of the Small Sample Effects". *Anthropologischer Anzeiger* 4, (2023): 363–383, <https://doi.org/10.1127/anthranz/2023/1719>.

Little, Michael A.; Baker, Paul T. "Migration and Adaptation". *Biological Aspects of Human Migration*, eds. C.G. Nicholas Mascie-Taylor, Gabriel W. Lasker. New York: Cambridge University Press, 1988, pp. 167–215.

Lovász, Gabriella; Pálfi, György; Marcsik, Antónia; Pósa, Annamária; Neparáczky, Endre; Molnár, Erika. "Skeletal Manifestation of Tuberculosis in a Late Medieval Anthropological Series from Serbia". *Acta Biologica Szegediensis* 54, No 2 (2010), pp. 83–91.

Maat, Gorge J.R. "Scurvy in Dutch Whalers Buried at Spitsbergen". *Proceedings of the Fourth European Members Meeting of the Paleopathology Association*, Middelburg-Antwerpen, 16–19 September. Utrecht, 1982, pp. 82–93.

Manning, Patrick. *Migration in World History.* London–NY: Routledge, 2005.

Martin, Rudolf. *Lehrbuch der Anthropologie, in systematischer Darstellung. Mit besonderer Berücksichtigung der anthropologischen Methoden.* Für Studierende Ärzte und Forschungsreisende. Jena: Gustav Fischer, 1914.

Martin, Rudolf; Seeler, Karl. *Lehrbuch der Anthropologie, in systematischer Darstellung. Bd.1.* Dritte, völlig umgearbeitete und erweiterte Auflage. Stuttgart: Gustav Fischer, 1957.

Mascie-Taylor, C.G. Nicholas; Krzyżanowska, Monika. "Biological Aspects of Human Migration and Mobility". *Annals of Human Biology* 44, issue 5: Human Biology of Migration (2017), pp. 427–440, <doi.org/10.1080/03014460.2017.1313448>.

Meiggs, David C.; Freiwald, Caroline. "Human Migration: bioarchaeological Approache". *Encyclopedia of Global Archaeology*, ed. Claire Smith, New York: Springer, 2014, pp. 3538–3545.

Ortner, Donald J.; Ericksen, Mary Frances. "Bone Changes in the Human Skull Probably Resulting from Scurvy in Infancy and Childhood". *International Journal of Osteoarchaeology* 7, issue 3 (1997), pp. 212–220, <https://

doi.org/10.1002/ (SICI)1099-1212(199705)7:3<212::AID-OA346>3.0.CO;2-5>.

Pearson, Karl. "Mathematical Contributions to the Theory of Evolution. On the Reconstruction of the Stature of Prehistoric Races". *Philosophical Transactions of the Royal Society London* 192 (1899), pp. 169–244.

Panhuysen, Raphael; Coenen, Vincent; Bruintjes, Tjasse. "Chronic Maxillary Sinusitis in Medieval Maastricht, the Netherlands". *International Journal of Osteoarchaeology* 7, No 6 (1997), pp. 610–614.

Petrashenko, Valentina A. *Drevnerusskoe selo po materialam poselenij u s. Grigorovka*. Kiev, 2005.

Povest' vremennyh let. Ch1. Pod redakciej Dmitrija S. Lihacheva i Borisa A. Romanova. Tekst i perevod. Moskva-Leningrad: Izd-vo Akademii nauk SSSR, 1950.

Pudło, Alexandra. *Mieszkańcy średniowiecznego Gdańska w świetle wyników badań antropologicznych*. Fontes Commentationesque ad Res Gestas Gedani et PomeRaniae, V., Gdansk, 2016.

Pudło, Alexandra. "Charakterystyka paleodemograficzna I morfologiczna". *Ciepłe. Elitarna nekropola wczesnośredniowieczna na Pomorzu Wschodnim*, ed. Sławomir Wadyl. Gdansk: Wydawnictwo: Muzeum Archeologiczne, 2019, pp. 383–405.

