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Results of Preliminary Stable Isotope Analysis of Selected Bone Samples from Avar-age Cemetery Stari Jankovci-Gatina, Eastern Croatia

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A B S T R A C T

The Late Avar age cemetery of Stari Jankovci–Gatina was discovered during the illegal exploitation of clay deposits by locals in 1978; emergency protective excavations were undertaken in the same year, and research continued in the campaigns of 1986 and 1988. In all three campaigns, a total of 88 graves were investigated, including a rich equestrian grave. Finds found in two graves that are in a private collection (grave A and grave B) testify to the functioning of the cemetery in the second half of the 8th century. Although a significant part of the cemetery has suffered damage and some of the bones are in poor condition, making them unsuitable for bioarchaeological analysis, we have decided to analyse 11 samples of bone remains from selected individuals in order to expand our knowledge about the dietary habits of the Late Avar period communities in the Western Syrmia region. We intend to compare our findings with two adjacent cemeteries that are part of the same cultural circle, namely Privlaka and Nuštar. This comparison will enable us to gain a better understanding of the dietary patterns and social structure prevalent across the wider region of the south(eastern) periphery of the Khaganate.

Key words: *archaeological anthropology, late Avar age, Eastern Croatia, Stari Jankovci-Gatina, stable isotope analysis, preliminary study*

Introduction

Late Avar age cemetery Stari Jankovci–Gatina was discovered during the illegal exploitation of clay deposits at the very edge of the village in 1978. By then, a certain number of graves were devastated, and the devastation continued in the following years with the activity of private collectors. Protective excavations were conducted in 1978, 1986 and 1988: a total of 88 graves were excavated. The associated settlement was located and excavated to a lesser extent; the total investigated area was 1000 square meters[1]. The most attractive is the equestrian grave 88, with a silver horseman's belt set and silver ornaments of horse harness and weapon finds[2]. The cemetery was in function during the 8th century AD. The excavated part can be traced chronologically up to the second half of the 8th century AD, while the graves from a private collection (GA, GB) testify of its use in the second half of the 8th century AD. The leader of the research, Marija Šmalcelj, believed that the original cemetery, previous to its destruction, had at least 120–150 burials. The results of the research were never fully published but sketched in short reports, summarized in 1992.[3,4] Šlaus performed a basic, bioanthropological analysis of the osteological remains from Stari Jankovci[5–7], the results of which were partially published[8].

The site is located in the area of the Bosut lowland, which can be considered a natural, well-defined and separate microregion of eastern Croatia; its 2355 square kilometres of surface represent a complete and, considering the landscape, homogeneous geographical unit[9]. Stari Jankovci, a settlement in the vicinity of today's Vinkovci (Roman Cibalae), is located on an elongated loess beam, oriented northwest–southeast in Vukovar–Syrmia county in Croatia (Figure 1). The settlement is slightly out of the way, located on the very border of the Bosut Plain and the Vukovar Plain, and the loess ridge on which it is located is already borderline part of the Vukovar loess Plain. The

