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SUBADULTNI STRES U KUMULATIVNOM UZORKU SREDNJOVJEKOVNE I NOVOVJEKOVNE DALMACIJE

SUBADULT STRESS IN A CUMULATIVE SAMPLE OF MEDIEVAL AND MODERN-ERA DALMATIA

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Dalmacija, subadultni stres, cribra orbitalia, hipoplazija zubne cakline, periostitis

U radu su prikazani rezultati antropološke analize srednjovjekovnog i novovjekovnog kumulativnog uzorka s područja Dalmacije. Analizirani su pokazatelji subadultnog stresa cribra orbitalia i hipoplazija zubne cakline te njihova međusobna korelacija, kao i korelacija s doživljenom dobi i pokazateljem nespecifičih zaraznih bolesti – periostitisom. Rezultati rada doprinose razumijevanju životnih uvjeta djece na arheološkim lokalitetima Dalmacije, te njihovoj usporedbi s uvjetima života djece u kontinentalnoj Hrvatskoj i okruženju. Analiza je pokazala nešto bolje životne uvjete u Dalmaciji nego u kontinentalnoj Hrvatskoj, no količina stresa kojoj su bila izložena djeca na obama uzorcima iznimno je visoka, a šansa za preživljavanje do odrasle dobi mala.

Key words:
Dalmatia, subadult stress, cribra orbitalia, dental enamel hypoplasia, periostitis

The paper presents the results of an anthropological analysis of a medieval and modern cumulative sample from the area of Dalmatia. The indicators of subadult stress cribra orbitalia and dental enamel hypoplasia (and their mutual correlation) were analysed, as well as their correlation with lifespan and with periostitis as an indicator of non-specific infectious diseases. The results of the work contribute to understanding of the historical living conditions of children at Dalmatia's archaeological sites, as well as to their comparison with the living conditions of children in continental Croatia and the wider region. The analysis showed slightly better living conditions in Dalmatia compared to continental Croatia, but in both samples the amount of stress to which the children were exposed was extremely high, and the chance of surviving to adulthood was low.

UVOD

Od druge polovice 20. stoljeća zanimanje bioarheologa i bioloških antropologa za životne uvjete i zdravlje djece na arheološkim lokalitetima kontinuirano se povećava. Pionir ovih istraživanja je Francis Johnstone[1] koji je proučavao rast i razvoj te smrtnost djece. S aspekta biološke antropologije djeca u arheologiji se proučavaju kroz prizmu rasta, paleopatologije i smrtnosti. Od patoloških promjena najviše se proučavaju tzv. pokazatelji subadultnog stresa (*cribra orbitalia (CO)* i hipoplazija zubne cakline (HZC)) koji su se pokazali kao najbolji indikatori zdravlja i količine stresa kojoj su izložena djeca tijekom rasta i razvoja, osobito ako se navedeni pokazatelji ne gledaju pojedinačno već kumulativno. Ovakva istraživanja na hrvatskim srednjovjekovnim i novovjekovnim lokalitetima nešto su rjeđa, odnosno postoji svega nekoliko radova o analizi subadultnog stresa, poput rada koji donosi podatke o populaciji s Dugopolja[2] (*cribra orbitalia*) te kumulativni uzorak kontinentalne Hrvatske[3] i sl. S druge strane, postoje brojni razlozi zašto je važno istraživati djecu u arheološkim populacijama. Zdravlje djece, njihova smrtnost kao i opći životni uvjeti iznimno su važni za razumijevanje zajednica u prošlosti koje uključuje poznavanje uloge žene u društvu, podjelu poslova u zajednici, zajedničku brigu o djeci i bolesnima, poznavanje medicinske skrbi i sl., kao i razumijevanje evolucijske antropologije. Za razliku od primata odgoj ljudske djece zahtijeva znatno veću količinu energije, odnosno znanja i sposobnosti čitave zajednice. Ljudska djeca rađaju se s najmanjim omjerom veličine mozga u odnosu na odraslu dob, također najmanje su pokretna i nezrela su te jedina zahtijevaju nošenje u rukama, što ih čini iznimno ranjivim i ovisnim.[4] Također, važno je naglasiti kako djeca (osobito ona najmanja) imaju ne-

[1] JOHNSTONE 1962: 249–254.
[2] NOVAK, ŠLAUS 2007: 451–475.
[3] NOVAK, ŠLAUS, PASARIĆ 2009: 247–270.
[4] HALCROW et al. 2020.

INTRODUCTION

Since the second half of the 20th century, the interest of bioarchaeologists and biological anthropologists in historical living conditions and health of children at archaeological sites has continuously grown. The pioneer of this research was Francis Johnstone,[1] who studied the growth and development as well as mortality of children. From the point of view of biological anthropology, in archaeology, children are studied through the prism of growth, paleopathology and mortality. The pathological changes most studied are the subadult stress indicators (*cribra orbitalia* (*CO*) and dental enamel hypoplasia (*DEH*) which have proved to be the best indicators of both children's health and the amount of stress to which they were exposed during growth and development, especially if these indicators are not viewed individually, but cumulatively. Such research at Croatia's medieval and modern-era sites is rather rare: there are only a few papers analysing subadult stress, such as a paper on *cribra orbitalia* in the Dugopolje population[2], and a continental Croatia cumulative sample[3]. Conversely, there are many reasons why it is important to research children in archaeological populations. The health of children, their mortality and general living conditions are extremely important to an understanding of communities in the past, including the role of women in society, the division of labour in a community, joint care of children and the sick, knowledge of medical care and the like, as well as the understanding of evolutionary anthropology. The reason for this is that the raising of human children, in comparison to those of other primates, requires a significantly greater amount of energy, including the knowledge and abilities of the entire community. Human children are born with the smallest ratio of brain size compared to that of adulthood. In addition, they are the least mobile and imma-

[1] JOHNSTONE: 1962, 249–254
[2] NOVAK, ŠLAUS 2007: 451–475.
[3] NOVAK, ŠLAUS, PASARIĆ 2009: 247–270.

razvijeni imunosni sustav koji zajedno s potrebom za brzim rastom i razvojem čini veliku ranjivost djece na okolišni stres. Upravo iz tog razloga pokazatelji subadultnog stresa direktno nas informiraju o količini okolišnog stresa ponajprije onog povezanog s nedostatnom i neadekvatnom hranom. Jer, iako pojedine zajednice mogu imati dovoljnu količinu hrane na raspolaganju, ta hrana često je bila, nutricionistički gledano, neadekvatna odnosno jednolična i s nezastupljenim svim nužnim nutrijentima. *Cribra orbitalia* jedan je od pokazatelja koji su usko povezani s nedostatkom željeza u krvi. Uzroci nedostatka željeza mogu biti mnogostruki, no najčešće su povezani s neadekvatnom prehranom, brojnim bolestima koje dovode do dijareje, poput zaraze parazitima gdje organizam eliminira željezo kao esencijalnu supstanciju za reproduktivni razvoj parazita ili drugih gastrointestinalnih infekcija i sl. S obzirom na višestruku etimologiju, *cribra orbitalia* uvijek se proučava s drugim čimbenicima, poput hipoplazije zubne cakline i sl., kako bi dala pouzdanije podatke. Hipoplazija zubne cakline, iako može biti povezana s traumama i nekim genetičkim čimbenicima, većinom je povezana s okolišnim stresom, poput izgladnjivanja, dugotrajne metaboličke bolesti, zarazne bolesti i sl. Cilj je ovog rada doprinijeti razumijevanju životnih uvjeta djece na arheološkim lokalitetima Dalmacije, te njihova usporedba s uvjetima života djece u kontinentalnoj Hrvatskoj i okruženju.