Russell, Josiah Cox. *The Control of Late Ancient and Medieval Population*. Philadelphia: American Philosophical Society, 1985.

Scheuer, Louise; Black, Sue. *Developmental Juvenile osteo*logy. San Diego: Elsevier Academic Press, 2000.

Schour, Issaac, Moury Massler. "Development of Human Dentition". *Journal of the American Dental Associsation* 20 (1941), pp. 379–427.

Schultz, Michael. "Paläopathologische Diagnostik". *Anthropologie: Handbuch der vergleichenden Biologie des Menschen*, hrgb. R. Knussmann, Bd. 1 (1): Wesen und Methoden der Anthropologie. Stuttgart, 1988, pp. 480–496.

Schultz, Michael. "The Role of Tuberculosis in Infancy and Childhood in Prehistoric and Historic Population". *Tuberculosis: Past and Present*, eds. Györgi Palfi, Olivie Dutour, J. Deak, I. Hutas, Budapest, Szeged: Golden Book and Tuberculosis Foundation, 1999,pp. 503–507.

Schultz, Michael. "Paleohistopathology of Bone. A New Approach to the Study of Ancient Diseases". *American Journal of Physical Anthropology* 116, issue S33 (2001), pp. 106–147.

Schultz, Michael; Tyede H. Schmidt-Schultz. "Is it Possible to Diagnose TB in Ancient Bone Using Microscopy?" *Tuberculosis* 95 (2015),pp. 80–86.

Schultz, Mihael; Kozak, Oleksandra. "Morfologija i klassifikacija sledov meningial'nyh reakcij na drevnih cherepah (problemy diagnostiki na primere srednevekovyh populjacij Kieva)". *OPUS: Mezhdisciplinarnye issledovanija v arheologii* 6 (2008), pp. 276–299.

Scott G. Richard; Winn, J.R. "Dental Chipping: Contrasting patterns of Microtrauma in Inuit and European Populations". *International Journal of Osteoarchaeology* 21, No 6 (2011), pp. 723–731, <https://doi.org/10.1002/oa.1184>.

Shiroukhov, Roman; Baranov, Vyacheslav; Ivakin, Vsevolod; Kozak, Oleksandra; Borysov, Artem; Carnap-Bornheim, Claus von; Kienle, Lorenz; Krause-Kyora, Ben; Meadows, John; Saleem, Khurram; Schuermann, Ulrich; Kozakaitė, Justina; Miliauskienė, Žydrūnė. "Baltic Migrants in the Middle Dnipro Region: A Comparative Study of the Late Viking Age Archaeological Complex of Ostriv, Ukraine". *Medieval Archaeology* 66, No 2 (2022), pp. 221–265, <https://doi.org/10.1080/00766097.2022.2118419>.

Sjøvold, Torsten. "A Report on the Heritability of Some Cranial Measurements and Non-Metric Traits". *Multivariate Statistical Methods in Physical Anthropology,* eds. G.N. Van Vark, W.W. Howells. Dordrecht: Reidel Publishing Company, 1984, pp. 223–46.

Snoddy, Anne Marie E., Hallie R. Buckley; Gail E. Elliott; Standen, Vivien G.; Arriaza, Bernardo T.; Halcrow, Siân E. "Macroscopic Features of Scurvy in Human Skeletal Remains: A Literature Synthesis and Diagnostic Guide". *American Journal of Physical Anthropology* 167, No 4 (2018), pp. 876–895.

Soto, Sara M. "Human Migration and Infectious Diseases". *Clinical microbiology and infection* 15, Supplement 1 (2009), pp. 26–28.

Spekker, Olga; Hunt, David R.; Paja, László; Molnár, Erika; Pálfi, György; Schultz; Michael. "Tracking down the White

Plague: The Skeletal Evidence of Tuberculous Meningitis in the Robert J. Terry Anatomical Skeletal Collection". *PLoS ONE* 15, No 3 (2020): e0230418, <https://doi.org/10.1371/journal.pone.0230418>.