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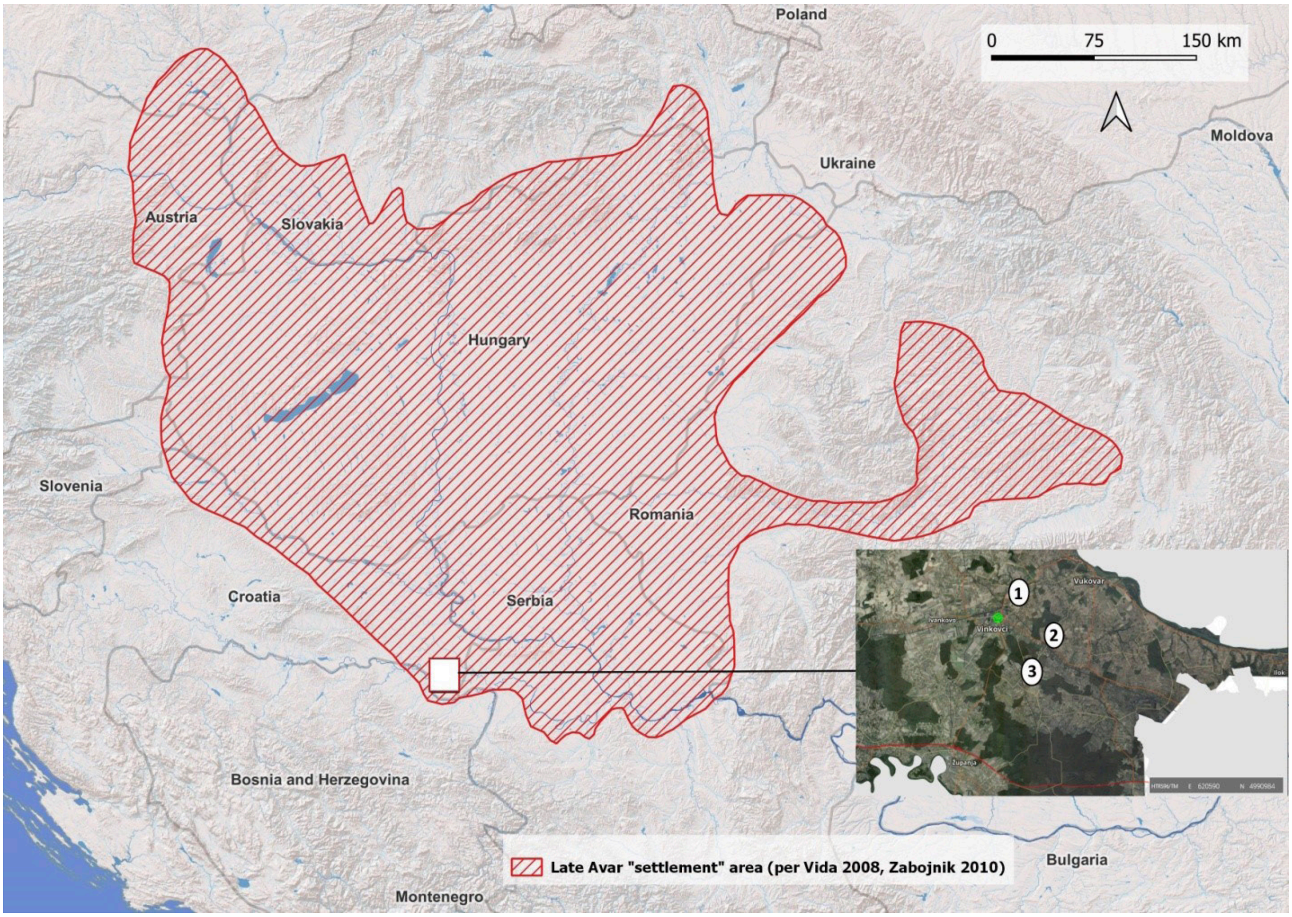

Fig. 1. Three Avar age sites in western Srijem where stable isotope analysis (carbon and nitrogen) of a certain number of samples was carried out, all in the vicinity of Vinkovci (former Roman Cibalae): 1. Nuštar–Khuen Belassy castle, 2. Stari Jankovci–Gatina, 3. Privlaka–Gole njive (created in QGIS and geoportal.dgu by Jere Drpić).

soils here were formed in the Pleistocene and Holocene; despite the small height difference compared to the alluvial floodplains they are surrounded by, there is a big difference between them. Thus, the village of Stari Jankovci, due to its location on the plain, is located in a drier, naturally fertile and more ecologically favourable area. The stream Gatina flows along the loess beam itself, which is situated in a floodplain, a seasonal wetland, as evidenced by Jankovačka Dubrava and Vidačevac, the forests that surround Stari Jankovci from the west and north[9]. The porous and dry loess on the surface corresponded well with grass vegetation. The rotting of the grass in the far eastern part of the (micro) region created a cover of fertile black soil. The porous and dry loess on the surface corresponded well with grass vegetation. The rotting of the grass in the far eastern part of the (micro)region created a cover of fertile black soil. Due to the drainability and pasture value of the loess cover, the easy creation of dugouts and the attractive location at the contact with the flood plains, this was an extremely suitable area for settlement in the past periods[10].

It is important to note that the region was part of the province of Pannonia Sirmiensis during Roman times; it was noticed that, in general, in the far east of Croatia, a significant number of Avar age sites are located on the route of (Late) Roman communications[11].

