49. Life and death during the Neolithic at the edge of the Pannonian Plain: bioarchaeology of human remains from Beli Manastir-Popova zemlja, Croatia

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Rescue archaeological excavations conducted in 2014 and 2015 at Beli Manastir-Popova zemlja site in eastern Croatia revealed numerous archaeological strata mostly dated to early/middle Neolithic Starčevo and Sopot cultures (ca 5700-4700 cal BCE). Among other features, a large settlement with human burials was excavated. The paper presents the results of conventional bioarchaeological analysis conducted on skeletal and dental remains belonging to 39 individuals buried within the settlement. The sample is characterised by high prevalence of cribra orbitalia (33.3%) and numerous cases of periosteal new bone formation in children. The frequency and distribution of dento-alveolar pathologies (caries 7.9%, AMTL 3.8%) strongly suggests a typical agricultural population with a subsistence mostly based on cereals. Additionally, only a few recorded skeletal injuries indicate a low level of interpersonal violence in this community. Nitrogen and carbon stable isotopes and ancient DNA analyses that are in progress will provide more information on diet and subsistence but also population structure and affinity of the people inhabiting southern edges of the Pannonian Plain during the Neolithic period.

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Geographic location and archaeological context

The human remains presented here were discovered during rescue excavations conducted in 2014 and 2015 at the Beli Manastir - Popova zemlja site located in eastern Croatia (Fig. 1). Excavations revealed numerous traces of human activity at the site, ranging from prehistoric (Neolithic, Early Iron Age) to the Roman period. The excavated surface of about 37,000 m² revealed a large Neolithic settlement consisting of 28 pit-houses, a long ditch, numerous storage and waste pits and 35 skeletal burials. Huge quantities of movable material were recovered during the two seasons: some 47,000 pottery fragments and more than 2,300 pieces of faunal remains, mostly from hunted or domesticated animals, along with tools and objects. Based on the archaeological context as well as radiocarbon dates the burials could be dated to the Neolithic period, i.e. Starčevo and Sopot cultures (G 7: 4790±455 BP, Poz-90127; G 14: 4763±4537 BP, Poz-90128; G 15: 5837±5659 BP, Poz-90139). The skeletal were located in pits, below house floors and in the ditch. Most of the deceased were found lying in crouched position on their left or right side with different orientations (Fig. 2). A large majority of burials contained some kind of burial goods, mostly ceramic vessels but some also contained stone and bone tools. Up to date, Beli Manastir - Popova zemlja represents the largest systematically excavated Neolithic burial site from northern Croatia.

The main aim of this study is to reconstruct health status of this prehistoric population through conventional bioarchaeological approach with a special focus on dento-alveolar lesions, indicators of subadult health, and skeletal injuries, and to compare it with the health status of other prehistoric populations from Croatia.

Osteological analysis

The skeletal remains were analysed at the bioarchaeological laboratory of the Institute for Anthropological Research in Zagreb, Croatia. The biological sex and age-at-death were estimated using standard protocols described in Buitkra & Hubelker (1994). Macroscopic identification and examination of pathologies was based on the methodology and standards described in Ortner (2003) and Aufderheide & Rodríguez-Martin (1998). The following pathologies were taken into consideration: cribra orbitalia, linear enamel hypoplasia (LEH), periodontal new bone formation, cranio-mandibular tooth loss (AMTL), dental wear, and skeletal injuries.

For the purposes of ancient DNA and stable isotopes (carbon and nitrogen) analyses human bone samples were taken from each of the studied skeletons. These analyses are part of a PhD thesis conducted at the University of Vienna, Austria. Some ancient DNA data from this site have been already published (Andrades-Valletaux et al., 2017, Mathiessen et al., 2018). Several teeth samples were also taken for tools cementum annulation (TCA) analysis conducted in Biomedizin Institute, Novi sad, Serbia. Besides, additional bone samples was collected for radiocarbon dating that is still in progress.

Results

General preservation of the skeletons from Beli Manastir - Popova zemlja is very good / excellent. Most of the skeletons were complete and only a few were missing some osteological elements due to recent human activity such as digging. In total, 39 individuals were available for the analysis: 17 subadults, 11 females and 11 males. The highest mortality in subadults is present in the adolescent age group (11-17 years), while among the adults the highest mortality is present among middle-aged adults (38-50 years) (Fig. 3).

