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HEALTH STATUS OF CHILDREN IN ANCIENT SIRMIUM*

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Abstract. – This paper presents diseases which directly leave traces on osteological material (enamel hypoplasia, caries, traumatic conditions, haematological disorders, metabolic diseases and middle ear inflammation) and diseases that leave no visible marks on bones, and may indeed be the direct cause of death of children in ancient Sirmium. In paleodemographic research, child mortality rate is an important element of a population's progress. Child mortality is considered an adequate criterion for the social and sanitation conditions of a community and a sensitive indicator of inadequate nutrition.

Key words. – Roman necropoles, 1st–4th century AD, 4th and 5th century AD, children, health status.

In the period from 1957 to 2015, ca one hundred sites have been explored in the territory of the city of Sremska Mitrovica (*Sirmium*) and the close surroundings (Fig. 1).[1] Human osteological material was found on 70 sites during archaeological excavations. However, the osteological material from only 35 sites from Sremska Mitrovica and one site in its surroundings were available for anthropological analysis. In other words, only half of the skeletal remains found were preserved for anthropological analysis. There are a number of reasons for this, starting with the fact that the material from several sites was sent to the USA for anthropological analysis during the 1970s, and the fact that part of the material was buried in 1985 in Palanka (a street in Sremska Mitrovica) so as to free space in the museum depot for other artefacts, without any analysis having been performed.

Sremska Mitrovica (*Sirmium*) represents a multilayered archaeological site, with human osteological material originating from the period between the 1st and 16th centuries. Anthropological research was conducted between 2004 and 2015 at the Museum of Srem in Sremska Mitrovica, the Faculty of Philosophy at the University of Belgrade and in the Institute of Archaeology in Belgrade.

MATERIALS AND METHODS

The anthropological analysis comprised a total of 332 interred and two incinerated individuals from the ancient period (Fig. 1), of which 257 were adults and 77 were children, discovered during archaeological

[1] We express our gratitude to Mr M. Radmilović for the map of the site (Fig. 1) and for post-production of all illustrations (Figs. 1; Plates I and II).

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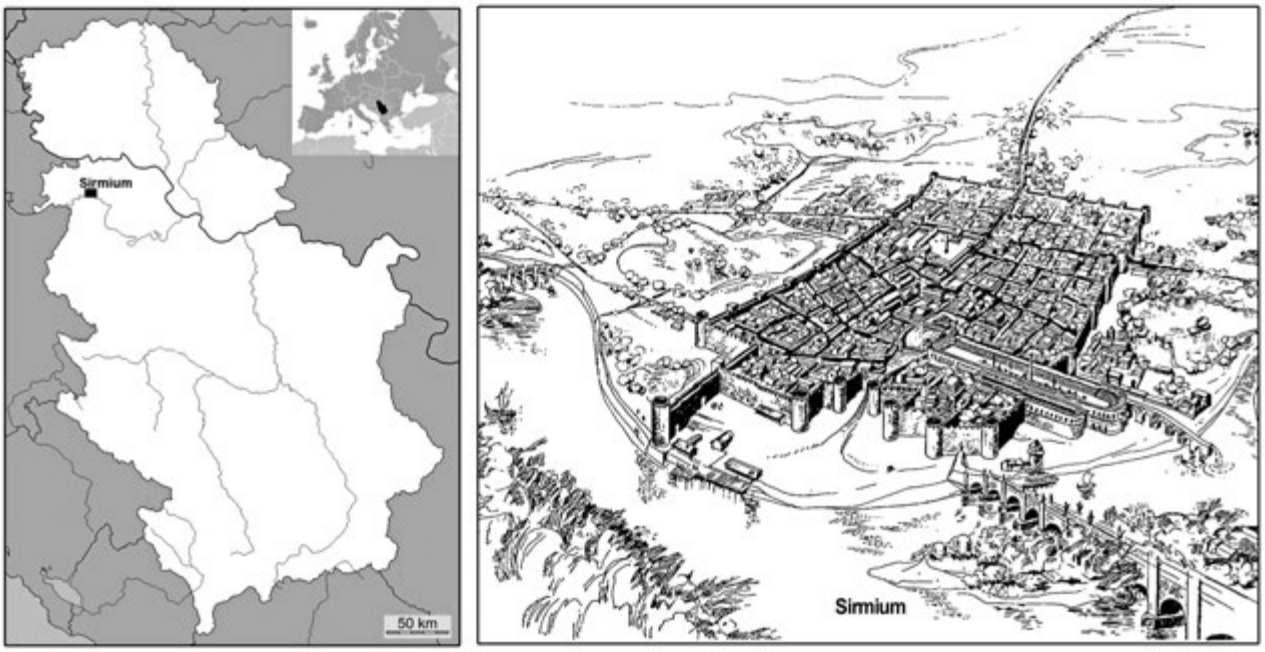

Fig. 1. Location of Sirmium on the map, with the position of the Republic of Serbia in Europe; Sirmium during the 4th century, ideal reconstruction (Jeremić 2004, 11, fig. 12)

Сл. 1. Локација Сирмијума на карти, са положајем Републике Србије у Европи; Сирмијум у IV веку, идеална реконструкција (Jeremić 2004, 11, fig. 12)

excavations in the period between 1957 and 2002 (Tables 1 and 2). The observed degree of skeletal preservation falls into category II (well preserved, incomplete skeleton). This preservation degree is a direct consequence of: erosion (graves in the shape of a well, on the banks of the river Sava); construction works (Sremska Mitrovica) and agricultural works (sites found in the surroundings of Sremska Mitrovica); robbing and the destruction of graves and grave constructions by illegal diggers; a high degree of humidity and notable changes of temperature in the rooms where the human osteological material was deposited, a lack of mechanical cleaning after the excavations, as well as the placement of the material into inadequate "temporary" packing. Apart from this, other extrinsic factors should also be taken into consideration,[2] as well as intrinsic factors (the character of the bone),[3] and the already mentioned facts that the entire human osteological material from certain sites was sent to the USA for anthropological analysis, as well as that part of the material was buried in 1985, in Palanka Street.