Nutrition as a factor of social organisation

The social structure of Avar age communities has been a frequently discussed topic in archaeological research of the Avars. The Avar period cultural circle is one of the most well-documented Early Medieval cultures in Central Europe[12, 13], but we still lack detailed and comprehensive analysis of the social component of Avar society[14]. During the Late Avar age (8th century), regionalism played a significant role in shaping cultural identity[15]. Archaeologists have the opportunity to uncover details that would otherwise remain unknown by conducting secondary laboratory analyses. Stable isotope analysis of Avar-age populations from different sites can reveal whether the populations of different regions had the same or different dietary habits. It can also provide insights into the existence of certain customs or rules related to these habits (see Herold[16]). Diet, that is, dietary habits are also dictated by the community to which an individual belongs–we

Fig. 2. Grave 88 in situ (photo by Marija Šmalcelj, 1988).

eat what our social environment determines as acceptable or, rather, we do not consume food that is unacceptable to the community we belong to; what kind of food that is also depends on the period and the society in which we live[17,18].

Materials and Methods

The analysis of stable isotopes from Stari Jankovci was performed on a total of 11 samples: 10% of the preserved archaeological material would be less than 8 samples, so the number of samples was increased to 11 (half the number of samples from Privlaka[19]) to obtain a certain range of samples according to sex, age and archaeologically determined social status. As mentioned in the introduction, the Anthropological Centre of the Croatian Academy of Sciences and Arts conducted basic anthropological analyses on the osteological remains of the deceased. In 2018, the Centre began revising the osteological material from the site and has so far analysed 40 skeletons. The analyses involved determining the sex and age at death in adult individuals, subadult mortality, and pathological changes. The sex of the skeletons was determined according to basic anthropological criteria based on the morphological differences between males and females, both in the cranial region[21] and the postcranial skeleton[21–24], especially taking into account the differences between male and female skeletons in the coccyx[25,26]. No attempt was made to determine the sex of subadults that were less than 15 years old at the time of death, as the sex of subadult skeletons cannot be determined with certainty[28,29].

The macroscopic examinations revealed cribra orbitalia, periostitis, Schmorl's nodes, antemortem fractures and possible vitamin C deficiency (scurvy) (see Table 1). Cribra orbitalia appears morphologically as sieve-like lesions or pitting on the orbital roof. It is thought to be a skeletal manifestation of either hereditary or acquired iron deficiency anaemia[30,31]. Similar bone alterations affecting the skull vault (porotic hyperostosis) are thought to be a feature of this condition[32–36].

The progressive formation of osteophytes around the edges of an articular joint surface characterises degenerative osteoarthritis. Unlike traumatic arthritis, which is caused by a disruption in the biomechanical functioning of a joint, these changes are caused by the wear and tear of daily activity.

Periostitis, an elementary inflammatory reaction, is caused by a widespread bacterial infection. Macroscopically, it appears as osseous deposits with distinct edges or uneven bone surface elevations. Trauma, certain infectious diseases such as leprosy, tuberculosis, and trepone-

TABLE 1

PATHOLOGIES OF INDIVIDUALS SELECTED FOR ANALYSIS

SITE	GRAVE No	SEX	AGE	MACROSCOPICALLY OBSERVED PATHOLOGIES
Stari Jankovci	9	Male	30–35	Osteoarthritis in the cervical spine
Stari Jankovci	17	Male	45–50	Osteoarthritis in all the major joints and thoracic, and lumbar spine
Stari Jankovci	25	Female	50–55	Osteoarthritis in the shoulders, elbows, hips, and thoracic spine
Stari Jankovci	40	Subadult	12.5–13.5	Healed periostitis on endocranial surface of rontal bone; severe active cribra orbitalia; bilateral active periostitis on middle shaft of tibiae and fibulae
Stari Jankovci	48A	Male	30–35	Antemortem fracture of the left clavicle; osteoarthritis in the left elbow and both knees
Stari Jankovci	48B	Female	30–35	Osteoarthritis in the right knee
Stari Jankovci	63	Subadult	4.5–5.5	No pathology present
Stari Jankovci	74	Female	45–50	Healed ectocranial porotic hyperostosis; osteoarthritis in the cervical and thoracic spine, and in the right ulnae
Stari Jankovci	79	Female	30–35	Osteoarthritis in the left hip and the thoracic spine; complete sacralisation of L5 and beginning of the sacro-iliac fusion; spina bifida (C2)
Stari Jankovci	84	Male	30–35	Schmorl's nodes in the thoracic spine; osteoarthritis in the left temporomandibular joint
Stari Jankovci	88	Male	55–60	Osteoarthritis in the cervical spine, shoulders, hips, and knees; benign cortical defect - Pectoralis maior enthesis (left humerus)

mal disease, as well as other medical conditions such as fluorosis, can all cause periostitis[37,38].

