The health status of subadults exhumed from the cemetery of the wooden church in Călugăreni (Giurgiu, Romania)

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Abstract. The analyzed osteological material comes from seven graves from the medieval cemetery related to the wooden church in Călugăreni village (Giurgiu County, Romania). The graves were discovered during preventive archaeological researches required by the extension of the place of worship. A series of isolated human bones discovered on the surface or in the soil layer above the graves were also analyzed; these bones probably come from disturbed graves. The graves are dated in the second half of the 18th century AD. To estimate the age at death, we analyzed the teeth eruption, but we also used other criteria, measurable or observable. The presence of bone and dental pathologies or abnormalities, especially those that can indicate the health status, was observed. The palaeodemographic analysis consisted of estimating the minimum number of individuals, which is nine (eight subadults and one adult). Six subadults died within the biological age range of one month to 7 years (*infans I*), one in the range of 7-14 years (*infans II*) and one in the range of 14-20 years (*juvenis*). The minimum biological age at the time of death is about one month. The critical period regarding the health status seems to be in the last months of breastfeeding, during the weaning period or shortly after weaning. The health status markers appeared on six skeletons and suggest the presence in this community of food deficiencies and/or acute diseases. Exocranial porosities were identified in four cases (three cases of *cribra orbitalia* and one case of porotic hyperostosis/*cribra cranii*) and Harris lines, in three cases. Intracranial porosity was reported in two cases, only one being accompanied by *perimortem* cranial trauma. A case of enchondroma was recorded. Dental cavities were recorded in one case, the same situation being in the case of the supragingival plaque. The absence of enamel hypoplasia on the teeth suggests that amelogenesis was not affected by these possible diseases or deficiencies, any health problems appeared at the end of the breastfeeding period or, most likely, around the time of weaning. In conclusion, the pathologies recorded in this study represent evidence of the existence of health problems in the subadult population, of acute episodes of physiological stress induced by the poor living conditions, the inadequate and insufficient nutrition, the poor hygiene, and maybe some cultural practices inappropriate to the child body.

Key-words: Călugăreni, wooden church, 18th century AD, palaeoanthropological analysis, health status.

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Starea de sănătate a subadulților deshumați din cimitirul aferent „Bisericii de lemn" din Călugăreni (Giurgiu, România). Materialul osteologic analizat provine din șapte morminte de inhumație din cimitirul medieval aferent „Bisericii de lemn" din Călugăreni (județul Giurgiu, România). Mormintele au fost descoperite prin cercetări arheologice preventive impuse de lucrările de extindere a lăcașului de cult. Au fost analizate și o serie de oase umane izolate, descoperite fie la suprafață, fie în stratul de pământ de deasupra mormintelor propriu-zise; aceste oseminte provin, cel mai probabil, din morminte deranjate. Mormintele cercetate sunt datate în a doua jumătate a secolului al XVIII-lea p. Chr. Pentru determinarea vârstei la deces, am analizat evoluția dentiției, dar am apelat și la alte criterii, măsurabile sau observabile. S-a urmărit prezența patologiilor și anomaliilor osoase și dentare, în special a celor ce pot oferi indicii cu privire la starea de sănătate. Analiza paleodemografică a constat în estimarea numărului minim de indivizi, care este de nouă (opt subadulți și un adult). Șase subadulți au decedat în intervalul de vârstă cuprins între o lună și 7 ani (*infans I*), unul în intervalul 7-14 ani (*infans II*) și unul în intervalul 14-20 ani (*juvenis*). Vârsta biologică minimă în momentul decesului în această serie scheletică este de circa o lună. Perioada critică în ceea ce privește starea de sănătate a subadulților analizați pare a fi în ultimele luni de alăptare, în perioada înțărcării sau la scurt timp după înțărcare. Indicatorii stării de sănătate au apărut la șase schelete și ne sugerează prezența în sânul comunității a unor posibile carențe alimentare și/sau a unor boli. Porozitățile exocraniene sunt prezente în patru cazuri (trei cazuri de *cribra orbitalia* și un caz de hiperostoză porotică/ *cribra cranii*), iar liniile Harris – în trei cazuri. Porozitatea endocraniană a fost semnalată în două cazuri, doar într-unul aceasta fiind însoțită de un traumatism cranian suferit *perimortem*. A fost înregistrat un caz de encondrom. Carii dentare au fost înregistrate într-un singur caz, situație valabilă și pentru tartrul supragingival. Absența hipoplaziei smalțului ne sugerează că amelogeneza nu a fost afectată de aceste posibile boli sau carențe; orice problemă de sănătate a apărut spre sfârșitul perioadei de alăptare sau, cel mai probabil, în jurul momentul înțărcării. În concluzie, patologiile înregistrate în seria scheletică analizată reprezintă dovezi ale existenței problemelor de sănătate în segmentul populațional infantil, ale unor episoade acute de stres fiziologic indus de condițiile nefavorabile de trai, de alimentația neadecvată și insuficientă, de igiena precară sau de anumite practici culturale nepotrivite organismului infantil.
Cuvinte-cheie: Călugăreni, „Biserica de lemn", secolul al XVIII-lea p. Chr., analiză paleoantropologică, stare de sănătate.

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Some archaeological data

The wooden church of Călugăreni village (Giurgiu County, Romania) is located between the two bodies of the Călugăreni forest, on one side of the Neajlov River, north-east of the confluence with the Câlnișteа stream and 140 m south of a tributary of Neajlov. Due to interventions of restoration at the wooden church from Călugăreni, which also involved the enlarging of the construction, implicitly affecting the land located to the west of the place of worship, preventive archaeological excavations became necessary, both inside the church and its western part, the direction in which the extension of the place of worship was expected. The excavations were conducted by a team of archaeologists lead by Raluca Kogălniceanu (scientist in charge)[1].

[1] Archaeologists Andrei Măgureanu, Alexandru Morintz and Radu Văcălie were also part of the team of specialists who participated at the preventive excavations carried out in 2012, and in 2018.

During the research conducted in 2012, five complete graves (noted M1-M5) were discovered, above which, on the surface of the ground, there was no funeral monument. These graves were located in the area characterized by a lack of such monuments, immediately to the west of the church. An empty pit (a possible grave, noted M6) and isolated human bones, recovered from the surface, most likely from disturbed graves were also discovered. Two other skull fragments (noted M7) were discovered in the unauthorized excavation of the new foundations. In 2018 another grave (noted M8) was discovered in the same part of the cemetery. According to the authors of the excavation, the investigated graves are dated in the second half of the 18th century AD (Raport de cercetare arheologică preventivă Nr. 714/30.10.2012; Măgureanu *et alii* 2017).

Osteological material and study methods

The osteological material comes from a minimum of nine skeletons (eight subadults and one adult). The skeletons from the graves are satisfactorily preserved. The bone remains discovered either on the surface or in the immediate upper layer of the graves are precariously preserved.

The first step of the palaeoanthropological study was the cleaning of the bones and the restoration of the skeletons. The next step was morphoscopic examination and anthropometric data collection. To estimate the biological age at the time of death, in the case of the subadults we used the eruption of the deciduous teeth criteria and its replacement with the permanent teeth (Ubelaker 1978, p. 46-47; Moorrees *et alii* 1963). The mineralization of the crowns, the formation of roots and the moment of eruption were observed. Another criterion used in biological age estimation at the time of death was the epiphyseal ossification degree of the bones of the appendicular skeleton (scapular girdle and upper limbs, pelvic girdle and lower limbs) and the arches and plates at the vertebral bodies. The length of the long bones of the upper (humerus, radius and ulna) and lower limbs (femur, tibia and fibula) was also considered. Even if the stature, implicitly the length of the long bones, is subject to a high biological variability, determined by both the genetic and the environmental factors, we also used these standards (Maresh 1955, 1970; Scheuer, Black 2000; Schaefer *et alii* 2009; Latham, Finnegan 2010).

The sex determination was not possible in the present study, because none of the skeletons provided clear features. In fact, with very few exceptions, on the skeletal remains sexual dimorphism can be undoubtedly detected only when the adolescence period begins, and only if the skeleton is well represented.

The main goal of this study was the recording and analysis of bone and dental pathologies and abnormalities, traumas and the epigenetic traits. Once identified, their severity was noted (Barnes 1994; Aufderheide, Rodriguez-Martin 1998;

Mays 1998; Ogden 2000; Ortner 2003; Lewis 2004, 2007; Slootweg 2007; O'Neal 2007; Chhem, Brothwell 2007; Kimmerle, Baraybar 2008; Katzenberg, Saunders 2008; Brickley, Ives 2008; Waldron 2009).