MATERIJAL I METODE

U ovom radu analiziran je koštani materijal s osam lokaliteta s područja Dalmacije, i to: Bijaći – Stombrate (9. – 10. st.), Svećurje – Žestinj (9. – 11. st.), Sv. Mihovil – Kučiće (12. – 14. st.), Koljani Gornji – Crkvina (14. st.), Kamen Most – Kaldrma (14. – 15. st.), Sv. Mavar – Žedno (13. – 17. st.), Dominikanski samostan sv. Katarine (16. – 19. st.) i Otok Vuletina rupa – Grebčine (17. – 18. st.) (tab. 1).

ture, being the only member of the species that needs to be carried. All this makes them extremely vulnerable and dependent.[4] It should also be emphasised that children (and especially infants) have an underdeveloped immune system. Combined with their rapid growth and development, this makes children highly vulnerable to environmental stress. This is why subadult stress indicators provide direct information regarding levels of environmental stress, primarily that associated with insufficient and inadequate food. Namely, even though certain communities may have had a satisfactory amount of food at their disposal, this was often inadequate in terms of its nutritional value, with a rather limited menu choice and lacking necessary nutrients. *Cribra orbitalia* is an indicator closely related to iron deficiency in blood. The causes of iron deficiency can be manifold: most frequently, they are associated with inadequate diet, as well as various diseases causing diarrhoea, such as infection with parasites (where the body eliminates iron as an essential substance for the reproductive development of parasites), or other gastrointestinal infections. Given its multiple etymology, *cribra orbitalia* is always studied in combination with other factors, such as dental enamel hypoplasia, in order to provide data which are more reliable. Although it can be related to trauma and some genetic factors, dental enamel hypoplasia is mostly associated with environmental stress such as starvation, long-term metabolic, and infectious disease. The aim of this paper is to contribute to the understanding of the historical living conditions of children at Dalmatia's archaeological sites and to their comparison with the living conditions of children in continental Croatia and the wider region at the time.

MATERIALS AND METHODS

In this paper, bone material from eight sites in Dalmatia is analysed, namely: Bijaći – Stom-

[4] HALCROW et al. 2020.

tablica 1. *Popis arheoloških lokaliteta s datacijom i veličinom uzorka*
table 1 *List of archaeological sites with datings and sample sizes*

Lokalitet / *Site*	**Datacija / *Dating***	**Veličina uzorka / *Sample size***
Bijaći – Stombrate	9. – 10. st. / *9th – 10th c.*	56
Svećurje – Žestinj	9. – 11. st. / *9th – 11th c.*	43
Sv. Mihovil – Kučiće	12. – 14. st. / *12th – 14th c.*	47
Koljani Gornji – Crkvina	14. st. / *14th c.*	55
Kamen Most – Kaldrma	14. – 15. st. / *14th – 15th c.*	31
Žedno – Sv. Mavar	13. – 17. st. / *13th – 17th c.*	9
Dominikanski samostan sv. Katarine u Splitu / *Dominican Monastery of Saint Katharine in Split*	16. – 19. st. / *16th – 19th c.*	83
Otok Vuletina rupa – Grebčine	17. – 18. st. / *17th – 18th c.*	44
UKUPNO / TOTAL	**9. – 19. st. / *9th – 19th c.***	**269**

Na lokalitetu Bijaći otkriveno je cjelovito groblje s 54 groba datirana u rani srednji vijek. Riječ je o tipičnom naseobinskom groblju na redove bez sakralnog objekta. Grobna arhitektura izrađena je većinom od kamena vapnenca u obliku nepravilnih ploča i tesanaca vezana glinom. Pokojnici su položeni na leđa, s pogledom prema istoku. Od nalaza najzastupljeniji je nakit, većinom obične karike i jednojagodne naušnice te malo importiranog nakita karantansko-ketlaške skupine i bizantskog podrijetla.[5]

Na lokalitetu Svećurje – Žestinj istraženo je groblje s 48 grobova. Riječ je o naseobinskom groblju na redove bez sakralnog objekta. Krajem 12. stoljeća gradi se crkvica 100-tinjak metara sjevernije i oko nje se formira novo groblje. Prevladavaju pojedinačni ukopi, pokojnici su položeni na leđa s ispruženim rukama u smjeru istok-zapad. Kod polovice grobova pronađeni su nalazi (većinom je riječ o nakitu). Od nakita prevladavaju različiti tipovi naušnica te prstenje, no posebno je zanimljiv nalaz dviju ogrlica. Jedna je rađena od staklene paste (grob 22), a druga (grob 32) od bikoničnih glatkih jagoda.[6]

Na lokalitetu Sv. Mihovil – Kučiće groblje je bilo u funkciji od kraja 12. do kraja 14. stoljebrate (9th – 10th c.), Svećurje – Žestinj (9th – 11th c.), Sveti Mihovil – Kučiće (12th – 14th c.), Koljani Gornji – Crkvina (14th c.), Kamen Most – Kaldrma (14th – 15th c.), Sveti Mavar – Žedno (13th – 17th c.), Dominican Monastery of Saint Katharine (16th – 19th c.) and Otok Vuletina Rupa – Grebčine (17th – 18th c.) (Table 1).

At the Bijaći site, a complete burial ground with 54 graves dated to the early Middle Ages was discovered. It is a typical settlement cemetery with burials in rows, and without a sacred structure. Grave structures are mostly made of irregular limestone slabs and hewn stones, bound with clay. The deceased were laid on their backs, facing east. The best represented find is jewellery, mostly ordinary circlets and single-beaded earrings, as well as some imports from the Carantanian-Köttlach group, and of Byzantine origin.[5]

A cemetery with 48 graves at the Svećurje – Žestinj site was excavated. It is a settlement cemetery with burials in rows, without a sacred structure. At the end of the 12th century, a small church was built about 100 metres to the north, and a new cemetery was formed around it. Burials are mostly individual. The deceased are laid on their backs with arms stretching in an east-west direction. Finds (mostly jewellery) were unearthed from half of the graves. Of the jewellery, different types of earrings and rings prevail, but

[5] KAMENJARIN 2009: 85–97.
[6] BURIĆ 2008.

[5] KAMENJARIN 2009: 85–97.