The anthropological analysis of children included: finding conditions, the degree of skeletal preservation, the minimum number of individuals, sex,[4] individual age,[5] stature,[6] dental and paleopathological analyses,[7] investigation of the probable cause of death and epigenetic characteristics.[8]

RESULTS

Roman necropoles from 1st–4th century AD

Anthropological analysis showed that on sites dating from 1st–4th century, in Sremska Mitrovica (*Sirmium*)

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[2] Extrinsic factors include the geological environment of a site, the nature of the local flora and fauna and other human activities (Gordon, Buikstra 1981; Lambert *et al.* 1985; Henderson 1987; Garland, Janaway 1989; Klein 1989; Haglund, Sorg 1997, 2002; Karkanas *et al*. 1999; Nielsen-Marsh, Hedges 2000; Stiner *et al*. 2001; Tuler, Duric 2006; Smith *et al*. 2007; Lee-Thorp, Sealy 2008).

[3] Intrinsic factors are small size, high porosity, lower mineralisation and high organic content of children's bones (Buckberry 2000; Bello, Andrews 2006; Lewis 2007).

[4] According to Schutkowski 1993.

[5] According to Ferembach *et al.* 1980, Brothwell 1981, Bass 1995, Scheuer, Black 2000.

[6] According to Walker, Pérez-Pérez.

[7] According to Ortner, Putschar 1985, Hillson 1990; *idem.,* 1996, Aufderheide *et al.* 1998, etc.

[8] Hauser, De Stefano 1989; Ђурић-Срејић 1995.

Age		Male	Female	Undetermined sex	Total
Infans I	Foetus	-	-	-	-
	NB – 0.5 year	-	2	1	3
	0.5 – 1 year	2	-	1	3
	1.5 – 2 years	1	-	1	2
	2.5 – 3 years	1	1	-	2
	3.5 – 4 years	1	1	-	2
	4.5 – 5 years	-	-	1	1
	5.5 – 6 years	1	2	2	5
	6.5 – 7 years	-	-	1	1
Infans II	7.5 – 8 years	1	-	1	2
	8.5 – 9 years	1	-	2	3
	9.5 – 10 years	2	-	-	2
	10.5 – 11 years	1	-	2	3
	11.5 – 12 years	-	-	-	-
	12.5 – 13 years	1	1	1	3
	13.5 – 14.5 years	-	1	1	2
Unknown age		1	-	9	10
Total number of children		13	8	23	44

Table 1. Paleodemographic structure of children in the 1st–4th century A. D. in Sirmium

Табела 1. Палеодемографска структура дечјих индивидуа у периоду I–IV века у Сирмијуму

and its surrounding area, skeletal remains of 188 individuals were discovered, comprising 144 adults (76.6 %) and 44 children (23.4%) (Table 1).

Dental analysis showed the presence of enamel hypoplasia in six children (one female, four males and one child of indeterminate sex) and caries in three children (one female, one male and one child of indeterminate sex) (Tables 3 and 5).

Paleopathological analyses revealed several diseases affecting children's skeletons: bone injuries, changes in bones caused by blood disorders, metabolic bone diseases and middle ear inflammation (Plates I and II). Skeletal material displayed an injury on an occipital bone in one female individual. Bone changes caused by blood disorders, such as *cribra orbitalia* (Plate I/1, 2), *cribra palatina*, *cribra humera* (Plate II/1, 2) or *cribra femora* (Plate II/3, 4) *et fibula* were visible in 16 individuals (four females, nine males and three children of indeterminate sex). Deep lesions at the ends of long bones were noticed in eight individuals (seven males and one child of indeterminate sex). Scurvy was determined in five individuals (one female, three males and one child of indeterminate sex) (Plate I/3, 4), and rickets in one female individual. Middle ear inflammation was determined in two individuals (one female and one male) (Tables 3 and 5).

Roman necropoles from 4th and 5th century AD

Anthropological analysis showed that on sites dating from the 4th and 5th century, in Sremska Mitrovica (*Sirmium*) and its surrounding area, skeletal remains of 146 individuals were discovered, comprising 113 adults (77.4 %) and 33 children (22.6%) (Table 2).

Dental analysis showed only the presence of caries in one male child (Tables 4 and 5).

Paleopathological analyses revealed several diseases affecting children's skeletons: changes in bones caused by blood disorders and metabolic bone diseases. Bone changes caused by blood disorders, such as *cribra orbitalia*, *cribra femora* and porotic hyperostosis could be ascertained in five individuals (one female, one male and three children of indeterminate sex). Deep lesions at the ends of long bones could be noticed in six individuals (five males and one child of indeterminate sex). Active periostitis (scurvy?) was identified in two individuals (one female and one child of indeterminate sex) (Tables 4 and 5).

DISCUSSION

The study of children's skeletal remains in necropoles is of particular importance because the data related

Age		Male	Female	Undetermined sex	Total
Infans I	Foetus	-	-	-	-
	NB – 0.5 year	-	2	5	7
	0.5 – 1 year	-	-	2	2
	1.5 – 2 years	1	-	3	4
	2.5 – 3 years	1	-	3	4
	3.5 – 4 years	-	-	2	2
	4.5 – 5 years	-	-	-	-
	5.5 – 6 years	1	-	2	3
	6.5 – 7 years	-	-	2	2
Infans II	7.5 – 8 years	-	-	1	1
	8.5 – 9 years	-	-	-	-
	9.5 – 10 years	-	-	-	-
	10.5 – 11 years	-	-	-	-
	11.5 – 12 years	1	-	1	2
	12.5 – 13 years	1	-	-	1
	13.5 – 14.5 years	-	-	1	1
Unknown age		1	-	3	4
Total number of children		6	2	25	33

Table 2. Paleodemographic structure of children in the 4th and 5th century A. D. in Sirmium

Табела 2. Палеодемографска структура дечјих индивидуа у IV и V веку у Сирмијуму

to children's health influences the overall health status of the whole investigated population. However, one of the most common limitations in the anthropological analyses of children's skeletal remains is their generally poor preservation. Lack of preservation of skeletal remains mainly affects the visibility of children in a community, even perhaps lessening the interest of anthropologists in their study.[9] This is why anthropologists have to be very careful in their analysis and interpretation.