Various skeletal indicators reflect conditions at death and conditions during life, and provide important information about the health status of past populations. Subadult health status in bioarchaeological studies of the past populations is evaluated through non-specific stress indicators, such as porotic hyperostosis/*cribra cranii*, *cribra orbitalia*, Harris lines, and dental enamel hypoplasia. Among the indicators of non-specific infection are generally considered periostitis, endocranial new bone formation, maxillary sinusitis, and otitis media.

The porosity of the roof/upper wall of the orbits (*cribra orbitalia*) and that of the bone of the neurocranium (porotic hyperostosis/*cribra cranii*) develops in childhood, and it results from the overactivity of the marrow, and a thinning of the outer table of the skull in response to the need of the organism to produce and store more red blood cells (Stuart-Macadam 1985). In the present study, these indicators were analyzed only macroscopically. The degree of severity, and their appearance, was recorded as follows:

- a) porotic; b) cribrotic; c) trabecular (Nathan, Haas 1966);
- a) capillaries; b) small scattered foramina; c) small and large isolated foramina; d) foramina forming a trabecular structure; e) trabecular mass extended beyond the *tabula externa ossis cranii* (Stuart-Macadam 1991);
- a) poorly discernable lesions; b) visible porosity; c) coagulated foramina; d) foramina associated with expansive changes (Buikstra, Ubelaker 1994).

Harris lines are the transverse lines of increased radio-opacity which occur in the growing bones of subadults in a result of catch-up growth after an episode of deceleration. These lines are the evidence of episodes of bone growth interruption, and can be identified using Roentgen electromagnetic radiation (X-rays). Their presence was searched in the living areas (metaphysis) of the long bones of the limbs. Any other anomalies identified on the radiographic film were analyzed and categorized (Chhem, Brothwell 2007). Radiographic images were obtained using the X-rays Shimadzu device, with the following characteristics: standard box – 20/30 cm, voltage – 76 kV, intensity – 20 mA, exposure time – 80 msec.

Endocranial/reactive new bone formation can be observed on the endocranial surface, and appears as diffuse or isolated layers of new bone on the original cortical surface, expanding around meningeal vessels. Such lesions are commonly found on the occipital bone, but also the parietal and frontal bones.

Dental enamel hypoplasia is a developmental disturbance of teeth caused by perturbed amelogenesis, characterized by deficient enamel matrix formation, and visible as areas of decreased enamel thickness. The presence of this defect

indicates episodes of acute physiological stress suffered during the formation of dental crowns (Goodman, Rose 1990; Suckling 1989).

Because in the skeletal series from Călugăreni there are both incomplete skeletons and isolated bones (complete or fragmented), the palaeodemographic analysis was based on the estimation of the minimum number of individuals – a quantification method that shows the least estimated number of subjects who, in the particular case of the skeletal series, formed the skeletal ensemble. For estimating the minimum number of individuals, we used, first of all, the criterion based on "the most frequent bone that is found after sorting by anatomical types and on the sides, right or left". Second, we considered the age criteria and the particular morphoscopic features. All these observations helped us to select individuals. We mention that the values obtained for the minimum number of individuals do not indicate the most probable number or the real number of individuals, but the estimated minimum number of subjects that contributed to the formation of the skeletal ensemble.

Description of the skeletons

Grave no. 1 (M1) / 2012

Archaeological data: inhumation grave, with the skeleton lying on its back, head to the west. The right arm was extended by the body, the left arm – bent at the elbow, with the hand on the pelvis. The tomb has no inventory[2].

Representation degree and preservation state: well-represented skeleton, almost complete, good preservation status. The cranial segment shows some minor damage in the region of the zygomatic processes (**Fig. 1/1-2**). From the postcranial segment are missing: a patella, parts of fibulae, left radius and some hand and foot bones. Several ribs are fragmentary.

Taphonomic observations. The cranial segment is slightly deformed *postmortem* (**Fig. 1/3-4**). All cracks and ruptures that led to the fragmentation of certain skeletal elements are produced *postmortem*.

Biological age estimation. The dentition, present almost entirely, is mixed (deciduous and permanent teeth) (**Fig. 1/5-6**). The crowns of the deciduous teeth are easily worn by the physiological process of chewing, those of the definitive teeth having almost no wear. The deciduous dental units present in the alveoli are: $c^{\#}$, m^{1}, m_{1}, $m^{2,}$ and m_{2}. The permanent first molars have fully formed their roots and closed apexes. The permanent lower incisors are erupted, with the closed apex; the right canine has erupted, and the left one was in erupting process at the time of death. The secondary permanent molars have not erupted; they have completely calcified crowns,

[2] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 13.

and their roots formed in the proportion of 20%. The upper frontal teeth are slightly delayed in the terms of eruption stage compared to the lower segment. According to the teeth eruption stage, the biological age of this subadult is about 8-9 years.

The dimensions of the nasal opening (maximum height of 23 mm, upper width of 15 mm, and a maximum width of 20 mm) place the biological age of this individual in a very wide range, between 5 and 13 years.

The length of the postcranial bones displaces the biological age within an earlier interval compared to the dental eruption. Measured without epiphyses, the length of the scapulae (91 mm), the femora (250 mm), the tibiae (208 mm), the humeri (186 mm), the ulnae (156 mm) and the right radius (142 mm) range within 5-7 years interval. However, the width of the scapulae (65 mm) and the length of the clavicles (89 mm) move the age at death to the range of 7-9 years, which overlaps with that established according to the dental eruption.

Another criteria used in the estimation of biological age is the degree of ossification of the posterior and anterior arches at the vertebral bodies. In the case of the first cervical vertebra, we mention the persistence of the posterior and, in part, of the anterior synchondrosis; for the second cervical vertebra – ossification of the *ossiculum terminale* and the neurocentral ossification. In the case of the fifth lumbar vertebra, we mention the neurocentral ossification and persistence of the posterior synchondrosis. Finally, for the sacrum, non-fused segments and the beginning of the ossification process of the posterior synchondroses.

According to all the criteria mentioned above, the biological age of this subadult at the time of death is about 8-9 years (*infans II* category/children). Sex is undeterminable.

Non-metric/epigenetic traits. The parietal foramen is missing from the right side (**Fig. 1/3**). The occipital condyles have two facets. On the frontal, above the orbits, the complete enlarged supraorbital foramen is distinguished (**Fig. 1/1**). The zygomatic foramen is also enlarged (**Fig. 1/2**). The humeri have a supratrochlear opening.

Health status. Each deciduous molar on the left upper dental hemiarch has one cavity (**Fig. 1/5**). On the lower frontal teeth and the deciduous molars the supragingival plaque is deposited; the layer of calculus is more consistent on the lingual facets of the crowns and weaker on the vestibular one (**Fig. 1/6**). No dental unit, deciduous or permanent, has visible enamel defects. Their absence indicates that both during the intrauterine or *postpartum* period, during the breastfeeding period, and later, during the weaning interval or early childhood (2-7 years), this child's body had all the necessary elements for the secretion and mineralization of tooth enamel (amelogenesis).

On the roof of both orbits we note the presence of *cribra orbitalia* (**Fig. 1/8**). The porosity is of low gravity, of porotic-cribrotic type (Nathan, Haas 1966), third-



Fig. 1. Călugăreni, M1/2012, subadult, 8-9 years old.
1. Skull, facial view, supraorbital enlarged foramina; 2. Skull, lateral view, enlarged zygomatic foramen; 3-4. Skull, occipital and vertical views, *postmortem* deformation; 5. Upper dental arch, tooth decay; 6. Mandible, supragingival plaque; 7. Left parietal, *cribra cranii*; 8. The roof of the right orbit, *cribra orbitalia*; 9. Tibia, distal metaphyseal area, Harris lines

Fig. 1. Călugăreni, M1/2012, subadult, 8-9 ani.
1. Craniu, norma facială, foramene supraorbitare largi; 2. Craniu, norma laterală, foramen zigomatic larg; 3-4. Craniu, norma occipitală și verticală, deformație *postortem*; 5. Arcada dentară superioară, carii; 6. Mandibula, depuneri de tartru supragingival; 7. Parietalul stâng, *cribra cranii*; 8. Peretele superior al orbitei drepte, *cribra orbitalia*; 9. Tibie, regiunea metafizară distală, linii Harris

degree (Stuart-Macadam 1991), which means several small foramina accompanied by several large isolated foramina. Porosity is easy to distinguish and fall into the second category, of visible/real and active porosity (according to Buikstra, Ubelaker 1994).

For this individual, *cribra orbitalia* is associated with other non-specific markers of physiological stress suffered at the age of early childhood. On the parietals, especially the one on the left side, near the cranial point *lambda*, there is porotic hyperostosis/*cribra cranii*, expressed in this case by fine foramina (**Fig. 1/7**). The presence of *cribra cranii*, especially accompanied by *cribra orbitalia*, may be an indicator of the living conditions and the quality of life (Walker *et alii* 2009).