ća. Istraživanja je vodila arheologinja Vedrana Delonga i istražila je 57 grobova. Orijentacija grobova standardna je za to razdoblje, smjer istok-zapad, u starijem dijelu groblja pokojnici su položeni s rukama uz tijelo, dok su u mlađem dijelu groblja pokojnicima ruke prekrižene na području zdjelice. Dovoljno očuvanih koštanih ostataka s ovog lokaliteta je 47[7].

Koljani Gornji – Crkvina nalazi se u zaseoku Bodružićima, lokalitet je istraživala arheologinja Maja Petrinec (Muzej hrvatskih arheoloških spomenika) tijekom 2007. godine. Ukupno su istražena 52 groba (većinom je riječ o pojedinačnim ukopima uz iznimke dvojnog i višestrukog ukopa). Nije istraženo cijelo groblje koje se tijekom zime nalazi pod vodom. Na temelju nalaza naušnice s tri jagode, naroskane naušnice, karičice s koljencima, prstenja, te nalaza novca ispod zdjelice pokojnika u jednom od grobova (ukupno 9, svi iz sredine i druge polovice 14. stoljeća) grobovi se datiraju u kasni srednji vijek.[8]

Kamen Most – Kaldrma nalazi se pokraj Imotskog, 2008. godine provedeno je istraživanje ovog lokaliteta i tom prigodom istraženo je 25 grobova koji se datiraju u razdoblje 14. i 15. stoljeća. Manji dio grobova obzidan je kamenom arhitekturom, dok je većina pokojnika bila položena u grobnu raku. *In situ* je pronađen stećak s prikazom oranta raskriljenih ruku i nogu savijenih u koljenima. Grobovi su sadržavali po jednog ili više pokojnika orijentacije sjeverozapad-jugoistok. Grobna mjesta bila su označena nadzemnim biljezima, od kojih je sačuvan jedan stećak *in situ*, nad grobom 6. Riječ je o masivnom bloku domaćeg vapnenca oblikovanom kao kuća, s prikazom oranta raskriljenih ruku i nogu savijenih u koljenima. Za potrebe ovog rada u kumulativni uzorak uključen je 31 koštani ostatak koji je dovoljno očuvan.[9]

Žedno – Sv. Mavar, riječ je o malom groparticularly interesting is the find of two necklaces. One is made of glass paste (Grave 22), and the other (Grave 32) of biconical smooth beads.[6]

The cemetery at the Sveti Mihovil – Kučiće site was in operation from the late 12th to late 14th century. The excavation campaign, during which 57 graves were unearthed, was led by archaeologist Vedrana Delonga. The east-west orientation of graves is standard for the period. In the earlier part of the cemetery, the deceased were laid with their arms next to their bodies, while in the later part their hands were crossed above their pelvises. There are 47 bone remains from this site that have been sufficiently preserved[7].

The Koljani Gornji – Crkvina site, located in the hamlet of Bodružići, was excavated in 2007 by archaeologist Maja Petrinec (Museum of Croatian Archaeological Monuments). A total of 52 graves were excavated. Most of them are individual burials, with occasional double and multiple burials. The entire cemetery has not been thoroughly explored, as the site is under water through the winter. On the basis of the finds of a three-beaded earring, a loop-and-knot earring, a plaited circlet, finger-rings, and coins under the pelvis of the deceased in one of the nine unearthed graves (all from the mid- and late-14th century), the graves are dated to the late Middle Ages.[8]

Kamen Most – Kaldrma is located near the town of Imotski. The site was excavated in 2008, and unearthed in the campaign were 25 graves dated to the 14th and 15th centuries. A minority of graves had stone structures around them; however, most of the deceased had been laid in a pit. *In situ*, a medieval tombstone (*stećak*) was uncovered, with a depiction of an orant with outstretched arms, legs bent at the knees. The graves contained one or more deceased individuals, their bodies oriented northwest-southeast. The burial places had above-ground markers, of which the *stećak*

7 DELONGA 2000.
8 JURČEVIĆ 2008: 135–150.
9 GUDELJ 2010: 441–449.

6 BURIĆ 2008.
7 DELONGA 2000.
8 JURČEVIĆ 2008: 135–150.

blju koje se nalazi na otoku Čiovu, datira se od 13. do 17. stoljeća. Izgradnjom romaničke župne crkve sv. Mavra počinje se formirati i groblje oko nje, i to u dvjema fazama, jedna je suvremena samoj crkvi i pripada razvijenom srednjem vijeku, a gornji sloj nastaje u kasnom srednjem vijeku i početku novog vijeka.[10] S ovog lokaliteta ukupno je očuvano i uključeno u ovu studiju 9 osoba.

Tijekom 2007. i 2008. godine provedena su zaštitna istraživanja na lokalitetu Dominikanski samostan. Tom prigodom istražena je sonda 9, koja predstavlja kosturnicu s većim brojem kostura. Helga Zglav-Martinac dijeli lokalitet na dvije faze, na predsamostansko razdoblje i samostansko razdoblje. Predsamostansko razdoblje (do sredine 16. stoljeća) obilježava nalaz 16 kasnoantičkih grobova. Samostansko pak razdoblje dijeli na tri faze: vrijeme I. samostana (od sredine 13. do sredine 17. stoljeća) vrijeme II. samostana (od sredine 17. stoljeća) te treće razdoblje (od vremena francuske uprave krajem 18. stoljeća do 2005. godine). Na ovom groblju pokapani su članovi samostanske zajednice kao i članovi bratovštine povezane sa samostanom. Naime, 1533. godine osnovana je Bratovština sv. rozarija ili sv. krunica koja je s kraćim prekidima djelovala do nedavno u sklopu samostana. Riječ je o zajedničkim ukopima velikog broja osoba (više od 100), različitog uzrasta i spola.[11]

Muzej Cetinske krajine 2011. godine proveo je zaštitna arheološka istraživanja na lokalitetu Otok Vuletina rupa te je istraženo ukupno 45 grobova koji se datiraju u 17./18. stoljeće. Većina pokopa bila je pojedinačna, pokojnici su polagani u zemljanu raku bez kamene arhitekture na leđima i ispruženih ruku. Orijentacija grobova je sjeverozapad-jugoistok. U grobovima su otkriveni sljedeći arheološki nalazi: brončane i željezne igle, kopče i puce za odjeću i par polukružnih potkova za obuću. Prema pronađenim pokretnim nalazima koji su glav-

[10] BURIĆ 2000: 9–14.
[11] ZGLAV-MARTINAC 2011.

above Grave 6 has been preserved *in situ*. It is a massive block of local limestone, shaped like a house, with a depiction of an orant with arms outstretched and legs bent at the knees. For the purposes of this work, 31 substantially preserved bone remains have been included in the cumulative sample.[9]

Žedno – Saint Maurus, a small cemetery located on the island of Čiovo, is dated from the 13th to the 17th century. After the construction of the Romanesque Parish Church of St. Maurus, the cemetery began to form around it. It has two burial layers: the lower (contemporary with the church) originating from the high medieval period, and the upper, created in the late medieval period / early modern era.[10] From this site, the remains of nine deceased individuals have been preserved and included in the study.