Schmorl's defects are lesions brought on by the intervertebral disc protruding and moving into the vertebral body next to it. According to Schmorl and Junghanns, degenerative changes are the most common cause of Schmorl's nodes[39].

Scurvy is a metabolic disorder caused by a deficiency of vitamin C. Vitamin C is the primary component of connective tissues such as skin, arterial walls, cartilage, and bone[40].

While selecting the samples, we tried to meet the following criteria: that chosen samples came from different locations in the cemetery, that the samples came from men, women and all age groups, and that members of the community of different social status were included (Figure 3). The samples, in all cases part of the ribs of the skeleton, were analyzed at the Center for Applied Isotope Studies, The University of Georgia, USA and in the laboratory of Isotoptech Zrt, Debrecen, Hungary. The results of the analysis can be seen in Table 2. During the interpretation, since the animal remains from Stari Jankovci were lost until recently[2], the obtained values were checked against the values obtained during the analysis of stable isotopes of the deceased individuals and animal remains from the Nuštar–dvorac Khuen Bellassy site; also a Late Avar-age inhumation cemetery from the same period as Jankovci[41]. This site is also located in the vicinity of today's Vinkovci, the former Roman city of Cibalae, the distance between Stari Jankovci and Nuštar is approximately 10 km (Figure 1) and it is a logical conclusion that the ecological and geographical characteristics of the area, as well as the way of breeding and feeding animals, do not differ at these two sites. As this is a preliminary analysis, its main objective was to determine if the samples are appropriate for analysis, considering that they were obtained from archaeological excavations that are over 30 years old, and the bone material, due to the soil conditions, is often poorly preserved in the region being studied. Therefore, the number of samples available for analysis is very limited. All results should be considered conditional and interpreted with caution, and any observed trends must be further confirmed by analyzing a significantly larger number of samples.

The analysis of carbon (^{13}C) and nitrogen (^{15}N) stable isotopes in collagen extracted from the bones of the deceased reveals information about their diet during a specific time in a person's life, depending on the type of bone sample. As different bones have varying turnover phases, they record diet from different periods of the individual's life. Among other things, the isotopic values of carbon from human tissue reflect the different photosynthesis paths of the two distinct kinds of plants, C_3 and C_4, whereas nitrogen values primarily reflect relative protein intake during life, i.e. meat and milk, though a distinction between such types still cannot be discerned. In the Avar age, millet was the only domesticated C_4 plant (its $\delta^{13}C$ range falling between –9‰ to –16‰ with an average –12‰ in the Carpathian basin, while wild C_4 plants are still very rare in that region today[42,43]. Additional differences in $\delta^{13}C$ values can also occur as a result of seafood intake due to the difference in isotopic base values of marine and terrestrial ecosystems, but in the case of Eastern Slavonia, such deviations are unlikely[17]. Isotope variations can differ based on various environmental factors in different regions. Therefore, it is essential to analyse and establish a

TABLE 2

RESULTS OF THE STABLE ISOTOPE ANALYSIS OF SELECTED SAMPLES FROM STARI JANKOVCI–GATINA SITE

SITE	GRAVE NO.	LAB #ID	ELEMENT	SEX	AGE	δ13C (‰)	δ15N (‰)	C:N
Stari Jankovci-Gatina	9	I/2800/3	rib	M	33	–16	11.6	3.3
	17	37477	rib	M	43	–16.8	10.9	3
	25	I/2800/1	rib	F	53	–16.1	10.5	3.3
	40	I/2800/2	rib	D	13	–16	10.4	3.3
	74	37474	rib	F	48	–16.7	10.6	3
	48A	I/2800/4	rib	M	33	–16.5	10.4	3.3
	48B	I/2800/5	rib	F	33	–17.2	9.4	3.5
	63	I/2800/6	rib	D	5	–15	10.4	3.3
	79	37476	rib	F	33	–16.8	10.2	3
	84	I/2800/7	rib	M	33	–16.1	10.4	3.4
	88	37475	rib	M	58	–17	11.9	3

TABLE 3

AVERAGE ISOTOPIC VALUES DIVIDED BY SEX

SEX	NUMBER OF SAMPLES	AVERAGE AGE	δ13C (‰)	δ15N (‰)	C:N
Males	5	40	–16.5	11	3.2
Females	4	42	–16.7	10.2	3.2

baseline of animal remains to serve as a reference for human samples. It is worth noting that human bone collagen δ13C is enriched by 5.1‰ compared to dietary sources[44]. Likewise, the δ^{15}N of herbivores, carnivores, and omnivores is enriched by approximately 3‰[45–47].