On the distal metaphyses of the tibiae, X-ray investigations revealed several Harris lines (**Fig. 1/9**). These lines indicate repetitive episodes of bone growth interruption during early childhood, in the age range of 1 to 6 years. The presence of Harris lines, regardless of location and, in particular, in combination with other non-specific indicators, betrays the episodes of crisis or physiological stress that occurred during the physiological process of somatic growth, implicitly skeletal, thus becoming extremely useful tools for assessing the health status of the past populations (Papageorgopoulou *et alii* 2011).

In this case *cribra orbitalia*, *cribra cranii*, and Harris lines – three markers of quality of life and certainly of the health status – are not associated with the enamel hypoplasia (which is also a non-specific marker of physiological stress). Most likely multiple nutritional deficiencies suffered by this child, who led to abnormal bone tissue growth on *tabula cranii externa* in parallel with stopping/restarting the bone growth on certain postcranial segments, occurred during early childhood (1-7 years), but did not affect the amelogenesis of the definitive teeth. The deficiencies that could have caused such phenomena are various. Cranial porosity could be induced by iron deficiency (a consequence of iron deficiency in diet or gastrointestinal and parasitic infections), vitamin C deficiency, vitamin B12 deficiency or folic acid deficiency. Harris lines could be caused by repetitive episodes of malnutrition or even hunger, acute infectious disease or intoxication. The presence of exocranial porosity in association with the Harris lines suggests that this child had serious health problems.

Grave no. 2 (M2) / 2012

Archaeological data: inhumation grave, with the skeleton lying on its back, oriented towards the west, arms bent at the elbows, hands brought to the chest. Three Ottoman coins, dated in the 18th century AD were discovered under the skull[3].

[3] The numismatic determinations were made by Aurel Vâlcu from the Institute of Archaeology from Bucharest (Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 13-14).

Representation degree and preservation state: almost complete and very well represented skeleton, good preservation status. Only the occipital bone is fragmentary (**Fig. 2/1**). From the postcranium the elements of the sternum and the left radius are missing. The restoration of the cranium was partially possible (**Fig. 2/1-3**).

Taphonomic observations. The cranial segment is strongly deformed *postmortem*, especially in the parietal area. On the left temporal bone, in the auricular area, were identified traces of oxidation left from a metal object with which the bone came into contact. All cracks and ruptures that led to the fragmentation of the skeletal elements are produced *postmortem*.

Biological age estimation. Both jaws are preserved (**Fig. 2/3**). All erupted teeth are deciduous, without wear. The first molars have almost completely formed roots, with open apexes. Canines and secondary molars have roots formed in a proportion of 50%. The definitive first molars are in alveoli (non-calcified buds). According to the teeth eruption stage, the biological age of this subadult is between 18 and 24 months.

The size of the *nasion-bregma* cranial arch (127 mm) indicates the age range of 18-24 months. Other dimensions considered for biological age estimation were those of the *pars basilaris ossis occipitalis*: maximum width (24 mm), sagittal length (17 mm), and maximum length (23 mm).

Postcranial bones have lengths that range in the interval between 18 and 36 months. Measured without epiphyses, the length of the femora (159 mm), tibiae (135 mm), fibulae (129 mm), humeri (128 mm), ulnae (106 mm) and right radius (96 mm) indicate the biological age of 18-24 months. The situation is the same for the length of the scapula (59 mm). Some dimensions, such as maximum length of the clavicle (70 mm), width of the scapula (47 mm), or length (57 mm) and width (63 mm) of the iliac bone slightly displace the age range, between 24 and 36 months.

According to all the criteria mentioned above, the biological age of this subadult at the time of death is about 18-24 months (*infans I*/infants). Sex is undeterminable.

Non-metric/epigenetic traits. The right zygomatic has three enlarged foramina (**Fig. 2/4**).

Health status. The dentition is not affected by cavities, plaque or other infectious processes. The enamel defects are missing from the deciduous dentition, which means that in the interval in which the deciduous dental crowns are formed (last 2-3 prenatal months, perinatal and first 2-3 postnatal months) the child's body did not suffer episodes of physiological stress which affect the amelogenesis.

On the roof of the orbits *cribra orbitalia* have been identified (**Fig. 2/5**), which are of the cribrotic to trabecular type (Nathan, Haas 1966), fourth-degree

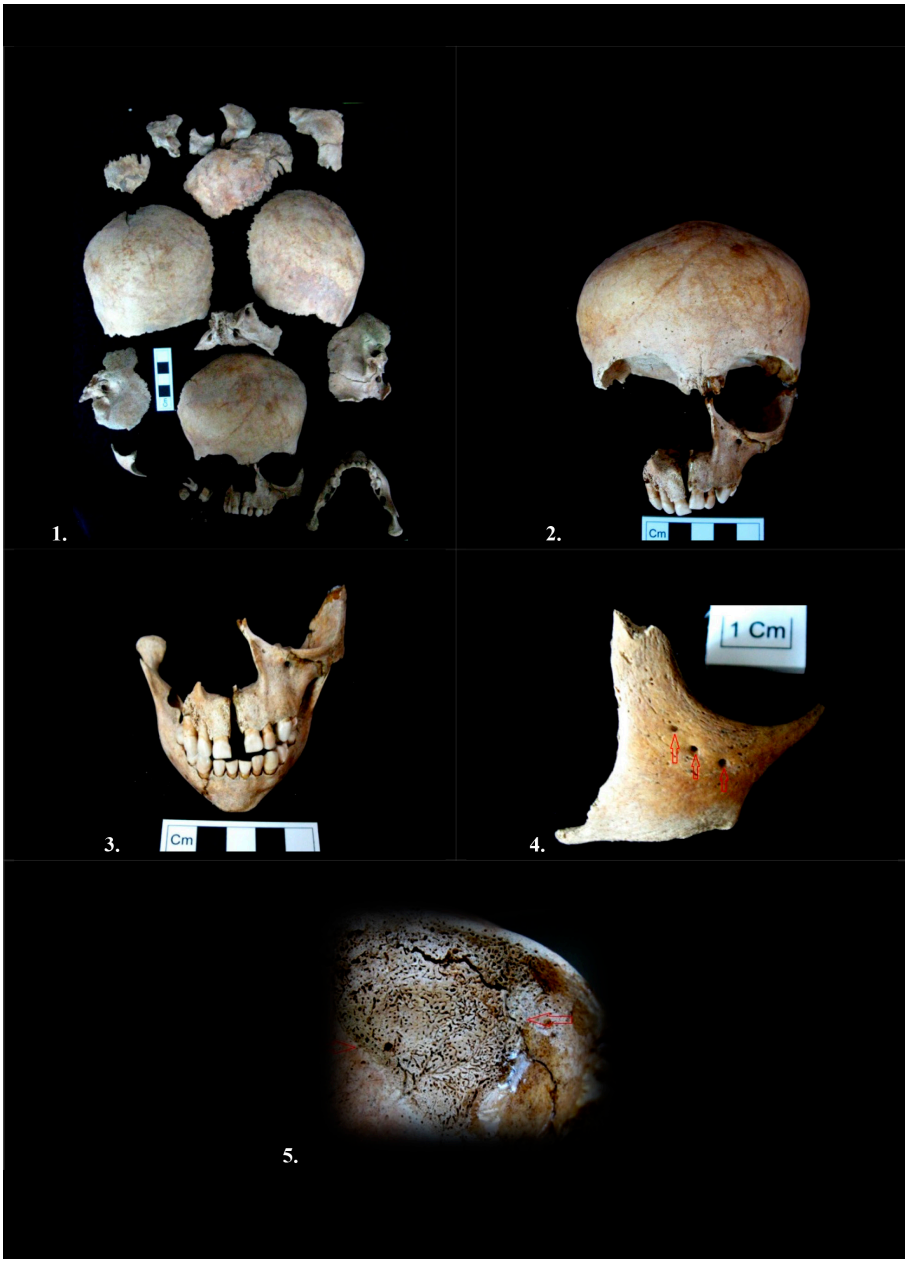


Fig. 2. Călugăreni, M2/2012, subadult, 18-24 months old.
1. Cranial bones; 2-3. Facial skeleton, incomplete; 4. Right zygomatic, multiple facial foramina; 5. The roof of the left orbit, *cribra orbitalia*
Fig. 2. Călugăreni, M2/2012, subadult, 18-24 luni.
1. Componentele segmentului cranian; 2-3. Parte din scheletul facial; 4. Zigomaticul drept, foramenele faciale multiple; 5. Plafonul orbitei de pe partea stângă, *cribra orbitalia*

(Stuart-Macadam 1991), which appear as a mixture of active porous and partially remodeled lesions. This type of orbital porosity falls into the category which includes foramina interspersed with trabeculae (Buikstra, Ubelaker 1994).