In the course of 2007 and 2008, protective excavation campaigns were conducted at the Dominican Monastery site. On this occasion, Trial Trench 9 was excavated, revealing an ossuary containing a significant number of skeletons. Helga Zglav-Martinac divided the site into two phases: the pre-monastery period and the monastery period. The pre-monastery period (until the mid-16th century) is represented by the discovery of 16 late antique graves. The monastery period is divided into three stages: the 1st monastery period (from the mid-13th to mid-17th century); the 2nd monastery period (from the mid-17th century) and the 3rd period (from the time of the French administration at the end of the 18th century until 2005). Buried in this cemetery are members of the monastic community as well as members of the brotherhood associated with the monastery. In 1533, the Confraternity of the Holy Rosary was established, which, with short interruptions, was continuously active within the monastery until recently. These are joint burials of a large number of individuals (over 100) of different ages and both sexes.[11]

[9] GUDELJ 2010: 441–449.
[10] BURIĆ 2000: 9–14.
[11] ZGLAV-MARTINAC 2011.

ni oslonac datiranja, groblje možemo okvirno vremenski odrediti u novovjekovno razdoblje 17. i 18. stoljeća, tim više što su na grobovima otkriveni kameni vijenci izrađeni od sitnijeg neobrađenog kamenja postavljeni oko grobne rake te se mogu povezati sa stanovništvom doseljenim iz unutrašnjosti Bosne krajem 17. i u 18. stoljeću.[12]

Antropološka analiza koštanog materijala provedena je u Laboratoriju za biološku i forenzičku antropologiju Sveučilišta u Splitu. Koštani je materijal opran nad sitom laganim mlazom vode i mekanim četkicama te ostavljen na zraku minimalno 24 sata da se osuši. Nakon sušenja posložen je u anatomski položaj, opisan i izmjeren te je za svaki kostur određen biološki profil osobe. Biološki profil osobe uključuje procjenu spola, doživljene dobi u trenutku smrti, procjenu prosječne tjelesne visine, podrijetla osobe, te su bilježeni znakovi patoloških i traumatskih promjena i habitualnih radnji te uzrok smrti. Spol se utvrdio na temelju morfoloških i osteometrijskih pokazatelja. Od morfoloških pokazatelja promatrale su se prije svega karakteristike lubanje i zdjelice, ali i ostale postkranijalne kosti, osobito u situacijama kada lubanja i zdjelica nisu očuvane.[13] Spolni dimorfizam na lubanji očituje se u pogledu: veličine, gracilnosti, izgleda čeone kosti i nadočnih lukova, veličine mastoidnih nastavaka i izraženosti sulkusa, naglašenosti nuhalnih linija na zatiljnoj kosti, veličine i gracilnosti donje čeljusti, kutom koji zatvara tijelo i grana donje čeljusti i veličina zglobnih nastavaka.[14] Na zdjeličnim su kostima pregledane sljedeće značajke: veličina i širina velikog sjednog ureza, aurikularna zglobna ploha, acetabulum, duljina tijela preponske kosti, postojanje ventralnog grebena i subpubične konkavnosti, izgled donje grane preponske kosti te

[12] LIBRENJAK 2012.

[13] PHENICE 1969: 297–301; MEINDL et al. 1985: 79–85; KROGMAN, ISÇAN 1986.

[14] KROGMAN, ISÇAN 1986; BASS 1995: 200–206; ŠLAUS 2006; WHITE, BLACK, FOLKNES 2012.

In 2011, the Museum of Cetinska Krajina Region conducted archaeological rescue excavations at the Otok Vuletina Rupa site. A total of 45 graves dated to the 17th and 18th centuries were excavated. Most burials were individual. The deceased were laid on their backs with stretched arms, and buried in earthen pits without stone structures. The orientation of the graves is northwest-southeast. The following archaeological finds were unearthed from the graves: bronze and iron pins, buckles, a clothes button, and a pair of semi-circular heel-irons for shoes. The movable finds would suggest dating the cemetery to the post-medieval period of the 17th and 18th centuries, in particular since stone wreaths unearthed on the graves were made of smaller, unworked stones placed around them, which can be associated with the population that immigrated from the Bosnian interior at the end of the 17th and during the 18th century.[12]

An anthropological analysis of the bone material was conducted in the Forensic and Biological Anthropology Laboratory at the University of Split. The bone material was washed over a sieve with a light stream of water and soft brushes and left in the air to dry for a minimum of 24 hours. After drying, it was arranged in an anatomical position, described and measured. After the skeleton had been washed and dried, it was placed in the anatomical position, and for each skeleton, the individual's biological profile was determined. Such a profile includes an assessment of sex, age of death, average height, and origin; in addition, any signs of pathological and traumatic changes and habitual actions, and the cause of death are recorded. Sex was determined based on morphological and osteometric indicators. The first observed morphological indicators were skull and pelvic characteristics, but other postcranial bones were examined, especially in situations where the skull and pelvis had not been preserved.[13] Sexual dimorphism on the

[12] LIBRENJAK 2012.

[13] PHENICE 1969: 297–301; KROGMAN, ISÇAN 1986;

postojanje predaurikularnog sulkusa.[15] Procjena spola morfološkim metodama važan je dio svake antropološke analize, no zbog svojih nedostataka, prije svega subjektivnosti metode, rabe se i druge metode, poput osteometrijskih metoda od kojih se najviše ističe diskriminantna funkcijska analiza koja se pokazala najpouzdanija za određivanje spola odraslih osoba.[16] Biološka dob osobe određivala se na temelju stupnja rasta i razvoja kod djece (duljina dijafize dugih kostiju, stupnja sraštavanja epifiza i dijafiza, te nicanja mliječnih i trajnih zuba), dok se kod odraslih osoba većinom temelji na stupnju propadanja, poput promjena na zglobovima (artroza, osteoartritis, promjene na pubičnoj simfizi), istrošenosti zuba i zglobova i sl.[17] Dob kod odraslih osoba procijenjena je u rasponu od minimalno pet godina, dok je za djecu procjena spola zbog dinamičnih promjena davana u znatno kraćim rasponima, i to od svega nekoliko mjeseci.