The preparation process was identical in both laboratories, using the modified Longin method[48]. During pretreatment, all samples were inspected and all visible marks on their surfaces were noted along with the initial mass. After repeated ultrasonication in ultrapure water, the bones were dried at 60°C overnight. The outer surface of the bones was removed by thorough abrasion. Then, larger bone fragments were ground and sieved to the adequate size fraction of 0.5–1.0 mm. For chemical pretreatment, 500–1000 mg (min. 100 mg) of the ground powder was placed in a special designed Omnifit™ glass column. These columns were used as flow cells in our semi-automatic system that was constructed for performing the acid-base-acid cleaning method for bone samples[49]. The pH was adjusted to 3 to eliminate any ambient CO_2 that may have been absorbed during the pretreatment phase. Afterwards, the acid-insoluble collagen was transferred to a test tube containing 5 mL of HCl solution at pH 3 and was put into a block heater at 75°C for 24 hrs. Dissolved gelatin was filtered via a 2 µm glass fiber filter (Milles AP20) into a 20 mL vial precleaned by nitrogen gas, and after freezing was freeze-dried for at least 2 days. Gelatin samples were then combusted using a modified sealed-tube combustion method where the sample and MnO2 reagent were together placed in a borosilicate combustion tube. After flame sealing, the closed tubes were placed in a muffle furnace at 550°C for at least 12 hrs to combust the gelatin. The CO2 gas produced was transferred and purified from any other by-product gases using a dedicated vacuum line[50].

Carbon and nitrogen stable isotope measurements were calibrated by control measurements of IAEA 600 (caffeine) and sulfanilamide standards after every fifth unknown sample. Measurements were performed by a Thermo Finnigan Delta Plus XP isotope ratio mass spectrometer. Gelatin sub-samples (~0.3 mg) were packed into ultraclean aluminium cups and combusted by an elemental analyser (Thermo Scientific™, EA IsoLink CNSOH). Stable isotope ratios and percentages were determined in the same run. δ13C and δ15N values are reported in standard ‰ notation concerning VPDB and atmospheric nitrogen, respectively. Sample quality was evaluated with %C, %N and C:N ratios before further analysis. C:N ratios fall between 3.0 and 3.3 and reflect good preservation for stable isotope analyses[51,52].

Statistics

Descriptive and analytical statistics using MS Excel® and SSPS® 27 were used to evaluate results, and the nonparametric Mann-Whitney-U test was applied for group comparisons since the number of samples is relatively small. The level of significance was p = 0.05.