In this case, *cribra orbitalia* is not associated with other porosities. There is no association with other non-specific markers of physiological stress, such as enamel hypoplasia (a marker of disruption of crown formation) or Harris lines (marker of disruption of bone growth during childhood).

This lack of association leads us to assume that in the two years of his life this child's body probably suffered only slight sideropenic anemia. Iron deficiency may be induced by iron deficiency in the diet, iron malabsorption or iron non-metabolization, but also may be an effect of gastrointestinal or parasitic iron-consuming infections. Other causes that could develop orbital porous lesions are deficiencies of vitamin C, vitamin B12 or folic acid, hypervascularization (Wapler *et alii* 2004; Walker *et alii* 2009). Any type of deficiency could have affected the health status of this infant. Therefore, we are inclined towards the hypothesis of postnatal sideropenic anemia, during the lactation period and probably at the threshold or at the time of ablactation (weaning).

Grave no. 3 (M3) / 2012

Archaeological data: disturbed grave; the skull and several cervical vertebrae were discovered immediately west of the skull of the deceased discovered in M1. The skull of the deceased in M3 was discovered broken into two pieces, with the front side lying in reverse (with orbits up and west) over the rest of the skull[4].

Representation degree and preservation state: incomplete skeleton; good preservation status. The cranial segment was restored in a proportion of 80% (**Fig. 3/1-4**). Reattachment of the zygomatic processes and nasal, orbital and basioccipital regions was not possible due to the high *postmortem* fragmentation. From the postcranial segment, the following elements are present: the left ilium and ischium, right scapula, manubrium, three sternebrae, six fragmentary ribs, vertebral arches from the C3-C7 vertebrae, arches of the thoracic vertebrae, 11 vertebral bodies (cervical, thoracic and lumbar), femora (the right is incomplete), tibiae (fragmented), fibulae, humeri, radii, left ulna, and hand and foot bones (fragmented).

Taphonomic observations. Almost all dental crowns have a brown-blackish pigmentation (**Fig. 3/1-2**). Except for the traumatic ones, the rest of the cracks and ruptures that led to the fragmentation of certain skeletal elements are produced *postmortem*.

[4] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14.

Biological age estimation. The teeth are all deciduous. Dental crowns do not show wear. The first molars have complete roots, with open apexes. The roots of the canines and of the second molars are formed in a proportion of 50%. The definitive first molars are in alveoli in the form of calcifying crowns. According to the stage of dental eruption, the biological age ranges between 18-24 months.

For the estimation of the biological age, we also counted the maximum width of *pars basilaris ossis occipitalis* (23 mm), the presence of the anterior rhomboid fontanel (**Fig. 3/4**) and the unfinished synostosis of the metopic suture (**Fig. 3/1**), the result being a slightly wider range, between 12 and 24 months.

Postcranial bone size shows a biological age between 12 and 24 months. Measured without epiphyses, the length of the left femur (139 mm), the fibulae (108 mm), the humeri (112 mm) and the radii (88 mm) indicate an age between 12 and 18 months. The dimensions of the right scapula (59 mm length and 42 mm width) show an age between 12 and 24 months, and the dimensions of the left ilium (52 mm length and 58 mm width), an age between 18 and 24 months.

According to all the criteria mentioned above, the biological age of this subadult at the time of death is about 18-24 months (*infans I*/infants). Sex is undeterminable.

Non-metric/epigenetic traits. Four additional ossicles of irregular shape are present on the lambdoid suture (**Fig. 3/3**). The largest (12x10 mm) is positioned at the *lambda* cranial point (*Inca* bone).

The other three bones (*Wormian* bones), two on the right arm and one on the left arm of the suture, are smaller compared to the *Inca* bone. These additional ossicles are anomalies of the normal fusion model of ossification centers. According to some authors, when they are few and small (as in this case), they represent a variant of normality (Jeanty *et alii* 2000). The metopic suture was almost closed at the time of death (**Fig. 3/1**). On the left zygomatic there are three foramina and on the right, two foramina (**Fig. 3.1**).

Health status. The dentition does not have cavities, plaque, nor enamel defects. At the time of death, only deciduous teeth erupted – the crowns forming in the last 2-3 prenatal months, perinatal and in the first 2-3 months *postpartum*. The absence of enamel hypoplasia suggests that at least in this interval the child's body had the necessary elements for the enamel formation. Any physiological stress, non-systemic or systemic, has acted and damaged the state of health further, as follows.

The roof of the orbits is covered with *cribra orbitalia* (**Fig. 3/5**). The lesions are of the cribrotic type (Nathan, Haas 1966), third-degree (Stuart-Macadam 1991), which means small foramina interspersed with large isolated foramina. The porosity was active at the time of death, and the remodeling process was not started. According to the classification proposed by Buikstra and Ubelaker (1994),

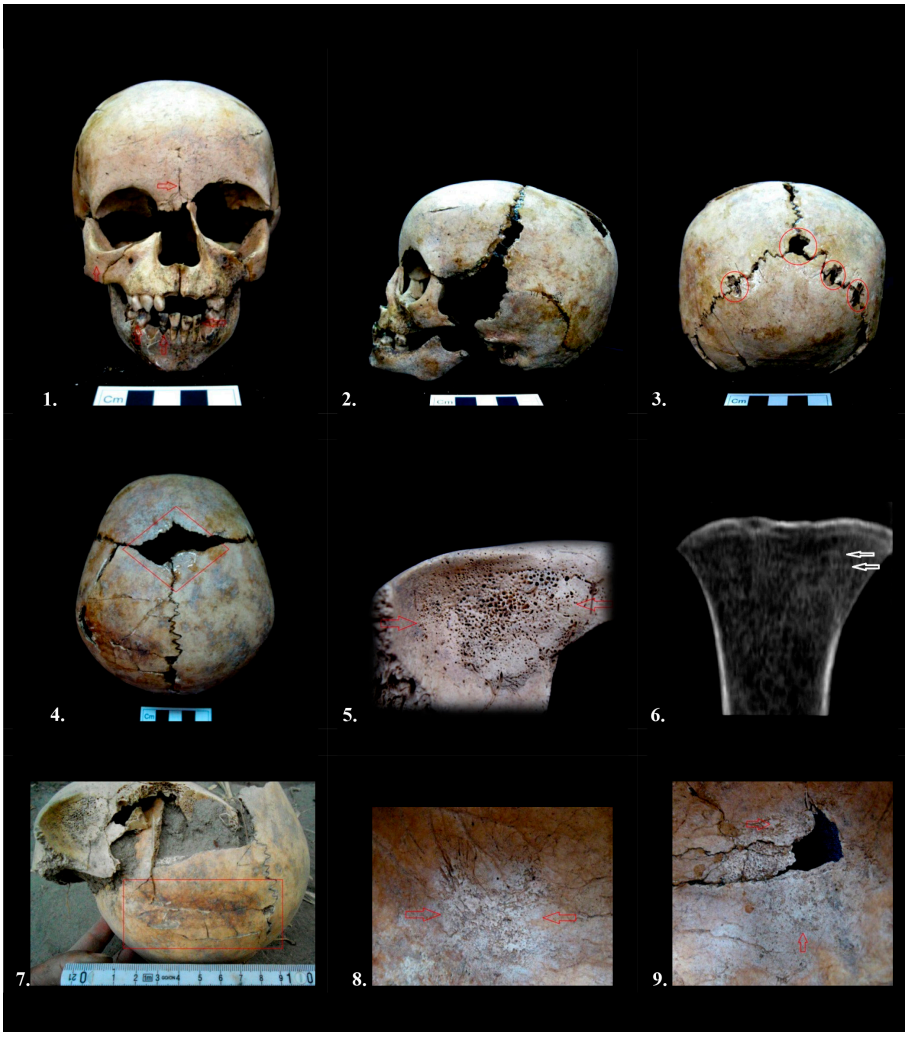


Fig. 3. Călugăreni, M3/2012, subadult, 18-24 months old.
1. Skull, facial view, traces of metopic suture, multiple zygomatic foramina and pigmented dental crowns; 2. Skull, lateral view; 3. Skull, occipital view, additional ossicles; 4. Skull, vertical view, anterior rhomboid fontanel; 5. The roof of the right orbit, *cribra orbitalia*; 6. Tibia, proximal metaphyseal area, Harris lines; 7. Image of the skull taken *in situ*, *perimortem* trauma; 8. Right parietal, inner cranial table, inflammation; 9. Left parietal, inner cranial table, inflammation

Fig. 3. Călugăreni, M3/2012, subadult, 18-24 luni.
1. Craniu, norma facială, urmă de sutură metopică, foramene zigomatice multiple și coroane dentare pigmentate; 2. Craniu, norma laterală; 3. Craniu, norma occipitală, osiculi suplimentari; 4. Craniu, norma verticală, fontanela anterioară romboidă; 5. Plafonul orbitei de pe partea dreaptă, *cribra orbitalia*; 6. Tibie, regiunea metafizară proximală, linii Harris; 7. Imagine a craniului aflat *in situ*, traumatism produs *perimortem*; 8. Parietalul drept, tăblia internă, inflamație; 9. Parietalul stâng, tăblia internă, inflamație

the orbital lesion is at the border of categories 2 and 3, one part of the lesions being of real/visible type, and another part, of coagulated type.