Jedan od najvažnijih pokazatelja subadultnog stresa jest *cribra orbitalia* (CO). *Cribra orbitalia* očituje se manjim lezijama koje su smještene na krovu očnih orbita, najčešće na anterolateralnoj strani, i kod 90 % slučajeva su bilateralne. Makroskopski se definira kao pojava malih, rupičastih lezija na svodovima orbita koje mogu biti promjera manjeg od 1 mm do većih otvora koji se djelomično spajaju. Može biti u aktivnoj fazi (sl. 1) i fazi sanacije. U aktivnoj fazi pojavljuje se za vrijeme djetinjstva i očituje se novoformiranom šupljikavom kosti, dok se u odrasloj fazi može zateći samo u fazi sanacije, kada na istom mjestu (gornjim svodovima orbite) ostanu prisutne male udubine u istoj razini s okolnom kosti. Navedeni proces može se kod djece uočiti i na svodu lubanje, i to najčešće na tjemenim kostima i zatiljnoj kosti. Uzrok *cribrae orbitaliae* najčešće

skull is manifested in terms of size, gracility, appearance of the frontal bone and brow ridges, the size of the mastoid processes and the expression of the sulcus, the size of nuchal lines on the occipital bone, the size and gracility of the mandible, the gonible angle and the size of the articular processes.[14] The following pelvic bone features were examined: greater sciatic notch size and width, auricular articular surface, acetabulum, pubic bone body length, the presence of a ventral ridge and subpubic concavity, the appearance of the inferior ramus of the pubic bone, and the presence of the preauricular sulcus.[15] Sex estimation based on morphology is an important part of any anthropological analysis. However, it has its shortcomings: in the first place its subjectivity. As a result, other methods are also applied, including the osteometric approach, and in particular the discriminant function analysis, which proved to be the most reliable for determining the sex of adults.[16] Children's biological age is determined on the basis of growth, and development stage (long bone diaphysis length, epiphysis and diaphysis fusion stage, and primary and permanent teeth eruption), while in adults it is mostly based on the degree of deterioration, such as changes in the joints (arthrosis/osteoarthritis, alterations to the pubic symphysis), or wear and tear of teeth and joints.[17] The estimated age of adult individuals covers a span of at least five years, while the dynamic changes in children enabled their age estimation in significantly shorter spans, of only a few months.

One of the most significant indicators of subadult stress is *Cribra orbitalia* (CO). *Cribra orbitalia* is manifested in smaller lesions of the orbital

[15] ACSÁDI, NEMESKÉRI 1970; KROGMAN, ISÇAN 1986; WHITE, BLACK, FOLKNES 2012.

[16] ŠLAUS 1997: 167–175; ŠLAUS, TOMIČIĆ 2005: 147–152; VODANOVIĆ et al. 2006: 263–77; BAŠIĆ et al. 2013: 272–278; BAŠIĆ 2015.

[17] BASS 1995: 200–206; UBELAKER 1999: 52–60.

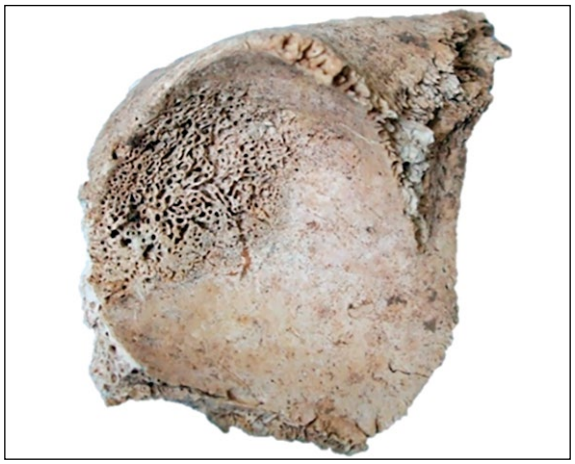
MEINDL et al. 1985: 79–85.

[14] KROGMAN, ISÇAN 1986; BASS 1995: 200–206; ŠLAUS 2006; WHITE, BLACK, FOLKNES 2012.

[15] ACSÁDI, NEMESKÉRI 1970; KROGMAN, ISÇAN 1986; WHITE, BLACK, FOLKNES 2012.

[16] ŠLAUS 1997: 167–175; ŠLAUS, TOMIČIĆ 2005: 147–152; VODANOVIĆ et al. 2006: 263–77; BAŠIĆ et al. 2013: 272–278; BAŠIĆ 2015.

[17] BASS 1995: 200–206; UBELAKER 1999: 52–60.



Slika 1. *Cribra orbitalia u aktivnoj fazi* (snimila: I. Kružić)
Figure 1 *Cribra orbitalia in its active stage* (photo by: I. Kružić)

se povezuje s anemijom uzrokovanom nedostatkom željeza,[18] do koje dolazi u povijesnim populacijama zbog parazita (odgovor organizma kojim smanjuje hemoglobin potreban za reprodukciju patogena),[19] zbog neadekvatne (jednolične) i nedostatne prehrane, trovanja olovom, kao i zbog niskog higijenskog standarda.[20]

Učestalost *cribrae orbitaliae* određivala se na način da se prvo bilježila očuvanost orbita, potom se bilježila pojavnost *cribrae orbitaliae* kao i faza u kojoj je (aktivna ili sanacija), po kriterijima koje su predložili Mittler i Van Gerven[21] te Mensforth i sur.[22]

Sljedeći pokazatelj subadultnog stresa povezan je s rastom, odnosno zastojem u rastu trajnih zuba. Riječ je o hipoplaziji zubne cakline koja je vidljiva u obliku vodoravnih linija nastalih zbog smanjenja debljine cakline, najčešće na bukalnoj i prednjoj strani zuba (sl. 2). Hipoplazija zubne cakline jest zastoj u rastu nastao u najvećoj mjeri kao posljedica metaboličkog stresa, dok se u manjem postotku pojavljuje kao posljedica traume ili zbog

[18] CARLSON, ARMELAGOS, VAN GERVEN 1974: 405–410; STUART-MACADAM 1985; 1991.
[19] HENGEN 1971: 57–75.
[20] MENSFORTH 1990: 81–99; ROBERTS, MANCHESTER 2007: 225–226.
[21] MITTLER, VAN GERVEN 1994: 287–297.
[22] MENSFORTH et al. 1978: 1–59.

roof, mostly its anterolateral part, and in 90 % of cases these are bilateral. It is identified macroscopically as the appearance of small, perforated orbital arch lesions (whose diameter can be smaller than 1 mm) to larger, partially merged apertures. It can be in the active stage (Fig. 1) or the healed stage. The active stage occurs during childhood and is manifested as newly formed porous bone, while in adults it is found only in the healed stage as small depressions in the supraorbital ridge, at the level of the surrounding bone. In children, the process can also be observed on the calvaria, most often on the parietal bones and the occipital bone. The cause of *cribra orbitalia* is most often associated with anaemia caused by iron deficiency[18] which occurs in historical populations due to parasites (the organism's response being to reduce the haemoglobin needed for pathogen reproduction)[19], inadequate (uniform) and insufficient nutrition, lead poisoning, as well as low hygiene standards.[20]

The frequency of *cribra orbitalia* was determined by first recording the orbit preservation grade and then the occurrence of *cribra orbitalia*, including its stage (active or healed), according to the criteria proposed by Mittler and Van Gerven[21] as well as Mensforth et al.[22]