The highest mortality rate in children in ancient Sirmium was during the interval NB–7 years of age (*infans* I), specifically: 1st–4th century 43.2%, and 4th and 5th century 48.5% (Tables 1 and 2). The mortality rate in adult females was highest in age range 23–40 (*adultus* I and II), specifically: 1st–4th century 24.4% (age 23–30, *adultus* I), or 42.2% (age 23–40, *adultus* I and II), and 4th and 5th century 18.9% (age 23–30, *adultus* I), or 32.4% (age 23–40, *adultus* I and II). It is interesting to note that mortality in children was lower during periods when females lived longer, and vice versa, the mortality in children was higher during periods when females lived shorter.[10]

In recent decades, using advances in medicine, modern anthropologists have been able to identify a number of diseases that leave marks on bones, and use them to evaluate the general health of a population, that is to say, the effects of the environment and lifestyle on the health of groups of people. Most diseases and causes of death remain undetermined, as they do not leave marks on bones and partly because of the usually poor preservation of osteological material from archaeological sites.[11] However, even if pathological changes are visible on skeletal material (with the help of diagnostic techniques such as inspection, radiography and microscopic bone analysis), in some cases it is impossible to establish a differential diagnosis. The reason for this is that it is impossible to track the stages of disease development, given that different diseases have the same effect on bone tissue as a final outcome (such as tissue production or destruction) and because it is impossible to establish pathognomonic changes that are not related to bone tissue.[12]

The diseases which left direct traces on children's dental and skeletal material in ancient Sirmium were enamel hypoplasia and caries, bone injuries, changes

[9] Kamp 2001; Shea 2006; Lewis 2007.

[10] Miladinović-Radmilović 2011, 559, 574.

[11] Ђурић-Срејић 1995, 310.

[12] *ibid.*, 310.

Grave number	Sex	Age	EH	C	CO	CFe	CH	CF	CP	SCUR-VY	RICK-ETS	Bone injuries	Ear infam.	Deep lesion
SITE No. 12														
Grave BB (II)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
SITE No. 24														
No. 69 (III)	unknown	6 y	–	–	–	–	–	–	–	–	–	–	–	–
No. 74, G-3 (II)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
SITE No. 26														
Burial / #3 (II)	unknown	NB	–	–	–	–	–	–	–	–	–	–	–	–
SITE No. 76														
Grave 2 (I)	male	9 y	+	–	+	+	–	–	–	–	–	–	–	+
Grave 2 (II)	male	3 y ± 12 m	–	+	–	–	–	–	–	+	–	–	–	+
Grave 3	male	13 y	–	–	–	+	+	+	–	–	–	–	–	+
Grave 4	female	14 y	+	+	+	–	+	–	+	–	+	–	–	–
Grave 5 (III)	unknown	7 y ± 24 m	+	–	–	–	–	–	–	–	–	–	–	–
Grave 7	male	18 m	–	–	–	–	+	–	–	+	–	–	–	+
Grave 8	female (?)	NB–6 m	–	–	–	–	+	–	–	–	–	+	+	–
Grave 9	male (?)	1 y	+	–	–	–	–	–	–	+	–	–	+	+
Grave 11 (II)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
SITE No. 77														
Grave 1 (I)	male (?)	10y	+	–	+	+	+	–	–	–	–	–	–	–
Grave 2 (V)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
Grave 4	male	about 10 y	+	–	–	+	–	–	–	–	–	–	–	+
Grave 5 (I)	male (?)	about 1 y	–	–	–	+	–	–	–	–	–	–	–	+
Grave 6 (I)	female	NB–6 m	–	–	–	–	–	–	–	+	–	–	–	–
Grave 6 (II)	male	unknown	–	–	–	–	–	–	–	–	–	–	–	–
Grave 6 (III)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
Grave 7 (I)	male (?)	8 y	–	–	–	–	+	–	–	–	–	–	–	–
Grave 8 (II)	unknown	24–30 m	–	–	–	+	–	–	–	+	–	–	–	+
Grave 8 (III)	unknown	8 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 12 (I)	female	4 y	–	–	–	+	–	–	–	–	–	–	–	–
Grave 13 (II)	female	3 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 14 (II)	male	11 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 16	unknown	11 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 17 (I)	female	6 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 19 (II)	unknown	unknown	–	–	+	–	–	–	–	–	–	–	–	–
Grave 23 (I)	unknown	9 y ± 24 m	–	+	–	–	–	–	–	–	–	–	–	–
Grave 24 (I)	male	4 y	–	–	+	–	–	–	–	–	–	–	–	–
Grave 24 (II)	unknown	13y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 26 (I)	female	13 y	–	–	–	+	–	–	–	–	–	–	–	–
Grave 26 (III)	unknown	9 y ± 24 m	–	–	–	–	–	–	–	–	–	–	–	–
Grave 27 (II)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
Grave 29	female	6 y	–	–	–	–	–	–	–	–	–	–	–	–
Grave 30 (I)	male	6 y	–	–	–	+	–	–	–	–	–	–	–	–
Site No. 80														
Grave 17 (II)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
Disl. bones III	unknown	14 y	–	–	–	–	–	–	–	–	–	–	–	–
Site Trasa toplovoda – naselje Matija Huđi/Orao														
16/95 (III)	unknown	about 6 y	–	–	–	–	–	–	–	–	–	–	–	–
Site Trasa toplovoda – naselje Matija Huđi														
G-9 (6/95) (III)	unknown	unknown	–	–	–	–	–	–	–	–	–	–	–	–
G-13 (13/95) (II)	unknown	11 y	–	–	–	–	–	–	–	–	–	–	–	–
G-13 (13/95) (III)	unknown	6 m	–	–	–	–	–	–	–	–	–	–	–	–
G-14 (14/95)	unknown	5 y	–	–	–	+	–	–	–	–	–	–	–	–