It is important to emphasize the association of *cribra orbitalia* with the lines of interruption of the bone growth. Harris lines, more diffused in this case compared to the one in M1, are present only at the proximal metaphyses of the tibiae (**Fig. 3/6**). There are no other porosities at the cranial or postcranial levels and no signs of amelogenesis disturbance. However, the presence of growth arrest lines in association with *cribra orbitalia* indicates health problems, especially deficiencies suffered during the breastfeeding period and probably at the time of weaning. We remind that the responsibility for the occurrence of exocranial porosity might be, first of all, the sideropenic anemia, this being induced by malabsorption or lack of iron in the diet or by parasitic gastrointestinal infections. The latter cause diarrheal diseases and "devour" iron reserves in the body. Probably due to acute episodes of physiological crisis, the nutrient requirement became insufficient, which led to a slight and short stagnation of bone growth. The types of stress that can lead to bone growth arrest are malnutrition, hunger, acute diseases, infections, avitaminosis, and intoxications.

Traumas. The skull of this subadult shows on the left parietal bone a longitudinal lesion of approx. 50 mm long. This is the result of a traumatic *perimortem* injury (**Fig. 3/7**). Most likely, the injury occurred following a blow (accidental or intentional?) applied in the area of parietal eminence with an elongated blunt object. The injured area has traces of hemorrhagic bone tissue. Near the lesion, on the endocranium, exactly in the region of the parietal fossa, there is porosity with traces of partial healing (**Fig. 3/9**). The same endocranial porosity is present on the right parietal fossa, also with traces of partial healing (**Fig. 3/8**). The changes in the *tabula interna ossis cranii* suggest that during the peritraumatic period there was hypervascularization and inflammation, forming abundant epidural hematomas. This inflammatory process led to the structural modification of the endocranium, of both parietal fossae. The lesions appear as highly corrosive areas, with numerous holes asymmetrically arranged on the bone surface; an abnormal and irregular growth of the bone tissue. On both parietal fossae the lesions have the same appearance (**Fig. 3/8-9**): pores interspersed with fibrous texture, the latter representing new-formed and remodeled bone tissue, accompanied by vascular impressions, from which we deduce that the healing process was in full deployment before death. Endocranial new bone remodeling, regardless of its causative factor, takes less time in children than in adults. Infantile bone tissue needs less time to respond by healing a trauma; in comparison with adults, infant osteoblasts replace ten times faster the bone destroyed by osteoclasts (Lewis 2004).

Most likely the trauma occurred shortly before death and did not represent the direct cause of the death, this being taken over by the complications that occurred in the immediate post-traumatic period (in particular, meningeal inflammation). We believe that this child "survived" the trauma itself and lived, probably in agony, for several days.

Grave no. 4 (M4) / 2012

Archaeological data: inhumation grave, with the skeleton lying on its back, with the head to the west, arms bent at the elbow and hands brought to the chest. The grave was opened until the pelvic area (including), the lower limbs being left in the profile of the excavation trench. An Ottoman coin dated in the 18th century AD[5] was found below the chest (near the abdomen), to the right.

Representation degree and preservation state: the skeleton is partially represented; the preservation status of the bones is very good. The bones of the lower limbs and some ribs are missing from the postcranial segment. The cranial segment was restored in a proportion of 95%, a process that led to a slight displacement of the temporal bones from their normal position (**Fig. 4/1-4**). Although they are present in the osteological inventory, the zygomatic processes, the right temporal squama and the basioccipital have not been reassembled.

Taphonomic data. The cranial segment is deformed *postmortem* (**Fig. 4/3**). All cracks and ruptures that led to the fragmentation of certain skeletal elements are produced *postmortem*.

Biological age estimation. All erupted teeth are deciduous. Regarding the development of the crowns, the deciduous dentition is complete; all 20 dental crowns have pierced the alveoli until the moment of death. The second deciduous molars have the roots formed in a proportion of 80%, with the apexes opened. The permanent first molars are in the alveoli (buds in the process of calcification). The crown wear is more pronounced on the front teeth (incisors and canines) and almost absent on the chewing surfaces. According to the dental eruption stage, the estimated biological age is about 2.5-3 years.

The lengths of the frontal (*nasion-bregma*) arch (116 mm) and chord (98 mm) indicate a biological age ranged between 1-3 years. The dimensions of the nasal aperture (upper width of 15 mm and a maximum width of 19 mm) move the age into a range between 2.5 and 4 years. Another criterion of age is the complete synostosis of the metopic suture (**Fig. 4/1**).

[5] The numismatic determinations were made by Aurel Vâlcu from the Institute of Archeology from Bucharest (Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14).



Fig. 4. Călugăreni, M4/2012, subadult, 2.5-3 years old.
1. Skull, facial view, bilateral supraorbital sulcus; 2. Skull, lateral view, double zygomatic foramen; 3. Skull, occipital view, additional ossicles; 4. Skull, vertical view; 5. Left humerus, metaphyseal-diaphyseal area, osteolysis nodular areas (enchondroma)
Fig. 4. Călugăreni, M4/2012, subadult, 2,5-3 ani.
1. Craniu, norma facială, sulcus supraorbitar bilateral; 2. Craniu, norma laterală, foramen zigomatic dublu; 3. Craniu, norma occipitală, osiculi suplimentari; 4. Craniu, norma verticală; 5. Humerusul stâng, regiunea metadiafizară, arii nodulare de osteoliză (encondrom)

The lengths of the clavicle (72 mm) and the bones of the upper limbs (humeri – 145 mm, radii – 110 mm, ulnae – 120 mm), measured without epiphyses, indicate the biological age in the same interval as the dental development, between 2.5 and 3 years. On the other hand, the dimensions of the ilium (72 mm long and 68 mm wide) slightly extend the range between 2 and 4 years.

According to all the criteria mentioned above, the biological age of this subadult at the time of death is about 2.5-3 years (*infans I*/infants). Sex is undeterminable.

Non-metric/epigenetic traits. On the frontal, immediately above the orbits, we identified the supraorbital sulcus (**Fig. 4/1**). Each zygomatic bone has two enlarged foramina (**Fig. 4/2**). On the lambdoid suture, near the *asterion* cranial points, there are three additional large ossicles (*Wormian* bones).

Two are located on the left arm of the lambdoid suture, and the third on the right arm (**Fig. 4/3**). We remind that the additional ossicles are anomalies of the normal fusion pattern of the ossification centers. When they are large (as in this case), or numerous, they may be associated with skeletal dysplasia, congenital anomalies or abnormalities of the central nervous system (Jeanty *et alii* 2000). However, we remain reserved in this regard, because there are no other indicators on the skeleton to confirm the presence of any skeletal dysplasia.

Health status. No tooth decay, plaque or other infectious processes, nor enamel defects were identified on this child's teeth. Especially the absence of the latter suggests the favorable conditions that his body had during the intrauterine period, perinatal period and in the first months of breastfeeding.

In the metaphyseal-diaphyseal area of the left humerus, with the X-ray investigation, we detected a rather rare pathology – an osteochondroma, which is a benign tumor consisting of cartilaginous tissue. It appears intraosseous (intramedullary), central, localization that fits it in the category of enchondromas. In more than 50% of cases, the osteochondromas are located on the long bones of the limbs, especially in the metaphyseal-diaphyseal region. Enchondromas have a malignancy potential of about 10-15%, transforming itself with aging in chondrosarcomas (Mereuță 2012, p. 27). In most cases, the enchondromas that develop in the fertile metaphysis of the long bones have a unilateral distribution, the same situation being valid also in this case. In the image taken from the radiographic film, at least two nodular areas of osteolysis can be observed, clear and homogeneous, as geodes, punctiform and intensely calcified, isolated from each other, with irregular but limited margins, with discrete trabeculation and with small opacities (**Fig. 4/5**). Probably this child was suffering from arm pains, accompanied by localized swelling. These, in time, would have led to pathological fractures, deformations and asymmetries of the humerus (due to growth disorders), implicitly to mechanical and functional dysfunctions.