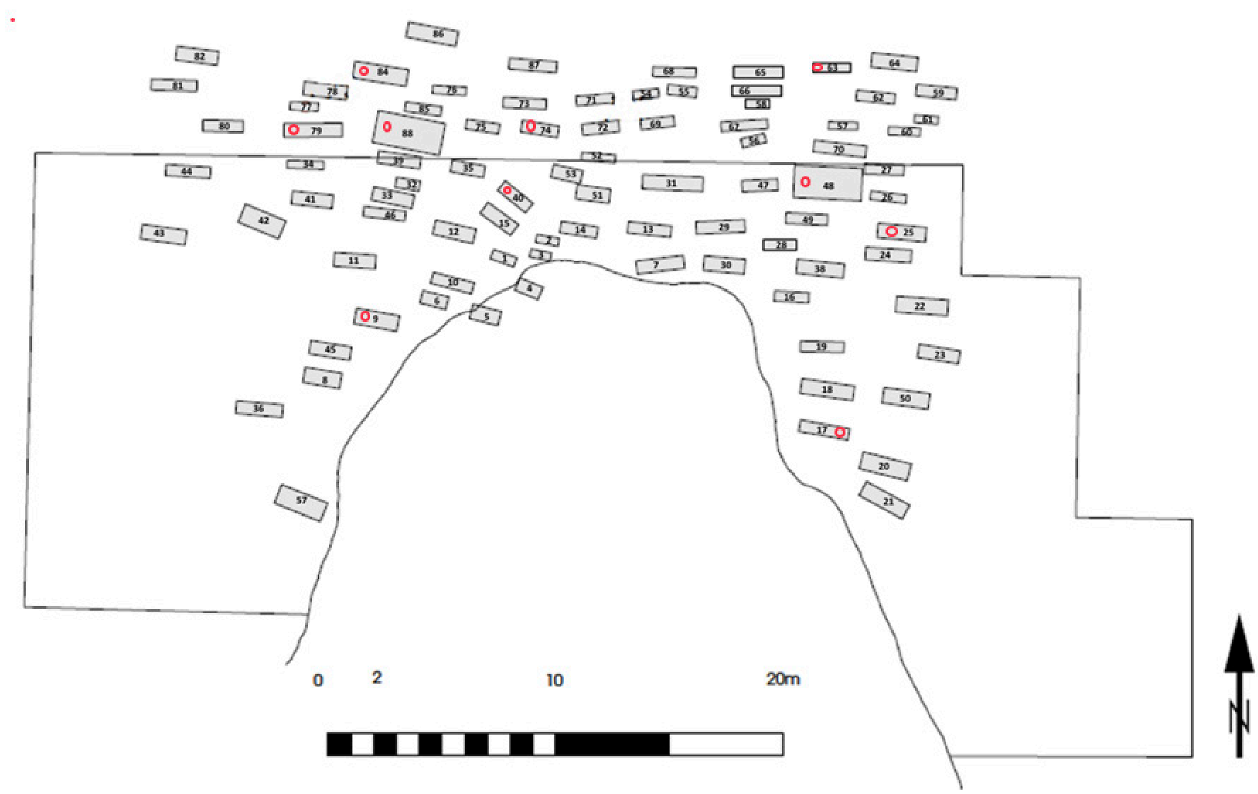

Fig. 3. Situational plan of cemetery Stari Jankovci–Gatina with marked graves from which samples were taken (map created in Montelius program).

Results

The analysis included samples from 11 individuals, five men, four women and two non-adults, aged from five to 58 years. The list of the samples with their respective isotopic values are shown in Table 2. The main aim was to determine a possible difference in diet based on sex (of adult individuals), age, and social status. It should be noted that 22 samples from the spatiotemporally close Late Avar age inhumation cemetery of Privlaka–Gole Njive were also subjected to stable nitrogen and carbon isotope analysis with the same objectives[19].

Discussion and Conclusion

The average δ^{13}C and δ^{15}N values for males is –16,5‰ and 11,0‰, and –16,7‰ and 10,2‰ for females, whereas for subadults is 10,4‰ and –15,5‰, respectively. Though small in number, the samples seemingly indicate a difference in isotopic values between males and females, where males show higher trophic levels and more positive carbon values (Table 3). However, inferential statistical analysis for males and females demonstrates no significant statistical difference for neither δ^{13}C nor δ^{15}N (Mann–Whitney U=45.500 p=0.382; U=42.000 p=0.125). The aforementioned small number of samples—including juvenile ones—precludes any further statistical comparison concerning age.

The possibility of women having a more carbohydrate-oriented diet and males inclining more toward a protein-based one does somewhat correspond to the initial analysis from 2018, where such results could not be overlooked in terms of sex as well as social stratification. While his δ^{13}C value of –17,0‰ indicates a C_3 plant-based diet with a mixture of C_4 elements, the horseman burial from the richest grave of the site (G88) also boasts the highest δ^{15}N value of 11,9‰. The burial is of a warrior character and, judging by the belt set and the rest of the finds, can be chronologically set to the very end of the Middle Avar and the beginning of the Late Avar age. While its burial type may attest to a high status within the society, which can also explain higher protein-based nutrition in the form of meat, seeing how the individual reached a rather high age for the Early Medieval period (estimated to be 58 years old at the time of death)[2], the nitrogen value may also speak of disease not detectable via standard bioarchaeological analysis, such as autophagy.