EH – enamel hypoplasia; C – caries; CO – cribra orbitalia; CFe – cribra femora; CH – cribra humera; CF – cribra fibula; CP – cribra palatina

Table 3. Paleopathological finds on children's skeletal remains from the 1st–4th century A. D. in Sirmium

Табела 3. Палеопатолошки налази на дечјим скелетним остацима из периода I–IV века у Сирмијуму

in bones caused by blood disorders (anemia, *cribra orbitalia*, *cribra humera, cribra femora*, *cribra fibula* and porotic hyperostosis), metabolic diseases (scurvy and rickets), periostitis, deep lesions at the ends of long bones and middle ear inflammations (Tables 3–5; Plates I and II).

Diseases on children's dental material

Enamel hypoplasia is a developmental disorder in the production of enamel matrix, which is recorded as defects on the enamel surface in the form of one or more grooves or pits on the tooth crown. This disorder may be caused by localised traumas and diseases or systemic causes, such as hereditary anomalies, infectious diseases, endocrine disorders, nephropathy, enteropathy, neurological disorders, and nutritional deficiencies.[13] Numerous studies have shown, however, that genetic factors and localised traumas are rarely responsible for the development of hypoplasia in humans.[14] The vast majority of hypoplastic defects in modern and archaeological populations are associated with systemic physiological stress, including starvation, infectious diseases, metabolic disorders and physical and psychological traumas. Enamel hypoplasias have attracted a lot of attention in the literature because the nature of enamel means that defects cannot be remodelled and, therefore, they provide a nearly permanent record of stresses occurring during the process of tooth germ development (from the foetal period up to the age of c. 7 years), and may provide a general index of infant/childhood health.[15] Dental analysis showed the presence of enamel hypoplasia with six children in ancient Sirmium during the 1st–4th century (Tables 3 and 5).

Dental caries develops when pH levels in the plaque are low enough to demineralise the enamel, cement and dentin. Dental caries manifests itself in a variety of ways. Lesions may be either opaque spots in the enamel, or large cavities. Carious lesions may start on the crown of the tooth or on the surface of the roots.[16] The examination of stress indicators in skeletal populations is a significant area of research in biological anthropology and dental caries is an important indicator of oral and general health in relation to diet.[17] Our dental analysis showed the presence of caries with three children during the 1st–4th century and one child during the 4th and 5th centuries (Tables 3–5).

Diseases on children's skeletal material

Bone changes caused by blood disorders, such as *cribra orbitalia*, *cribrae humera, femora et fibula* and porotic hyperostosis are good indicator of subadult stress and the health and nutritional status of past populations. It can also provide evidence for a valid estimate of the living conditions of archaeological populations. Most authors associate the appearance of *cribrae orbitaliae* with anaemia caused by iron deficiency.[18] Macroscopically, *cribra orbitalia* appear as small pitted lesions on the superior vaults of the orbits, with a diameter varying from less than 1 mm to wide gaps that partially unite.[19] These changes are usually the result of hypertrophy of the medial porous part of the bone of the skull, which causes the extenuation and porosity of the external cortex of the bone, and may be in an active or healed state.[20] The factors conducive to this type of anaemia are poor and inadequate nourishment, unhygienic living conditions, chronic gastrointestinal and parasitic diseases,[21] lead poisoning,[22] changes in nutritional habits[23], and food rich in phytates, which hinder the absorption of iron.[24] Some authors noticed a connection between lesions on the femoral and humeral neck (*femoral cribra* and *humeral cribra*) and *cribra orbitalia* i.e. these lesions are morphologically identical to those on the orbital roof in *cribra orbitalia*. They suggested the term cribrous syndrome, which consists of *cribra orbitalia*, symmetrical *femoral cribra* and symmetrical *humeral cribra* (variable).[25] The mortality of children at Sirmium was highest in the infant age group (0–7 years) – 55.8%. In the one to four years age group, where the incidence of *cribrae orbitaliae* is at its peak, the mortality rate was 27.3%.[26] The very high incidence of *cribrae orbitali-*

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[13] Pindborg 1982; Goodman, Rose 1991.

[14] Pindborg 1970; Goodman *et al*. 1991; Hillson 1996.

[15] Goodman, Rose 1990.

[16] Hillson 1990.

[17] Hillson 1990; Ђурић-Срејић 1995; Papathanasiou 2005; Šlaus 2008; Miladinović-Radmilović 2011.

[18] Oxenham, Cavill 2010, 199–200.

[19] Facchini *et al.* 2004, 126.

[20] Миладиновић-Радмиловић 2012, 233.

[21] Walker 1986; Mensforth 1990; Mays 1998.

[22] Stuart-Macadam 1991.

[23] Roberst, Manchester 1995.

[24] Carlson *et al.* 1974.

[25] Miquel-Feucht *et al*. 1999a, b, c; Polo-Cerdá *et al*. 1999a, b, 2000.

[26] Миладиновић-Радмиловић 2012, 233.

[27] Bernat 1983.