Grave no. 5 (M5) / 2012

Archaeological data: inhumation grave, from which only the bones of the lower limbs were taken, the rest being left in the section of the archaeological trench. Located west of the other graves, the skeleton was oriented to the west and appears to have been laid on its back[6].

Representation degree and preservation state: incomplete skeleton, good state of preservation. The cranial segment is missing. From the postcranial segment there are only a few bones of the lower limbs, namely, the tibiae, the fibulae (fragmented) (**Fig. 5/1**), calcanei, taluses, three tarsals, six metatarsals, two phalanges, and a fragmentary rib.

Taphonomic observations. All cracks and ruptures that led to the fragmentation of certain skeletal elements are produced *postmortem*.

Biological age estimation. Because the teeth are missing from the osteological inventory, the biological age at the time of death was estimated only by the length of the long bones, integrable being only the tibiae. Measured without epiphyses, the lengths of the tibiae indicate a slight asymmetry: the right tibia has 164 mm and the left tibia has 162 mm. According to these values, the biological age ranges between 2.5 and 3.5 years (*infans I*/infants to children).

We also considered the stage of epiphyseal ossification to the diaphysis of the bones, which offers the same age range. Neither the calcanei nor the tali have the ossified epiphyses; the same situation applies to the proximal area of the metatarsals and phalanges. Sex is undeterminable.

Health status. X-ray investigations revealed the Harris lines – a non-specific marker of the physiological stress suffered in childhood. The growth arrest lines in this case are diffuse and hardly identifiable, present only on the tibiae (**Fig. 5/2**). They indicate the moments when bone growth stagnated and then restarted. Contrary to the case discussed above, when the lines were located only on one of the two fertile metaphyses of a certain bone, in this case they appear, even if very discreetly, on both metaphyses, both proximal and distal. Because no other indicators of nutrient deficiency appear on the tibiae and fibulae, and also, the skull is missing from the bone inventory, we suppose that in the 2-3 years of life, namely during breastfeeding and weaning, the body of this child went through a series of physiological crises, probably of short duration, which acted unfavorably on the bone growth. We can invoke malnutrition (avitaminosis), infectious diseases, parasites, maybe poisoning.

[6] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14.



Fig. 5. Călugăreni, M5/2012, subadult, 2.5-3.5 years old.
1. Tibiae and fibulae; 2. Tibiae, proximal metaphyseal area, Harris lines
Fig. 5. Călugăreni, M5/2012, subadult, 2,5-3,5 ani.
1. Tibiile şi peroneele; 2. Tibii, regiunea metafizară proximală, linii Harris

Grave no. 6? (M6?) / 2012

At the same depth as the graves in the west of trench S1, a hollow pit of a size similar to that for another subadult grave was discovered. It is possible that this pit belonged to a grave that was relocated for reasons that may be related to the construction of the church. The excavation level of the pit has not been identified[7].

Grave no. 7? (M7?) / 2012

Archaeological data. In the ground resulting from the unauthorized excavation of the new foundation, in the southwest corner of the wooden church, two fragments from a skull were discovered. These were noted M7[8].

Representation degree and preservation state: very poorly represented skeleton, good state of preservation. The two skull fragments are from the left temporal squama and the left parietal (**Fig. 6/1**).

Taphonomic observations. All cracks and ruptures that led to the fragmentation are produced *postmortem*.

Biological age estimation. The fragment from the parietal has an intact sagittal suture, which makes it measurable, at least in the suture area. The length of the *bregma-lambda* arch (130 mm) and the *bregma-lambda* chord (118 mm), and the thickness of the parietal bone (3.5 mm) lead us to estimate a biological age of 14-20 years (*juvenis*/adolescent). Sex is undeterminable.

[7] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14.
[8] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14.

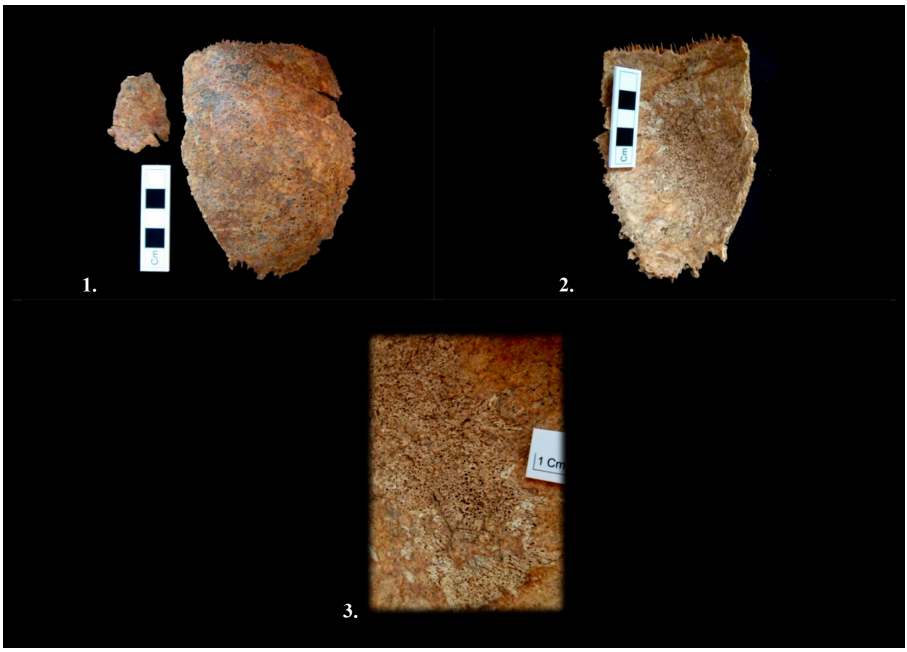


Fig. 6. Călugăreni, M7/2012, juvenile, 14-20 years old.
1. Cranial fragments; 2-3. Left parietal, *tabula interna ossis parietalis*, partially healed porous lesions
Fig. 6. Călugăreni, M7/2012, juvenil, 14-20 ani.
1. Fragmente craniene; 2-3. Parietalul stâng, *tabula interna ossis parietalis*, leziuni poroase parțial vindecate

Health status. The parietal fragment shows an extremely porous and corrosive lesion on the endocranial surface, with traces of partial healing (**Fig. 6/2-3**). The lesion has a trabecular punctiform appearance accompanied by vascular impressions; these are the results of an abnormal growth of bone tissue on the *tabula interna ossis parietalis*. The presence of the trabeculae proves that the remodeling process was active at the time the death occurred. The internal lesion has no correspondent on the external tabula, which excludes the possibility of trauma located on this bone. Probably there was a trauma to other components of the neurocranium, which are missing from the osteological inventory. The meninges certainly suffered an inflammation and hypervascularization before death, modifying the bone structure of the internal cranial tabula in the parietal fossa. Besides of trauma, there are many other causal factors of intracranial porosity, such as meningitis, chronic tumors, iron deficiency anemia, scurvy, rickets, disorders of the venous drainage, treponematosis, tuberculosis, metabolic disorders, endocrine dysplasia, and dystrophies (Lewis 2004; Sikanjic 2006).



Fig. 7. Călugăreni, M8/2018, subadult, approx. 1 month *postpartum*.
1. Frontal (bipartite); 2. Unerrupted dentition on the upper arch; 3. Mandible (bipartite)
Fig. 7. Călugăreni, M8/2018, subadult, circa 1 lună *postpartum*.
1. Frontal (bipartit); 2. Dentiție neeruptă de pe arcada superioară; 3. Mandibula (bipartită)

Grave no. 8 (M8) / 2018

Archaeological data: inhumation grave, with the skeleton lying on its back, slightly turned to the right, oriented towards the west, right arm bent at the elbow, legs slightly bent to the right[9].

Representation degree and preservation state: very well represented skeleton, almost complete; the preservation status is good.

Taphonomic observations. A fragment, which seems to come from the extremity of a long bone, has traces of oxidation, most likely from a metal object with which the bone came into contact. All cracks and ruptures that led to the fragmentation of certain skeletal elements are produced *postmortem*.

Biological age estimation. Both jaws were preserved. The deciduous teeth are in full formation, all the dental units being in the alveoli, uninterrupted. Some crowns are calcified (for example, incisors) (**Fig. 7/2-3**).

[9] Information kindly provided by archaeologist Raluca Kogălniceanu, head of preventive excavations at the wooden church from Călugăreni.