It has been suggested that during the Early Avar age, there existed a significant social stratification among people, which is visible in the graves as per their archaeological context. This stratification may also indicate that there was a differentiation by sex in terms of dietary habits. The stable isotope analysis of three sites in Lower Austria, dating from the end of the Middle to throughout Late Avar age, confirmed this differentiation[16]. There is a

TABLE 4

AVERAGE ISOTOPIC VALUES, DIVIDED BY AGE GROUPS

AGE	NUMBER OF SAMPLES	AVERAGE AGE	δ13C (‰)	δ15N (‰)	C:N
Subadults	2	9	–15.5	10.4	3.3
Adults	5	33	–16.5	10.4	3.3
Senior	4	50	–16.7	11	3.1

presumption, based on archaeological evidence in various cultures from various periods–that the members of the community of higher social status had more access to food based on animal protein, and the rest of the community had a higher proportion of a plant-based diet[17, 53–55]. Interestingly enough, the differentiation of dietary habits by sexes, which was confirmed in Lower Austria, could not be established via stable isotope analysis of samples from Middle and Late Avar age site of Sajópetri in Hungary, where no differentiation by sex or archaeologically determined social status was detected[43]. Apart from G88, the individual from Grave 9 also shows a higher than average nitrogen value (11,6‰). A male of 33 years of age at the time of death exhibits a rather standard δ^{13}C value (–16,0‰), and according to his archaeological context, was of lower social status (three buckles and an arrowhead vs. full silver belt set, decorated horse harness, and weapons in G88). Whether this may mean that social status was not a primary factor in diet stratification, or that this person also suffered from some autoimmune disease which may have elevated the said value (and was one of the side effects of an ailment that ultimately proved fatal), remains unknown. While the results presented here may indicate protein-richer nutrition in favour of men, the small sample size precludes any definitive conclusions on this matter and can be treated only as an indication.

The difference in dietary habits related to age groups was studied in the samples of two individuals of child age, five samples of individuals who can be determined as members of the group of younger adults, and four members of the group of older adults. The samples were divided by general age groups: sub-adults (up to 15 years), younger adults (15–33 years) and older adults (34 years and older). The results show a small difference in the consumption of carbohydrates and a larger difference in the consumption of proteins in favour of the group of older adults compared to sub-adults and younger adults (Table 4). It should be emphasized that all members of the older age group, according to the finds in graves, belong to a group of higher social status (G17 and G88 graves with sets, G25 and G47 women's graves that point to wealthier members of the community), so the difference from this perspective may reflect social status. At the same time, on the samples from Privlaka, a difference in nutrition was implied between individuals of older age and non-adults versus adults: non-adults and the elderly have had slightly higher nitrogen values, which may indicate a higher consumption of food of animal origin. However, there too was the problem of a smaller sample size.

It was very difficult to set the criteria for determining the social status of these 11 samples according to the archaeological indicators (i.e. the finds from graves and the overall archaeological context). Stari Jankovci generally shows a slightly different picture than Privlaka, where different social groupings are determined according to archaeological finds in graves[19]. An additional unfavourable circumstance was the devastation of a significant part of the cemetery, with registered cases of earlier looting during excavation campaigns. As a result, a certain number of graves were written off on the basis that we could not be sure of the original repertoire of finds[2]. At Jankovci, the graves with belt sets do not have clear female counterparts[a]; it is also difficult to separate the groups of well-to-do and average graves. The easiest to determine was the group of graves with belt sets as those of the highest social status in the community, well-to-do graves were defined as those female graves in which earrings of type X appear (their production requires more skill than the making of simple earrings with one glass bead or a simple ringlet) or at least two different elements of jewellery combined with some kind of grave offering, male graves with more than 1 buckle (G9) or graves where there are finds that stand out from the average picture of graves of the same sex or age (G63); as average samples from graves with the finds of a knife, animal bones and/or a vessel and at least one jewellery element in the case of females, while graves with a small number of finds, such as the simplest forms of jewellery or only one tool or part of a costume, were designated as poor.

The results show a higher proportion of protein in the diet of the well-to-do and individuals with belt sets, but it is interesting that the group of graves with belt sets also has more positive plant-based diet values; members of the average and poor groups have significantly lower values of animal protein and somewhat more negative values associated with food of plant origin (Table 5). Also, the samples of groups of graves with belt-set belong to people of an older age group, which could play an important factor

[a] In Privlaka, it was fairly easy to discern female counterparts of the deceased with belt-sets according to social status, by luxurios or of greater artisanal quality compared to the majority of jewellery finds on the site; in Stari Jankovci, there was no luxurious jewellery or one easily defined as of greater artisanal quality than the general production.