The next indicator of subadult stress, related to permanent tooth growth or growth stop, is dental enamel hypoplasia, evident as linear horizontal defects caused by a reduction in enamel thickness, most frequently on the buccal and front sides of the teeth (Fig. 2). Dental enamel hypoplasia is a result of stunted growth as a result, primarily, of metabolic stress, and somewhat less frequently of trauma or genetic factors.[23] Various factors can slow down or com-

[18] CARLSON, ARMELAGOS, VAN GERVEN 1974: 405–410 STUART-MACADAM 1985; 1991.
[19] HENGEN 1971: 57–75.
[20] MENSFORT 1990: 81–99; ROBERTS, MANCHESTER 2007: 225–226.
[21] MITTLER, VAN GERVEN 1994: 287–297.
[22] MENSFORTH et al. 1978: 1–59.
[23] GOODMAN, ARMELAGOS, ROSE 1980: 515–528; PINDBORG 1982: 123–134; GOODMAN, ROSE 1991, 279–294.

genetskih čimbenika.[23] Razni faktori mogu usporiti ili potpuno zaustaviti proces mineralizacije cakline. Kako zubna caklina nema sposobnost remodeliranja, kao na primjer kost, tako će hipoplazija zubne cakline ostati vidljiva sve dok se zahvaćeni dio krune ne uništi abrazijom zuba. U arheološkim populacijama hipoplastični defekti najčešće su posljedica neadekvatne i nedovoljne prehrane, patoloških stanja i sugeriraju na stres i loše zdravstveno stanje kod djece. U uzorku je izrađen zubni karton za svaku osobu te je bilježena prisutnost hipoplazije zubne cakline.

Nespecifična zarazna bolest očituje se i pojavnošću periostitisa, no važno je razlikovati periostitis kao posljedicu nespecifične zarazne bolesti od periostitisa kao posljedicu fiziološkog stresa koji je čest kod djece, a nastaje zbog intenzivnog rasta kosti. Periostitis se očituje promjenama na periostu u obliku poroznosti i stvaranja nove šupljikave kosti. On može biti lokaliziran kada zahvaća samo jednu ili dio jedne kosti ili može biti sustavan kada zahvaća veći broj kostiju. U ovom istraživanju uključen je samo sistemski periostitis koji je najvjerojatnija posljedica nespecifične zaraze, kako bi se možebitnom korelacijom s pokazateljima subadultnog stresa dobio što bolji uvid u kvalitetu života djece.

Većina podataka dobivenih antropološkom analizom nema normalnu distribuciju, pa su za određivanje statističke značajnosti razlika dobivenih rezultata korištene neparametrijske metode. Razlike u prosječnim doživljenim starostima između muškaraca i žena te između uzoraka testirane su pomoću neparametrijskog Mann-Whitneyeva testa. Razlike u učestalosti pokazatelja subadultnog stresa između djece i odraslih te između muškaraca i žena testirane su pomoću hi-kvadrat testa, a u slučajevima kada je to bilo potrebno korištena je Yatesova korekcija. Korelacija između *cribrae orbitaliae*,

[23] GOODMAN, ARMELAGOS, ROSE 1980: 515–528; PINDBORG 1982: 123–134; GOODMAN, ROSE 1991: 279–294.

Slika 2. *Hipoplazija zubne cakline* (snimila: I. Kružić)
Figure 2 *Dental enamel hypoplasia* (photo by: I. Kružić)

pletely stop the enamel mineralisation process. Since dental enamel does not have the ability to remodel, as do bones, dental enamel hypoplasia remains visible until the affected part of the crown is destroyed by tooth abrasion. Hypoplastic defects in archaeological populations are most often the result of inadequate and insufficient nutrition, and of pathological conditions, suggesting stress and poor health in children. In the sample, a dental record was made for each individual, which also included dental enamel hypoplasia occurrence.

Among the consequences of non-specific infectious diseases is also periostitis, which is to be distinguished from periostitis resulting from physiological stress, commonly found in children following intensive bone growth. Periostitis is manifested in alterations in the periosteum such as porosity and periosteal new bone formation. If it affects only one bone or a bone part, it is called localised periostitis, and if it affects several bones, it is called systemic periostitis. In order to obtain the best possible insight into children's quality of life based on a possible correlation with indicators of subadult stress, this study included only systemic periostitis that was most likely the consequence of a non-specific infection.

Most of the data obtained through an anthropological analysis do not have a normal distribution. Hence, non-parametric methods were used to determine the statistical significance of the differences in the obtained results.

TABLICA 2. *Distribucija po spolu i dobi u kompozitnom uzorku*
TABLE 2 *Distribution by sex and age in the composite sample*

Starost u godinama / *Age in years*	**Djeca / *Children***	**Žene / *Women***	**Muškarci / *Men***
>60		10	15
55-59		3	11
50-54		10	10
45-49		7	16
40-44		8	37
35-39		8	15
30-34		13	19
25-29		5	10
20-24		9	5
15-19		10	4
10-14	15		
5-9	30		
2-5	48		
1-2	12		
0-1	51		
Ukupno osoba / *Total persons*	**156**	**83**	**142**
Prosječna starost / Average age	**3,94**	**37,22**	**40,83**

hipoplazije zubne cakline i periostitisa analizirana je pomoću Spearmanova testa. U svim statističkim izračunima i testovima korišten je statistički računalni program SPSS 10.0 for Windows.

REZULTATI

Ukupno je analizirana 381 osoba, 158 djece, 81 žena i 142 muškarca, što čini omjer od 1 : 0,51 : 0,90. Prosječna doživljena dob djece u kompozitnom uzorku iznosi 3,94 godine, prosječna doživljena dob žena je 37,22, dok je muškaraca 40,83, nema statistički značajne razlike u doživljenoj dobi između muškaraca i žena (χ^2 = 0,103; P = 0,75) Distribucija po dobi prikazana je u Tablici 2.

Učestalost i distribucija *cribra orbitalia* u kompozitnom uzorku južne Hrvatske prikazana je u Tablici 3.

O^1 = broj osoba s očuvanim čeonim kostima

Differences of average lived ages between men and women and among the samples were tested using the nonparametric Mann–Whitney *U* test. Differences in the frequency of subadult stress indicators between children and adults, and between men and women, were tested using the chi-squared test, and where necessary, Yates's correction for continuity was applied. The correlation between *cribra orbitalia*, dental enamel hypoplasia and periostitis was analysed using Spearman's correlation coefficient. All statistical calculations and tests were carried out with SPSS 10.0 for Windows software for advanced statistical analysis.