The length (30 mm) and the width (26 mm) of the scapulae and the length of the clavicle (35 mm) range within the biological age between 1-5 months. Measured without epiphyses, the length of the femora (68-70 mm), the tibiae (58-59 mm), the humeri (59-61 mm) and the radii (51 mm) indicate a biological age of about one month *postpartum*; as well the size of the arch (62 mm) and the chord (59 mm) of *nasion-bregma*.

Other considered dimensions were: maximum width (12.5 mm), sagittal length (12 mm), and maximum length (16.5 mm) of the *pars basilaris ossis occipitalis*, indicating an age of about 2-3 weeks *postpartum*. The appearance of the anterior rhomboid fontanel, of the frontal (bipartite) (**Fig. 7/1**) and the mandible (bipartite) (**Fig. 7/3**) were also considered.

According to all the criteria mentioned above, the biological age of this subadult at the time of death is approximately one month postpartum (*infans I*/infants). Sex is undeterminable.

Health status. No enamel defects are visible on the deciduous crowns (unerupted at the time of death). Their absence indicates that during the intrauterine interval the body of this fetus had all the necessary elements for the process of secretion and mineralization of the tooth enamel (amelogenesis).

Isolated human bones/2012

The bone remains analyzed in this section were discovered during the excavations executed in 2012, in the soil layer above the graves, at the depth between 0-0.60 m. They probably come from disturbed graves[10]. The analysis of these remains was performed according to the methodology recommended for the disturbed bones or bones discovered in the secondary context.

Infans I/infants-children (3-5 years old), undeterminable sex. Two fragments from the right humerus, one from the diaphysis and another from the distal metaphyseal area.

Infans I/infants-children (3-5 years old), undeterminable sex. A fragment from the diaphysis of a fibula.

Infans I/infants-children (3-5 years old), undeterminable sex. Two lumbar vertebral bodies.

Infans I/infants-children (3-5 years old), undeterminable sex. The arch of a thoracic vertebra.

Infans I/infants-children (3-5 years old), undeterminable sex. Three fragments from the diaphysis of a radius.

[10] Raport de cercetare arheologică preventivă Nr. 714/30.10.2012, p. 14.

Adultus/young adult (20-30 years old), undeterminable sex. A definitive lower premolar with *postmortem* fractured root. The occlusal surface has low wear.

Adult (over 20 years old), undeterminable sex. A thoracic vertebra with the fragmentary body.

Adult (over 20 years old), undeterminable sex. A fragment of a coxal.

Adult (over 20 years old), undeterminable sex. A fragment from the diaphysis of a tibia.

Adult (over 20 years old), undeterminable sex. A fragmentary cuboid.

Adult (over 20 years old), undeterminable sex. A fragmentary metatarsal.

Palaeodemographic and palaeopathological data

The skeletal series discovered during preventive archaeological researches in 2012 and 2018 in the cemetery related to the wooden church from Călugăreni (Giurgiu County, Romania), dated in the second half of the 18th century AD, is statistically unrepresentative. However, observations on bone remains, together with palaeodemographic data lead to interesting deductions in terms of health status, living conditions and morbidity of this small population group – a component of the local past community.

On the analyzed bone remains there were no reliable morphoscopic characteristics for the determination of sex, a valid situation for both the remains from adults, and especially for those of subadults. Regarding the age at death, the situation is different. For the analyzed skeletal series, the minimum number of individuals is nine: eight subadults (with biological age at the time of death ranging from first postnatal month to 20 years) and one adult (with the age of death more than 20 years). Six subadults died at ages ranged between one month and 7 years (*infans I*), only one at age ranged between 7-14 years (*infans II*), and another at age ranged between 14 and 20 years (*juvenis*). The six individuals with biological age at the time of death estimated in category *infans I* (0-7 years) passed the critical *postpartum* threshold (the minimum age at death estimated in this group was 1 month), but did not exceed the biological age of 7 years – the threshold between early and late childhood. From birth to 7 years of age, the body of the child undergoes essential biological changes: intense and continuous height and weight growth (including growth spurts), dental eruption, intense motoric development, physiological adaptation, diet modification, and many more. During this interval, in the first part, until the age of about 2 years, children go through the period of breastfeeding, which inevitably ends with weaning (ablactation). The timing of weaning is critical, because the fragile body of the "abandoned" baby enters withdrawal, becoming extremely sensitive to many pathogens. Commonly, high frequencies of stress indicators and growth deficit identified through skeletal

growth profiles in children between the ages of 2 and 4 years have been related to weaning stress (Lewis 2007).

The fact that six individuals went beyond the postpartum critical threshold lead us to assume that either the breastfeeding period or, rather, the moment of weaning was critical for some children to overcome. The infant's body depends on the qualities of the mother's milk to provide them the nutrients and immunological protection. Mother's milk is crucial for the child's health, growth and development (Krenz-Niedbala 2017). When the breastfed baby is undergoing a sudden dietary transition (and not gradual, as it should), the infantile body endures an extremely brutal physiological stress. The transition from an exclusively milk diet to one containing other foods is a particularly vulnerable time. Contamination and inadequacy of the complimentary food together with decreased immunological protection during this critical period may increase the risk of faltering growth and nutritional deficiencies (Fleischer Michaelsen *et alii* 2000; Krenz-Niedbala 2017). This situation was a common one in Medieval Europe, in the families from the middle and lower social layers. At weaning, at an average age of about 2 years, infants were switched directly from breast milk to the diet of other family members. Especially during this age period the food factor is very important, because the susceptibility to pathogens is very high. Sudden and aggressive change along with the high degree of contagiousness (due to poor hygiene) can produce real systemic "disasters" in the child's body. In fact, in a population, when the children are weaned, morbidity and infant mortality increase sharply, the primary cause being the high frequency of infectious and diarrheal diseases (Richards *et alii* 2002; Burt 2013).

In the last years, through the method of measuring the quantity of stable isotopes of nitrogen and carbon, the chronological interval of weaning of infants in past populations has been determined. In Europe, in the late medieval times, mothers breastfed their children until the age of about 2 years (in Britain – 12-17 months, in Florence – 12 months, in Rome – 14 months, in Brescia and Perugia – 18-24 months, in Poland – between 24-36 months). From a physiological perspective, the average age of 2 years is preferred, because most infants have at this age all the deciduous teeth on the arches, including the molars (the chewing area). The time of weaning, besides the cultural and social factors, is also linked to other factors, such as the sex of the baby (the girls were weaned atthe age of about 1 year, and the boys, at about 2 years), the state of health (the sick children and the twins were breastfed for a longer period, between 2 and 3 years), season (weaning is avoided during hot summer days), phase of the month, other circumstances directly related to the breastfeeding mother (Fildes 1995, p. 115; Richards *et alii* 2002; Żołądź-Strzelczyk, Krenz-Niedbala 2017; Burt 2013).

The structure of this small skeletal series from Călugăreni suggests that the population most likely had a high infant mortality rate, especially in the age range between 1 month and 5 years (which includes six of the eight analyzed subadults). We can go further, assuming that such infant mortality was caused by an extremely high rate of morbidity in this past community, which, in turn, can be determined, among many other factors, by the increase of population density. Infants, children, and adolescents seem to be the crucial age subgroups in a population to reconstruct past health and disease and to show the degree to which a population had successfully adapted to its environment (Goodman, Armelagos 1989; Buikstra and Ubelaker 1994; Mays 1999; Saunders 2000, Lewis 2002; Krenz-Niedbala 2017). Infant mortality is also an important indicator of health status, both of which are closely related to the living environment.

In this study the health status markers were identified in six individuals and are generally consequences of food deficiencies, infectious diseases or inflammatory processes. On the analyzed skeletons, complete or incomplete, were identified: exocranial porosities such as *cribra orbitalia* (three cases) and porotic hyperostosis/ *cribra cranii* (one case), Harris lines (three cases), dental cavities (one case), supragingival dental plaque (one case), and enchondroma (one case); also, we mention two cases of porosity on *tabula interna ossis parietalis*. In one case, intracranial porosity is accompanied by head trauma, which, however, did not represent the direct cause of death.