TABLE 5

AVERAGE ISOTOPIC VALUES DIVIDED BY SOCIAL STATUS

CATEGORIES	GRAVE NUMBER	NUMBER OF SAMPLES	AVERAGE AGE	δ13C (‰)	δ15N (‰)	C:N
Rich graves	17, 88	2	51	–16.9	11.4	3
Well to do graves	9, 25, 63	3	30	–15.7	10.8	3.3
Average graves	48A, 48B, 84,74	4	37	–16.6	10.2	3.3
Poor graves	40,79	2	23	–16.4	10.3	3.15

TABLE 6

AVERAGE ISOTOPIC VALUES DIVIDED BY SIMPLIFIED SOCIAL STATUS

SIMPLIFIED CATEGORIES	GRAVE NO.	NUMBER OF SAMPLES	AVERAGE AGE	δ13C (‰)	δ15N (‰)	C:N
Well to do	17, 88, 9, 25, 63	5	38	–16.3	11.1	3.1
Average to lower status	48A, 48B, 74, 84, 40, 79	6	32	–16.5	10.2	3.2

in nitrogen values, while the well-to-do group is represented by individuals from all age groups (subadult from G63, female from G25, and male from G9; 5, 53, and 33 years of age at death, respectively), and as it is a very small number of samples, any significant deviation in the value of one sample will affect the average values of the group.

For these reasons (small number of samples, unequal representation of age groups), we have converted these 4 groups into two: well-to-do and rich grave type individuals and individuals of average to a lower status (Table 6, Figure 4). In this way, a certain difference in isotopic results can be noticed, with well-to-do and rich graves showing more positive δ^{13}C values (–16,3 ‰ vs –16,5 ‰) and visibly higher trophic levels in terms of δ^{15}N values (11,1 ‰ vs 10,2).

It seems that the community that buried its members at the Stari Jankovci site, according to these results, could be applying both sex and social differentiation in everyday life, for example, men and individuals of richer burials being privileged in terms of nutrition (i.e. higher protein intake). The results which indicate a difference in dietary habits according to social status are somewhat surprising, considering that the results of analysis from neighbouring sites of Nuštar and Privlaka suggest no difference in dietary habits according to social status; the results which indicate difference in isotopic values according to sex were also registered in Privlaka, but not in Nuštar[17, 19]. These results may signal somewhat different social relations/organization of the community buried in Stari Jankovci. On the other hand, they should also be treated with great caution because of the small sample size. In any case, this preliminary analysis showed that the samples from Stari Jankovci, despite the long storage time after excavation and the poor pedological conditions at the site, are suitable for analysis. The results, especially in comparison with the results from Privlaka and Nuštar, indicate a possibility of the existence of different customs of communities in a tiny area as far as dietary habits are concerned. This, along with other indications related to material finds, could be interpreted as an indication of identity differences between Late Avar age communities in the region of Western Syrmia.

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REZULTATI PRELIMINARNE ANALIZE STABILNIH IZOTOPA ODABRANIH UZORAKA SA AVARODOBNOG GROBLJA STARI JANKOVCI-GATINA, ISTOČNA HRVATSKA

S A Ž E T A K

Kasnoavarodobno groblje Stari Jankovci-Gatina otkriveno je ilegalnom eksploatacijom gliništa 1978. godine. Hitno zaštitno iskopavanje poduzeto je iste godine, a nastavljeno je 1986. i 1988. Otkriveno je sveukupno 88 grobova, uključujući i bogati konjanički grob, dok nalazi dva groba iz privatne kolekcije svjedoče o funkcioniranju groblja u drugoj polovici 8. stoljeća. Unatoč devastaciji dijela groblja i vrlo lošem stanju dijela osteološkog materijala, zbog mogućnosti usporedbe rezultata s dva prostorno vrlo bliska groblja (Privlaka, Nuštar), 11 osteoloških uzoraka odabranih pokojnika podvrgnuti su analizi stabilnih izotopa ugljika i dušika kako bi saznali više o prehrambenim navikama kasnoavarodobne populacije zapadnog Srijema i doprinijeli spoznajama o prehrambenim navikama i posljedično, o socijalnoj strukturi u širem području jugo(istočne) periferije Kaganata.