[28] Šlaus 2006, 162.

ae in individuals aged one to four is a consequence of the depletion of the reserves of iron and the cessation of suckling.[27] The discontinuation of suckling and the introduction of solid food exposes the child to a broad spectrum of gastrointestinal pathogens which cause diarrhoea. Diarrhoea has two very negative effects on the health of a child: it diminishes appetite and increases considerably the loss of magnesium and iron. The result is anaemia, which is morphologically manifested as *cribra orbitalia*.[28]

Grave number	Sex	Age	EH	C	CO	CFe	PH	Scurvy	Rickets	Perio-stitis	Deep Lesion
Site No. 3											
Disl. bones	unknown	6 m	–	–	–	–	–	–	–	–	+
Site No. 49											
Disl. bones I (III)	unknown	4 y	–	–	–	–	–	–	–	–	–
Site No. 55											
Grave 1 (III)	unknown	unknown	–	–	–	–	–	–	–	–	–
Grave 9 (III)	unknown	12 y ± 36m	–	–	–	–	–	–	–	–	–
Grave 12 (I)	female	NB–6 m	–	–	–	–	+	–	–	+	–
Grave 12 (II)	unknown	unknown	–	–	–	–	–	–	–	–	–
Grave 15 (III)	female	NB–6 m	–	–	–	–	–	–	–	–	–
Grave 32 (II)	unknown	NB–6 m	–	–	–	–	–	–	–	–	–
Grave 46 (III)	unknown	7 y	–	–	–	–	–	–	–	–	–
Grave 52 (III)	unknown	8 y	–	–	–	–	–	–	–	–	–
Grave 55 (III)	unknown	2.5 y	–	–	–	–	–	–	–	–	–
Grave 56 (II)	unknown	18 m	–	–	–	–	–	–	–	+	+
Grave 86 (IV)	male	13 y	–	–	–	+	–	–	–	–	–
Site No. 59											
Sector IV (3) (II)	male	12 y	–	+	–	–	–	–	–	–	–
Sector IV (3) (III)	unknown	12 m	–	–	–	–	–	–	–	–	–
Sector IV (4) (II)	unknown	NB–6 m	–	–	–	–	–	–	–	–	–
Site No. 75											
Grave 3 (I)	unknown	18 m	–	–	–	–	–	–	–	–	–
Disl. bones III	unknown	12 m	–	–	+	+	–	–	–	–	+
Oslikana grobnica iz ulice Mike Antića											
Oslikana grob. (I)	unknown	NB	–	–	–	–	–	–	–	–	–
Site No. Mačvanska Mitrovica											
MG 166 (IX)	unknown	24 m	–	–	–	–	–	–	–	–	–
MG 166 (X)	unknown	4 y	–	–	–	–	–	–	–	–	–
MG 166 (XI)	unknown	6 y	–	–	–	–	–	–	–	–	–
MG 166 (XII)	unknown	6 y	–	–	–	–	–	–	–	–	–
MG 166 (XIII)	unknown	7 y	–	–	–	–	–	–	–	–	–
MG 167 (VI)	male	24 m	–	–	–	–	–	–	–	–	–
MG 167 (VII)	unknown	30 m	–	–	–	–	–	–	–	–	–
Site No. Trasa toplovoda – Pivarska ulica											
Grave 1 (IV)	male	unknown	–	–	–	–	–	–	–	–	–
Site No. Trasa toplovoda – naselje Dekanske bašte											
Grave 3 (III)	unknown	14 y	–	–	–	+	–	–	–	–	–
Grave 3 (IV)	male	6 y ± 24 m	–	–	–	–	–	–	–	–	–
Grave 5 (I)	unknown	NB–6 m	–	–	–	–	–	–	–	–	+
Grave 7 (III)	unknown	3 y	–	–	+	–	–	–	–	–	+
Grave 7 (IV)	unknown	unknown	–	–	–	–	–	–	–	–	–
Grave 8 (III)	male	2.5–3.3 y	–	–	–	–	–	–	–	–	+

EH – enamel hypoplasia; C – caries; CO – cribra orbitalia; CFe – cribra femora; CH – cribra humera; CF – cribra fibula; CP – cribra palatina

Table 4. Paleopathological finds on children's skeletal remains from the 4th and 5th centuries A. D. in Sirmium

Табела 4. Палеопатолошки налази на дечјим скелетним остацима из IV и V века у Сирмијуму

CHILDREN'S DISEASES	1st–4th century A. D.	4th and 5th centuries A. D.
Enamel hypoplasia	6 (13.63%)	– –
Caries	3 (6.81%)	1 (3.03%)
Cribra orbitalia	5 (11.36%)	2 (6.06%)
Cribra femora	10 (22.72%)	3 (9.09%)
Cribra humera	6 (13.63%)	– –
Cribra fibula	1 (2.27%)	– –
Cribra palatina	1 (2.27%)	– –
Porotic hyperostosis	– –	1 (3.03%)
Scurvy	5 (11.36%)	– –
Rickets	1 (2.27%)	– –
Bone injuries	1 (2.27%)	– –
Inflammation of the middle ear	2 (4.54%)	– –
Periostitis	– –	2 (6.06%)
Deep lesions	8 (18.18%)	6 (18.18%)

Table 5. Paleopathological finds on children's skeletal remains from the 1st–4th century and from the 4th and 5th centuries A. D. in Sirmium

Табела 5. Палеопатолошки налази на дечјим скелетним остацима из периода I–IV и из IV и V века у Сирмијуму