THE RESULTS

A total of 381 persons were analysed, of which 158 were children, 81 women and 142 men, which makes a ratio of 1 : 0.51 : 0.90. The average lived age of children in

tablica 3. *Učestalost i distribucija cribrae orbitaliae u kompozitnom uzorku južne Hrvatske*
table 3 *Cribra orbitalia frequency and distribution in the composite sample of southern Croatia*

Dob/spol ***Age/sex***		**CO u sanaciji** ***Healed CO***			
	O[1]	A1[2]	%	A2[3]	%
0-1	11	0	0	3	27,27
1-2	3	0	0	1	33,33
2-5	16	0	0	10	62,5
6-10	10	2	20	5	50
11-15	3	0	0	2	66,66
Djeca ukupno ***Children total***	43	2	4,65	21	48,84
Žene *Women*	39	6	7,69	0	0
Muškarci *Men*	61	12	19,67	0	0
Odrasli ukupno ***Adults total***	100	18	18	0	0

/ *number of persons with preserved frontal bones*

A1[2] = broj osoba s očuvanim čeonim kostima na kojima su vidljivi tragovi *cribrae orbitaliae* u fazi sanacije / *number of persons with preserved frontal bones, on which traces of cribra orbitalia in the healed stage are visible*

A2[3] = broj osoba s očuvanim čeonim kostima na kojima su vidljivi tragovi *cribrae orbitaliae* u aktivnoj fazi / *number of persons with preserved frontal bones, on which traces of cribra orbitalia in the healed stage are visible*

Kod odraslih osoba uočena je samo *cribra orbitalia* u fazi sanacije, i to u ukupnom postotku od 18 %, bez značajnije razlike između muškaraca i žena (χ^2 = 0,208; P = 0,649). Kod djece najvećim dijelom uočena je u aktivnoj fazi (48,84 %), dok je u fazi sanacije uočena samo kod 4,65 %. Postoji statistički značajna razlika između učestalosti *cribrae orbitaliae* kod djece i odraslih (χ^2 = 9,384; P = 0,002). Najniža učestalost *cribrae orbitaliae* uočena je kod najmanje djece do jedne godine života (27,27 %), potom u nešto veće djece do dvije godine 33,33 %, dok je u svim ostalim dobnim skupinama učestalost viša od 50 %. Uočena je pozitivna korelacija između prisutnosti *cribrae orbitaliae* i doživljene dobi. Prosječna the composite sample was 3.94 years, the average lived age of women was 37.22, while that of men was 40.83. Hence, there is no statistically significant difference between the lived age of men and women (χ^2=0.103; P=0.75). Distribution by age is shown in Table 2.

Cribra orbitalia frequency and distribution in the composite sample of southern Croatia is shown in Table 3.

In adults, only *cribra orbitalia* in the healed stage was observed, with a total percentage of 18 %, and without significant differences between men and women (χ^2=0.208; P=0.649). In children, it was mostly observed in the active stage (48.84 %), and in only 4.65 % in the healed stage. There is a statistically significant difference between the frequency of *cribra orbitalia* in children and adults (χ^2=9.384; P=0.002). The lowest frequency of *cribra orbitalia* was observed in infants up to one year of age (27.27 %), followed by toddlers up to 2 years (33.33 %), while in all other age groups the frequency was higher than 50 %. A positive correlation was observed between the presence of *cribra orbitalia* and lived age. The average age of death in individuals without *cri-*

TABLICA 4. *Učestalost i distribucija hipoplazije zubne cakline u kumulativnom uzorku južne Hrvatske*
TABLE 4 *Dental enamel hypoplasia frequency and distribution in the cumulative sample of southern Croatia*

Lokalitet / *Site*	**Stoljeće / *Century***	**Žene / *Women***			**Muškarci / *Men***			**UKUPNO / *TOTAL***	
		A^1	**A^2**	**%**	**A^1**	**A^2**	**%**	**A^1(ž+m)^1/A^2(ž+m)** ***A^1(f+m)^1/A^2(f+m)***	**%**
Bijaći – Stombrate	9. – 10.	56	0	0	68	2	2,91	124/2	1,61
Svećurje –Žestinj	9. – 11.	27	2	7,41	73	9	12,33	100/11	11
Rižinice	9. – 10.	12	0	0	8	0	0	20/0	0
Sv. Mihovil – Kučiće	12. – 14.	13	4	30,77	51	28	54,9	64/32	50
Koljani Gornji – Crkvina	14.	6	0	0	30	6	20	36/6	16,67
Kamen Most – Kaldrma	14. – 15.	24	0	0	56	0	0	80/0	0
Žedno – Sv. Mavar	13. – 17.	0	0	0	4	0	0	4/0	0
Dominikanski samostan sv. Katarine u Splitu *Dominican Monastery of Saint Katharine in Split*	16. – 19.	18	7	38,89	48	21	43,75	66/28	42,42
Otok Vuletina rupa – Grebčine	17. – 18.	42	0	0	179	12	6,7	221/12	5,43
Ukupno *Total*	9. – 19.	198	13	**6,5**7	517	78	**15,09**	715/91	**12,73**

A^1 = ukupni broj sjekutića i očnjaka / *total number of incisors and canines*
A^2 = broj sjekutića i očnjaka na kojim su vidljivi tragovi hipoplazije zubne cakline / *number of incisors and canines showing traces of dental enamel hypoplasia*

dob u trenutku smrti kod osoba bez *cribrae orbitaliae* viša je za 4,8 godina.

Učestalost i distribucija hipoplazije zubne cakline u kompozitnom uzorku južne Hrvatske prikazana je u Tablici 4. Ukupna učestalost hipoplazije zubne cakline kod odraslih osoba je 12,73 % (kod žena je 6,57 %, a kod muškaraca 15,09 %), postoji statistički značajna razlika između muškaraca i žena (χ^2 = 7,508.; P = 0,006).

Nije uočena pozitivna korelacija između doživljene dobi u trenutku smrti i pojavnosti hipoplazije zubne cakline. Također nije zabilježena značajnija korelacija između osoba koje imaju *cribru orbitaliu* i hipoplaziju zubne cakline (u većini slučajeva osoba ima samo jedan od navedenih pokazatelja subadultnog stresa).

bra orbitalia was 4.8 years higher.

Dental enamel hypoplasia frequency and distribution in the composite sample of southern Croatia is shown in Table 4. While the total frequency of dental enamel hypoplasia in adults is 12.73 % (6.57 % in women and 15.09 % in men), there is a statistically significant difference between men and women (χ^2=7.508; P=0.006).

No positive correlation was observed between the age of death and the incidence of dental enamel hypoplasia. Also, no significant correlation was recorded between individuals with *cribra orbitalia* and dental enamel hypoplasia (in most cases the individual had only one of the mentioned subadult stress indicators). On the other hand, in 38 % of individ-

S druge strane, kod 38 % osoba s *cribrae orbitaliae* uočeni su i znakovi aktivnog generaliziranog periostitisa.