Cribra orbitalia is present in 33.3% (11/33) of all studied frontal bones while in subadults this prevalence is 64.3% (9/14) (Fig. 4). Linear enamel hypoplasia was recorded on the permanent dentition of three individuals (two subadults and one adult). Periodontal new bone formation was observed in three subadults: in two individuals it was located on both the maxilla and mandible, while in one subadult it was located along bones in active form.

Caries is present in 7.9% (35/442) of all teeth belonging to the adults (Fig. 4) while the prevalence of AMTL in adults from this site is 3.8% (22/573). Most of the analysed adult teeth are characterized by slight to moderate occlusal wear, however, the distinctiveness of two different individuals is visible by occlusal wear (Fig. 5).

Skeletal injuries were recorded in only two individuals: (i) in a younger male (G 23) who exhibited an oval-shaped (18x12 mm) antemortem blunt force trauma to the frontal bone (Fig. 7) and one antemortem fracture of the 7th left rib; (ii) an older female (G 14) exhibited antemortem end-plate fractures of the T8, T11, L4 and (LS 5).

Discussion and conclusion

As already mentioned, the Beli Manastir - Popova zemlja site represents the largest systematically excavated Neolithic burial site from northern Croatia. Due to its excellent skeletal preservation it offers an unprecedented insight into the health status of the people inhabiting this region over 6,000 years ago. Unfortunately, up until now only a few Croatian prehistoric samples of similar size have been studied: the Copper Age Potočani (Novak, unpublished data) and Vucedol (Sarau 2002) skeletal collections, and the Bronze Age Đakovica Cave (Sarau 2012). The high frequency of cribra orbitalia, but also the cases of LEH recorded in Beli Manastir strongly suggest that most individuals from this population experienced severe episodes of physiological stress during early childhood. This stress could have been caused by numerous factors such as acquired or genetic anemia resulting from inadequate nutrition, metabolic or blood disorders, infectious disease, parasitism and weaning diarrhea (Stuart-Macadam 1985, Lascari 1997, Ormer 2003, Walker et al. 2009), and even the effects of weaning (Blakey et al. 1994). Furthermore, three cases of periodontal new bone formation from this site again point at poor childhood health since the occurrence of this pathological change, beside 'non-specific infections', can also be associated with the conditions like birth trauma, metabolic disorders, leukemia, etc. (Wheeler 2012). In this regard, the comparison of the Beli Manastir population with other prehistoric samples from Croatia stresses almost identical trends - high frequency of these pathologies suggesting very poor subadult health.

The prevalence of caries is typical for a community whose diet was mostly based on carbohydrates (cereals) and similar values have been already observed in other prehistoric samples from Croatia like Vucedol (6.5%) and Đakovica Cave (8.1%). On the other hand, the caries frequency in the Potočani sample is only 0.5% strongly suggesting a diet mostly based on proteins (meat and dairy products) which is also in accordance with the results of carbon and nitrogen stable isotopes analysis. The prevalence of AMTL and dental wear at Beli Manastir might be associated with relatively short average life span in this population - an almost identical process was also observed in Potočani where most of the adults belonged to younger individuals.

When skeletal injuries are taken into consideration, the Beli Manastir sample shows very low trauma prevalence: two adult individuals exhibit antemortem injuries, and only one blunt force trauma to the frontal bone in a younger male) may point to intentional violence (Walker 1989). Other injuries were most probably caused by accidents, and this is especially true for the multiple vertebral end-plate fractures in an older female that most probably occurred as a result of significant osteoporotic changes (Roberts and Manchester 2007). All other prehistoric Croatian samples exhibit much higher trauma frequencies, while the Potočani mass burial even represents the site of a prehistoric massacre (Janković et al. 2017). Judging by the presented data, it seems that Beli Manastir during the Neolithic period was a relatively peaceful place.

The bioarchaeological analysis of the Beli Manastir - Popova zemlja skeletal assemblage indicates the following: (i) it was a typical Neolithic population heavily dependent on agriculture, (ii) it’s members suffered from poor subadult health, (iii) it was a peaceful community that experienced a low level of international violence. Hopefully, additional ancient DNA, stable isotope and TCA analyses will reveal more insights into health, diet, lifestyle and population structure of this Neolithic community.

References