Metabolic bone diseases in the individuals studied here are presented as scurvy, rickets, possibly with deep lesions at the ends of long bones, and periostitis. Scurvy is a disease that is caused by an insufficient intake of vitamin C (ascorbic acid), which is essential for the production of collagen in connective tissue, osteoid and the cement substance binding the endothelial cells of the blood vessels.[29] It is a disease that is almost unique to the human species because most animals that require vitamin C synthesise their own. The disease manifests as occasional haemorrhages (bleeding) occuring in the skin, mucous membrane, gums, muscles and bones, all of which can cause anaemia.[30] The body can obtain the required amount of vitamin C from almost all types of diets and if these diets are not ingested in adequate amounts, humans of any age can develop scurvy. Vitamin deficiency and the appearance of scurvy usually follow natural or social disasters, such as long-term droughts or sieges. However, the cause could also lie in specific, culturally conditioned taboos against the consumption of certain foods or in a long-standing diet reduced in the number of foods, as was, for example, the diet on transoceanic sailing ships or in prisons.[31] Porotic lesions on some parts of cranial bones and postcranial skeletal remains are determined as consequences of scurvy by numerous eminent experts.[32] On the other hand, rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency.[33] Vitamin D promotes the absorption of calcium and phosphorus from the gastrointestinal tract. A deficiency of vitamin D makes it difficult to maintain proper calcium and phosphorus levels in bones, which can cause rickets.[34] Lack of adequate calcium in the diet may also lead to rickets (cases of severe diarrhoea and vomiting may be the cause of the deficiency). Once the child starts to walk, the long bones bend under its weight, resulting in the bowed legs characteristic of this disease. If the child is crawling rather than walking, the bones of the upper limbs can also be affected. Archaeologically, rickets is evident in most time periods, but it was especially prevalent during the industrial revolution, particularly in lower class populations where the combination of poor diet and severe overcrowding in cities led to its increase.[35]

Looking at Tables 3–5, one can notice that most children had changes in bones caused by haematological disorders and metabolic diseases, mostly scurvy. However, most of these diseases could not have been the direct cause of death of the children.

In paleodemographic research, as previously mentioned, the child mortality rate is an important element of a population's progress. Child mortality is considered an adequate criterion for the social and sanitation conditions of a community and a sensitive indicator of inadequate nutrition. In order to properly interpret data collected by anthropological analysis, it is necessary to

[29] Miladinović-Radmilović, Vulović 2015.

[30] Ђурић-Срејић 1995, 336.

[31] Šlaus 2006 165, 166.

[32] Ђурић-Срејић 1995, 336, 337; Ortner, Ericksen 1997; Aufderheide *et al*. 1998, 310–314; Ortner *et al*. 1999; Ortner *et al*. 2001; Ortner 2003, 383–393; Šlaus 2006, 165–169; Brickley, Ives 2008, 41–74; Mahoney-Swales, Nystrom 2009; Brown, Ortner 2011.

[33] Mankin 1974.

[34] Атанацковић 1990.

[35] Aufderheide et al. 1998; Ortner, Mays 1998; Stirland 2003; Mays *et al.* 2006.

determine additional causes of child mortality, i.e. illnesses that do not leave visible marks on osteological material.[36] Due to different causes of death, infant mortality (children aged up to one year) should be viewed separately from that of older children.

Neonatal mortality (the first four weeks after birth) is most often caused by an infant's physiological and organic weaknesses,[37] genetics and other developmental anomalies. On the other hand, post neonatal mortality (aged one month to one year) almost entirely depends on exogenic conditions. High post neonatal mortality indicates poor sanitary conditions, malnutrition and increased exposure to infections, especially gastrointestinal and respiratory.[38] Infant nutrition is particularly important. Breastfeeding, i.e. mother's milk, satisfies nutritious requirements, enables proper growth and development, maintains immune protection and stops exposure to bad sanitary conditions associated with artificial feeding, reducing instances of diarrhoea, acute urinary and respiratory infections, parasitosis, nutrition disorders, anaemia and many other diseases, thus lowering mortality. The number of mortalities in children less than one year old at sites in ancient Sirmium and the surrounding area were as follows: 1st–4th century – 6 (13.6%), and 4th and 5th centuries – 9 (27.3%).[39]

Without doubt, there are other significant causes of death, some of which are: sudden infant death syndrome (usually occurs before the fourth month), infanticide, miscarriage, etc.

Where the mortality of children older than one year is concerned, it can be concluded that although the nutritional needs of children decreased, especially after the age of three, diet still plays an important role. Likewise, diarrhoea, respiratory and gastrointestinal infections are the leading causes of death, together with accidents.[40]Mortality rates of children over one year old at sites in ancient Sirmium and the surrounding area were as follows: 1st–4th century – 38 (86.4%), and 4th and 5th centuries – 24 (72.7%).[41]

CONCLUSION

Mortality in children during the 1st–4th century could have been caused by a number of diseases. There are many diseases that leave no visible marks on bones, and may indeed be the direct cause of death. By all accounts, swamps were a constant source of epidemics (e.g. malaria). Food and lead poisoning were also frequent during the Roman period.

Historical records contain fragmentary data of a "catastrophic plague" that afflicted Sirmium in the spring of 270 A. D. This was when Claudius entered the city, after spectacularly defeating the Goths at Naisus, earning himself the nickname "Goth". Hoards of German prisoners were brought with him, some of whom were probably carriers of "plague germs." The military triumph quickly turned into a disaster. It is unclear how many inhabitants of Sirmium succumbed to the disease, but the number must have been huge. The scale of the disaster is best illustrated by the fact that Claudius himself died in the city as a result of the plague. The news echoed around the empire and became the first piece of evidence of plague in this area.[42]

Although the situation was much better during the 4th and 5th centuries, mortality in children could also have been the consequence of numerous diseases. A well-planned utility system, the use of clear drinking water from the wells of Fruška Gora and other benefits, such as public baths and local thermal wells, created hygienically favourable living conditions for the settlers. However, it is evident that the use of thermal wells did not reduce osteoarthritis and other joint diseases in adults.[43] Likewise, it should be added that respiratory and gastrointestinal infections and poisonings, as well as malaria could also have been the main causes of death for the settlers.

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[36] Miladinović 2005; Миладиновић-Радмиловић 2008.

[37] Saunders, Katzenberg 1992.

[38] Gastrointestinal infections are more frequent during summer, and respiratory during winter months (Миладиновић-Радмиловић 2008).

[39] Miladinović-Radmilović 2011, 566, 576.

[40] Миладиновић-Радмиловић 2008.

[41] Miladinović-Radmilović 2011, 566, 576.

[42] Mirković 1971, 35.

[43] Miladinović-Radmilović 2011.