Templin, Olaf, Michael Schultz. "Evidence of Tuberculosis in the Medieval Infant population from Bettingen (Switzerland)". *HOMO* 45 Supplement (1994), p. 130.

Trotter, Mildred; Goldine, Gleser. "A Re-evaluation of Estimation of Stature Based on Measurements of Stature Taken during Life and Long Bones after Death". *American Journal of Physical Anthropology* 16, No 1 (1958), pp. 79–123.

Ushkova, Julija. Do pitannja pro oznaki vershnictva na antropologichnomu materiali. *Istorichna antropologija ta bioarheologija Ukraïni II*, Kiïv, 2020, pp. 140–153.

Villotte, Sebastien; Stefanović, Sofija; Knusel, Christopher J. "External Auditory Exostoses and Aquatic Activities During the Mesolithic and the Neolithic in Europe: Results from a Large Prehistoric Sample". *Anthropologie* LIII, No 1 (2014), pp. 73–89.

Volkovich, N. *Povrezhdenija kostej i sustavov*. Kiev: Izdatel'stvo Kievskogo medicinskogo instituta, 1928.

Waldron, Tony. *Counting the Dead: The Epidemiology of Skeletal Populations*. Chichester-New York: John Wiley & Sons, 1994.

Živanovič, Srboljub. *Ancient Diseases: The Elements of Palaeopathology*. New York: Pica Press, 1982.

Antropologiniai XI a. Ostrivo kapinyno prie Rosės (Ukraina) duomenys: migracijos poveikis

Oleksandra Kozak

Straipsnyje pateikiami 67 kapų iš XI a. kapinyno, kurį Ukrainos nacionalinės mokslų akademijos Archeologijos institutas tyrinėjo Porosės vietovėje, paleopatologinio tyrimo rezultatai. Archeologiniai ir tanatologiniai tyrimai leido iškelti hipotezę dėl šiaurės ir šiaurės rytų Europos, t. y. baltų ir Skandinavijos, gyventojų atsikraustymo į Porosės teritoriją, plytinčią palei pietines Kyjivo Rusios ribas. Preliminarūs morfologinių ir genetinių tyrimų bei stabiliųjų izotopų tyrimų duomenys patvirtina hipotezę, kad Ostrive palaidoti žmonės yra migrantai.

Tiriant šią populiaciją išryškėjo demografiniai ir antropologiniai neseniai įvykusios migracijos požymiai, įskaitant vyriškosios lyties asmenų persvarą ir vidutinį ar didelį griaučių morfologinių savybių kintamumą. Spėjama, kad dalis vyrų priklausė karinei įgulai – tai patvirtina kapuose rastas didelis skaičius ginklų ir su karine veikla susiję osteologiniai požymiai. Remiantis šia ribota imtimi, daroma preliminari prielaida, kad migracija galėjo turėti patologinį poveikį, atsiskleidusį kaip dantų ėduonies suintensyvėjimas dėl pasikeitusios mitybos ir geriamojo vandens sudėties bei dantų akmenų būklės pakitimas. Nustatyta daug postkranijinio skeleto, ypač apatinių galūnių, sužalojimų, kuriuos galėjo sukelti įvairi veikla migracijos metu ar bandymai prisitaikyti prie naujų sąlygų. Be to, pastebėta uždegiminių procesų, rodančių migrantų adaptaciją prie naujos mikrobiotos arba per migraciją išplitusią infekciją. Tyrimo rezultatai įgalina manyti, kad 67 tirti asmenys galėjo atstovauti skirtingoms migracijos bangoms. Tikėtina, vienoje migracijos bangoje pasklidusi infekcija lėmė didelį jaunų žmonių mirštamumą.