Because the exocranial porosities recorded a high frequency, it is useful for the reader to detail the importance of such prevalence. Exocranial porosity is the result of an abnormal growth of bone tissue on *tabula externa ossis cranii* and is caused by hyperplasia and hypertrophy. The exocranial porosities such as *cribra cranii* and *cribra orbitalia* are most frequently related to anemia, and particularly iron-deficiency anemia (Oxenham, Cavill 2010; Nowak *et alii* 2013). Other causes, such as inflammation, osteoporosis, and rickets have been shown to play a role in their etiology (Wapler *et alii* 2004), as the hemolytic and megaloblastic anemias or vitamin C and B12 deficiencies (Walker *et alii* 2009). The simple appearance of porosity on the external cranial layer itself can serve as a tool in assessing the health status and nutritional status of the past populations, being an indicator of the quality of life in a certain population. Exocranial porosities are possible, suggestive, indirect, non-specific indicators of living conditions in a past community, of chronic health problems and the possible dietary deficiencies suffered by the members of the population during childhood. As a result, they also become useful tools in the analysis of socioeconomic stratification. The porosities located on the *tabula externa ossis cranii* develop especially during early childhood (Piontek, Kozlowski 2002), being most commonly reported on skeletons of breastfed infants, whose diet

is sometimes qualitatively and/or quantitatively inadequate. Breastfed infants have an increased susceptibility to gastrointestinal diseases, especially diarrheal diseases, both during breastfeeding and especially during weaning. Exocranial porosities are less common in adolescents and much rarer in adults (Stuart-Macadam 1985; Mays 1998, p. 142-145).

In the absence of generalized porosities throughout the bone system, a valid situation also in the case of the skeletons analyzed in this study, it is correct to invoke sideropenic anemia as the first cause in the occurrence of exocranial porosity, *i.e.* the iron deficiency. Thus, we exclude the hereditary ferriprive anemia. Either active or healed exocranial porosity, especially *cribra orbitalia*, does not indicate that the individual died from iron-deficiency anemia, but rather than iron deficiency, in combination with other factors, may have contributed to poor health (Goodman, Martin 2002). Iron deficiency leads to the inefficiency of the immune system and, implicitly, increasing the risk of illness, especially with contagious diseases (bacterial, viral, fungal, parasitic). Iron deficiency is caused either by insufficient iron intake in the diet, or by malabsorption/non-metabolization of this element. The iron deficiency in the body of the breastfed baby can also be caused by the mother's iron deficiency, premature birth, even prolonged breastfeeding or the state of the baby's body at weaning. There is a direct correlation between acute gastrointestinal (diarrheal) or parasitic infections and the amount of iron; these are influencing each other. On the one hand, diarrheal gastrointestinal diseases "devour" iron reserves in the body, and on the other hand, iron deficiency predisposes the infant body, especially the one that is weaned suddenly, to infectious and parasitic diseases. Other diseases or deficiencies that can cause the development of porous lesions on *tabula externa ossis cranii* are scurvy (vitamin C deficiency), rickets (vitamin D deficiency), vitamin B12 deficiency, folic acid deficiency, osteitis, osteomyelitis, periostitis, infectious processes or their secondary dissemination in the area of the neurocranium (Ortner 2003, p. 102-107).

An increased incidence of exocranial porosity in a population, especially in children, may also reflect a certain mechanism of defense of the organism against the poor living conditions. In the child's body infected with viruses, bacteria or mycoses, a self-defense mechanism is activated, which consists in reducing the amount of iron in the blood, so that the iron-devouring microorganisms remain without nutritional reserves and reduce their vital potential (Stuart-Macadam 1992, p. 39-47). Such biological "adaptation" may have also occurred in the population of the subadults analyzed in this study.

In the skeletal series from Călugăreni, the cranial porosities are not associated with defects of the teeth enamel. Enamel hypoplasia is an indicator of the physiological stress suffered during the perinatal period and in the first 5-7 years

of life and implies the deficiency of elements necessary for amelogenesis, *i.e.* the formation and mineralization of the tooth enamel. Enamel defects develop in response to nutritional imbalances, infections, malnutrition, vitamin deficiencies, low birth weight, maternal health, immunodeficiency diseases, drug toxicities, general poor living conditions, low socioeconomic status, and almost any disease which severely stresses metabolism. Thus, the enamel defects are a nonspecific and highly sensitive indicator of physiological and metabolic changes (Cutress, Suckling 1982; Goodman, Rose 1990; Goodman, Martin 2002; Miszkiewicz 2015; Krenz-Niedbala 2017). The absence of hypoplastic defects on the deciduous teeth suggests that, in the age range in which the deciduous dental crowns are formed (last 2-3 prenatal months, perinatal and in the first 2-3 postnatal months), these children had all the necessary elements for the crown formation and calcification (calcium, phosphorus, carbonates, fluorine, magnesium, silicium). The health problems of these children began most likely during the period of intensive and perhaps exclusive maternal breastfeeding (3-12 months), worsening with the time of ablactation. The weaning probably did not take place gradually, but suddenly, the baby being switched from the mother's breast milk directly to the nutrition of the other members of the household – a common custom in medieval times in the families of the lower and middle social layers. By extrapolating, we could suppose that the feeding of the breastfeeding mother, implicitly her health, was not satisfactory, both being deeply dependent on the lifestyle, cultural factors and socioeconomic status.

Regarding the association of cranial porosity with the Harris lines, the situation is different from the one described above, these two markers being present in tandem in 2/9 cases. The Harris lines show the growth disruption and mark the chronological times when bone growth was restarted after it was stopped. On the radiographic images they appear transversely in the fertile metaphyseal areas of the long bones. This bone growth arrest occurs when the child's body does not have enough available nutrients. As the crisis passes, the bone begins to grow again, leaving behind linear evidence of stress. The main responsible factors are malnutrition, starvation, acute illness, septicemia, pneumonia, intoxications, poisoning, rickets, congenital syphilis, birth trauma, poor maternal health, gastrointestinal disease, parasitosis, avitaminosis (Jerszyńska, Nowak 1996; Piontek *et alii* 2001; Lewis 2007; Suter *et alii* 2008; Nowak, Piontek 2012; Krenz-Niedbala 2017). The presence of the growth arrest lines, especially in association with the exocranial porosities, suggests the existence of episodes of acute physiological stress in the population.

The intersutural additional ossicles (*Wormian* bones) are recorded in two cases. They are abnormalities of the normal fusion pattern of the ossification centers,

and their occurrence is controlled in some way by genetic factors and represents a variant of normality (El-Najjar, Dawson 1977, p. 155-160). Many authors find correlations between the *Wormian* bones and the congenital abnormalities or those of the central nervous system (Jeanty *et alii* 2000). Their associations were also reported with: acrogeria, chondrodysplasia, copper deficiency, rickets, pycnodysostosis, dysgenesis, osteogenesis imperfecta, progeria, hypothyroidism, trisomy 21 and many more (Waldron 2009, p. 134, 199, 201). All these diseases can induce the formation of several cranial ossification centers, which can lead to the appearance of additional ossicles. When the additional ossicles appear as a variant of normality in a population, they tend to be smaller and less numerous (as in the case of the subadult in M3). In contrast, when they are large (as is the case of the subadult in M4) or numerous, they may be associated with certain skeletal dysplasias (Jeanty *et alii* 2000).

Another interesting situation is that of the subadult with the biological age of about 2.5-3 years of M4, whose left humerus shows an enchondroma – a benign bone tumor. The enchondroma was not the cause of death, because it did not become malignant, but it certainly caused the child pain in the arm. If he had survived, his arm would probably have swollen over time, and then it would have fractured, deformed, becoming dysfunctional. In 10-15% of cases, the enchondromas become malignant, turning into chondrosarcomas.

Also important is the head trauma suffered by the subadult with biological age at the time of death of only 18-24 months (M3). The trauma, accidental or intentional, is located on the left parietal eminence and seems to be the result of a blow with a blunt object of elongated shape. Unexpected, but this trauma did not directly represent the cause of death. There was a post-traumatic interval, even if short-lived, in which the meninges hypervascularized and became inflamed, abundant epidural hematomas formed which led to changes in the areas of the parietal fossae. The structural changes occurring on *tabula interna ossis parietalis*, with clear evidence of remodeling, show us that the healing process was in full swing at the time of death. We assume that the subject survived the trauma and lived, probably in agony, for several weeks. In another train of thought, there are various causes of the endocranial new bone formation, including chronic meningitis, trauma, anemia, neoplastic diseases, scurvy, rickets, and tuberculosis (Lewis 2007).

Surely these subadults were exposed to harmful environmental and cultural factors. The analysis of skeletal indicators of health shows their relatively medium experience of stress events and nonspecific infections and their relatively low adaptability to their both natural and cultural environments. The presence and the increased severity of the exocranial porosity (three cases of *cribra orbitalia*

and one case of *cribra cranii*), next to the three cases of Harris lines, without excluding the cases of the enchondroma and endocranial new bone formation, even if indirectly, they represent evidence of the existence of health problems in the studied population, especially in the infants. This information gives us an episode of the medical and social history of a past population segment that lived in the second half of the 18th century under unfavorable living conditions, poor hygiene (implicitly infectious diseases and gastrointestinal diarrheal and parasitic diseases), quantitatively and qualitatively insufficient nutrition, cultural practices inadequate for the breastfed child's body during the full process of growth and development.

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