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ЗДРАВСТВЕНО СТАЊЕ ДЕЦЕ У АНТИЧКОМ СИРМИЈУМУ

Кључне речи. – римске некрополе, I–IV век, IV и V век, деца, здравствено стање

Антрополошка анализа је обухватила укупно 332 инхумиране и две спаљене индивидуе из античког периода (сл. 1), односно 257 одраслих и 77 дечјих индивидуа откривених током археолошких ископавања у периоду 1957–2002. године (табеле 1 и 2). Степен очуваности скелетног материјала одговарао је II категорији (добро очуван, некомплетан скелет). Овакав степен очуваности био је директна последица ерозије (гробови у облику бунара, на обали реке Саве), грађевинских (Сремска Митровица) и пољопривредних радова (локалитети пронађени у околини Сремске Митровице), пљачкања и уништавања гробница и гробних конструкција од стране дивљих копача, затим високог степена влажности и значајних температурних промена у просторијама где се чува људски остеолошки материјал а да претходно, након ископавања, није механички очишћен и опран, као и полагања материјала у неадекватно „привремено“ паковање. Поред тога, требало би такође узети у обзир и друге спољашње и унутрашње факторе (сама природа кости) као и чињенице да је људски остеолошки материјал са неколико локалитета послат у САД на антрополошку анализу и да је део материјала покопан 1985. године на Паланци.

Антрополошком анализом деце обухваћени су услови налаза, степен очуваности скелетног материјала, најмањи број индивидуа, пол, старост, телесна висина, денталне и палеопатолошке анализе, испитивање могућег узрока смрти и епигенетске карактеристике.

Римске некрополе из I–IV века

Антрополошка анализа је показала да су на локалитетима из I–IV века у Сремској Митровици (*Sirmium*) и њеном окружењу откривени скелетни остаци 188 индивидуа, тј. 144 одрасле (76,6%) и 44 дечје (23,4%) индивидуе (табела 1).

Дентална анализа је показала присуство хипоплазије код шест дечјих индивидуа (једне женске, четири мушке и једне непознатог пола) и каријеса код три дечје индивидуе (једне женске, једне мушке и једне непознатог пола) (табеле 3 и 5).

Палеопатолошка анализа је на дечјим скелетима открила неколико болести: повреде, промене на костима узроковане крвним поремећајима, метаболичке болести костију и запаљење средњег уха (табле I и II). Код једне женске индивидуе је уочена повреда на окципиталној кости. Промене на костима узроковане крвним поремећајима, као што су *cribra orbitalia* (табла I/1, 2), *cribra palatina*, *cribra humera* (табла II/1, 2), *cribra femora* (табла II/3, 4) *et fibula,* биле су уочене код 16 индивидуа (четири женске, девет мушких и три непознатог пола). Дубоке лезије на крајевима дугих костију су примећене код осам индивидуа (седам мушких и једне непознатог пола). Скорбут је констатован код пет индивидуа (једне женске, три мушке и једне непознатог пола – табла I/3, 4), а рахитис код једне женске индивидуе. Запаљење средњег уха је уочено код две индивидуе (једне женске и једне мушке – табеле 3 и 5).

Смртност деце током I–IV века могла је да буде узрокована већим бројем болести. Постоји много болести које не остављају видљив траг на костима, а које могу бити директан узрок смрти. По свему судећи, мочваре су могле биле константан извор епидемија (нпр. маларије). Такође, тровање храном и оловом током римског периода није била ретка појава.

Историјски извори садрже фрагментарне податке о „катастрофалној куги“ која је погодила Сирмијум у пролеће 270. године. То је било у време када је Клаудије, након спектакуларне победе над Готима код *Naisus*-а, ушао у град и том приликом наденуо себи надимак „Гот“. Са њим су доведене и хорде германских затвореника, од којих су неки вероватно донели „клице куге“. Војни тријумф се убрзо претворио у катастрофу. Нејасно је колико је становника Сирмијума подлегло болести, али број је вероватно био велик. Размера катастрофе је најбоље илустрована чињеницом да је и сам Клаудије умро у Сирмијуму од последица куге. Вест се проширила целим царством и постала је први доказ куге на овом простору.

Римске некрополе из IV и V века

Антрополошка анализа је показала да су на локалитетима из IV и V века у Сремској Митровици (*Sirmium*) и њеном окружењу откривени скелетни остаци 146 индивидуа, тј. 113 одраслих (77,4%) и 33 дечје (22,6%) индивидуе (табела 2).

Дентална анализа је показала само каријес код једне мушке дечје индивидуе (табеле 4 и 5).

Палеопатолошком анализом је на дечјим скелетима откривено неколико болести: промене на костима узроковане крвним поремећајима и метаболичке болести костију. Промене на костима узроковане крвним поремећајима, као што су *cribra orbitalia*, *cribra femora* и порозна хиперостоза су константоване код пет индивидуа (једне женске, једне мушке и три непознатог пола). Дубоке лезије на крајевима дугих костију могле су се уочити код шест индивидуа (пет мушких и једне непознатог пола). Активни периоститис (скорбут?) идентификован је код две индивидуе (једне женске и једне непознатог пола) (табеле 4 и 5).

Иако је ситуација у самом Сирмијуму и његовој околини током IV и V века била много боља, смртност деце је и тада могла да буде последица многих болести. Добро изведен

канализациони систем, коришћење чисте пијаће воде допремане акведуктом са извора на Фрушкој гори и друге бенефиције, као што су коришћење јавних купатила и локалних термалних извора, створили су у хигијенском погледу знатно повољније услове за живот становника. Међутим, јасно је да употреба термалних извора није смањила остеоартритис и друге болести зглобова код одраслих индивидуа. Такође, треба напоменути и то да су респираторне и гастроинтерстиналне инфекције, тровање, као и маларија могли бити главни узроци смрти становника.

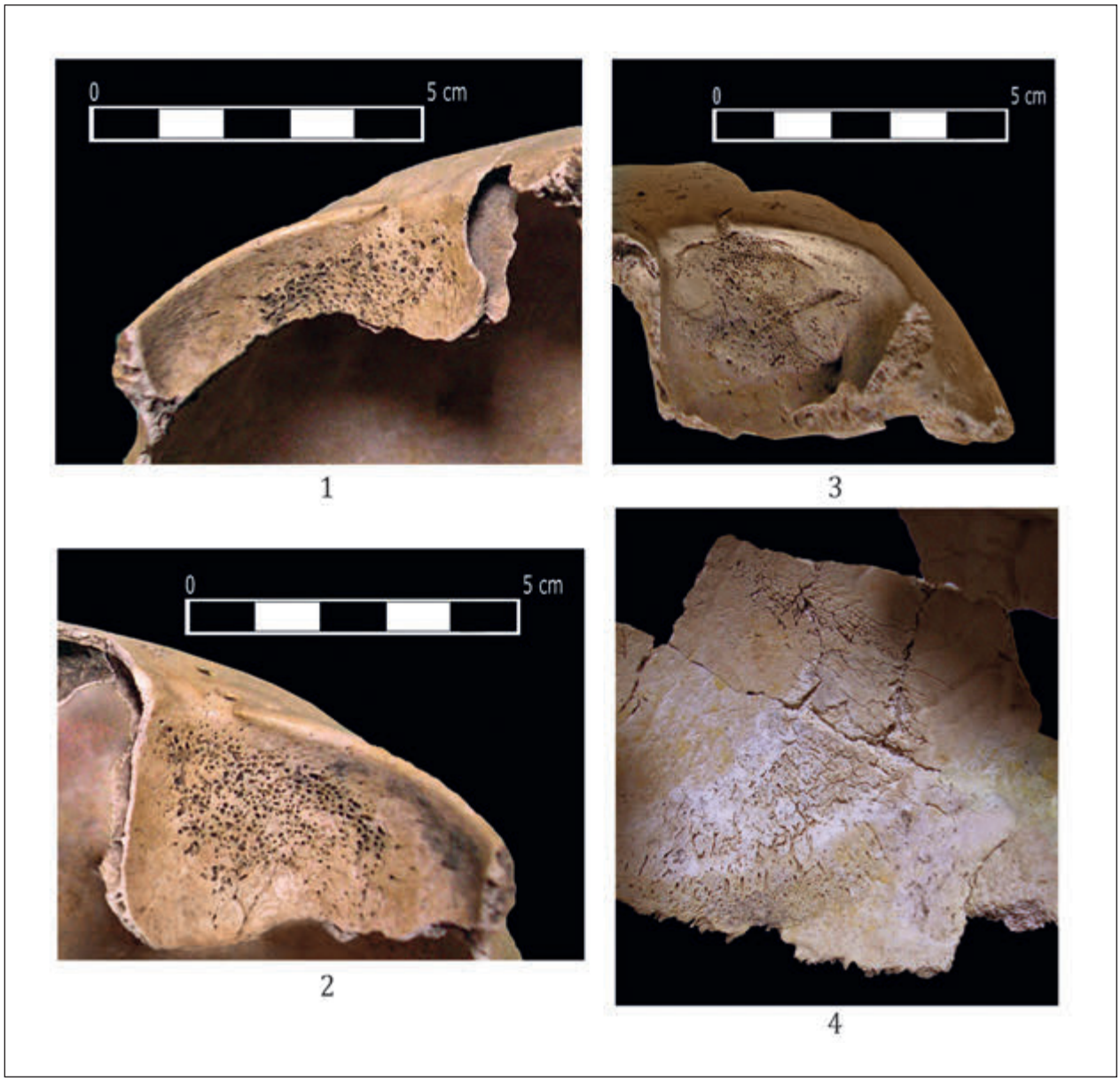

Plate I – 1) cribra orbitalia on the right orbital roof (Sirmium, site No. 76, Grave 2, I individual, male, 9 years old); 2) cribra orbitalia on the left orbital roof (Sirmium, site No. 76, Grave 2, I individual, male, 9 years old); 3) traces of scurvy on the left orbital roof (Sirmium, site No. 76, Grave 7, male, 18 months); 4) traces of scurvy on lamina interna (Sirmium, site No. 76, Grave 7, male, 18 months)

Табла I – 1) cribra orbitalia на крову десне орбите (Сирмијум, локалитет 76, Гроб 2, I индивидуа, индивидуа мушког пола, стара 9 година); 2) cribra orbitalia на крову леве орбите (Сирмијум, локалитет 76, Гроб 2, I индивидуа, индивидуа мушког пола, стара 9 година); 3) трагови скорбута на левом крову орбите (Сирмијум, локалитет 76, Гроб 7, индивидуа мушког пола, стара 18 месеци); 4) трагови скорбута на lamina interna-и (Сирмијум, локалитет 76, Гроб 7, индивидуа мушког пола, стара 18 месеци)

Plate II – 1) appearance of active periostitis (scurvy) on the humeri (Sirmium, site No. 77, Grave 6, I individual, female, NB – 6 months); 2) cribra humera (Sirmium, site No. 76, Grave 4, female, 14 years old); 3) cribra femora (Sirmium, site No. 77, Grave 26, I individual, female, 13 years old); 4) cribra femora (Sirmium, site No. 77, Grave 1, I individual, male, 10 years old)

Табла II – 1) појава активног периоститиса (скорбута) на хумерусима (Сирмијум, локалитет 77, Гроб 6, I индивидуа, индивидуа женског пола, NB – 6 месеци); 2) cribra humera (Сирмијум, локалитет 76, Гроб 4, индивидуа женског пола, стара 14 година); 3) cribra femora (Сирмијум, локалитет 77, Гроб 26, I индивидуа, индивидуа женског пола, стара 13 година); 4) cribra femora (Сирмијум, локалитет 77, Гроб 1, I индивидуа, индивидуа мушког пола, стара 10 година)