RASPRAVA

Omjer djece, muškaraca i žena nije tipičan u analiziranom kumulativnom uzorku Dalmacije, odnosno žene su nešto podzastupljenije. Razlog takvoj distribuciji vjerojatno se krije u necijelovitoj istraženosti lokaliteta, jer bi očekivani omjer između muškaraca i žena trebao biti 1 : 1, dok se udio djece kreće od jedne do dvije trećine u uzorku.[24] Doživljena dob u trenutku smrti nešto je veća za muškarce (40,83 godine) u odnosu na žene (37,22 godine) vjerojatno kao posljedica visokog rizika kojem su žene izložene tijekom reproduktivnog razdoblja, ali vjerojatno i zbog položaja u društvu. Slična doživljena dob zabilježena je i u kumulativnom uzorku kontinentalne Hrvatske gdje muškarci prosječno dožive 37,2, a žene 33,6 godina, a kraći životni vijek žena zabilježen je na brojnim drugim arheološkim lokalitetima.[25]

Učestalost *cribrae orbitaliae* kod odraslih osoba je 18 %, dok je u kumulativnom uzorku kontinentalne Hrvatske *cribra orbitalia* uočena kod 23,1 % osoba. Kod djece je ukupna učestalost *cribrae orbitaliae* 48,84 %, dok je u kumulativnom uzorku kontinentalne Hrvatske ta učestalost nešto viša 60,8 %. Slične vrijednosti zabilježene su i na arheološkim lokalitetima u Europi, poput nalazišta Cedynia u Poljskoj gdje je ukupna pojavnost *cribrae orbitaliae* 31,4 %,[26] a na nalazištu Kaimas u Litvi rezultati su nešto sličniji Dalmaciji i iznose 19,9 %.[27] U kumulativnom uzorku nema značajne razlike između učestalosti *cribrae orbitaliae* kod muškaraca i žena, dok su, s druge strane, takve razlike pronađene u kuuals with *cribra orbitalia*, signs of generalised active periostitis were also observed.

DISCUSSION

The ratio of children, men and women in the analysed cumulative sample of Dalmatia is not typical: women are slightly under-represented. Such distribution is probably due to incomplete site excavations, because the expected ratio between men and women is usually 1 : 1, while the share of children in the sample ranges from one to two thirds.[24] Age at death is slightly higher in men (40.83 years) compared to women (37.22 years), probably as a consequence of women's high exposure risk during the reproductive period, but probably also due to their position in society. A similar lived age has also been recorded in the cumulative sample of continental Croatia, where men's average lived age was 37.2, and women's 33.6; a shorter life span in women has been recorded at numerous other archaeological sites[25].

Cribra orbitalia frequency in adults is 18 %, while in the cumulative sample of continental Croatia *cribra orbitalia* was observed in 23.1 % of the population. In children, total *cribra orbitalia* frequency is 48.84 %, while in the cumulative sample of continental Croatia, it is somewhat higher, at 60.8 %. Similar values have been recorded at other archaeological sites in Europe such as the Cedynia site in Poland, where *cribra orbitalia* total incidence is 31.4 %[26], while the results at the Kaimas site in Lithuania are rather more similar to those in Dalmatia and amount to 19.9 %.[27] In the cumulative sample, there are no significant differences between *cribra orbitalia* frequency in men and women, while on the other hand such differences were indeed found in the cu-

[24] ŠLAUS 2002: 41; ŠLAUS 2006.
[25] ANGEL 1968: 258–263; BOLDSEN 2000: 233–244; ŠLAUS 2002; NOVAK, ŠLAUS, PASARIĆ 2007: 330.
[26] JERSZYŃSKA 1991: 106; PIONTEK et al. 2001: 175, T. 3.
[27] JANKAUSKAS 1995: 34–45.

[24] ŠLAUS 2002: 41; ŠLAUS 2006.
[25] ANGEL 1968: 258–263; BOLDSEN 2000: 233–244; ŠLAUS 2002; NOVAK, ŠLAUS, PASARIĆ 2007: 330.
[26] JERSZYŃSKA 1991:106; PIONTEK et al. 2001: 175, T. 3.
[27] JANKAUSKAS 1995: 34–45.

mulativnom uzorku kontinentalne Hrvatske.[28] Visoka učestalost *cribrae orbitaliae* kod djece je zabilježena ne samo u Hrvatskoj već i diljem Europe gdje se vrijednosti kreću od 32 % u Litvi (Kaimas) do 63 % u Poljskoj (Cedynia).[29] Najmanja djeca (do 1 godine) imaju najnižu stopu učestalosti *cribrae orbitaliae* što je i očekivano jer tijekom intrauterinog razvoja dijete akumulira dovoljnu razinu željeza, koja mu bude dostatna za prve mjesece života (do pola godine). No ako se dijete, odnosno majka ne hrani adekvatno, vrlo se brzo može pojaviti problem nedostatka željeza. Veliko pogoršanje u prehrani djece nastupa pri prestanku dojenja koje se obično događa između 2. i 5. godine djetetova života, kad se djeca u potpunosti oslanjaju na redovnu prehranu zajednice koja najčešće nije zadovoljavajuća u pogledu količine i u pogledu kakvoće. Majke su djecu pokušavale dojiti što duže jer su im na taj način osiguravale bolju količinu nutrijenata i mikronutrijenata, no zbog čestih trudnoća morale su prestajati. Prestanak dojenja predstavljao je opasnost od parazitskih i zaraznih bolesti, jer su umjesto sterilnog majčina mlijeka djeca počinjala jesti i piti vodu upitne zdravstvene vrijednosti, te su često obolijevala od raznih zaraznih bolesti koje se manifestiraju dijarejom, koja pak smanjuje apetit i doprinosi smanjenju željeza.[30] Upravo u tom razdoblju učestalost *cribrae orbitaliae* iznimno je visoka, više od 60 %, a riječ o aktivnoj *cribrae orbitaliae*, odnosno anemiji koju, a možda i zbog koje, djeca nisu uspjela preboljeti druge bolesti. Rizik neadekvatne prehrane nastavljao se i u sljedeća razdoblja djetinstva, te je zabilježen najveći postotak aktivne *cribrae orbitaliae* kod djece starosti između 11 i15 godina. U kumulativnom uzorku Dalmacije on iznosi 66,7 %, dok u kumulativnom uzorku kontinentalne Hrvatske on iznosi 60 %.[31] Ovaj podatak ne

[28] NOVAK, ŠLAUS, PASARIĆ 2009: 261.
[29] JERSZYŃSKA 1991: 106.
[30] ROWLAND, ROWLAND 1986: 115–119; ROWLAND, ROWLAND, COLE 1988: 134–138.
[31] NOVAK, ŠLAUS, PASARIĆ 2009: 262.

mulative sample of continental Croatia.[28] A high frequency of *cribra orbitalia* in children has been recorded not only in Croatia but also throughout Europe, where values range from 32 % in Lithuania (Kaimas) to 63 % in Poland (Cedynia).[29] Infants (up to 1 year) have the lowest *cribra orbitalia* frequency, which is expected, as during intrauterine development the child accumulates a level of iron sufficient for the first months of life (up to half a year). However, malnutrition in a child (or its mother) can very quickly lead to iron deficiency. A major deterioration in children's nutrition would occur at the cessation of breastfeeding, which usually happened between the ages of 2 and 5, as the children thereafter relied entirely on their community's regular diet, which was usually unsatisfactory both in terms of quantity and quality. Mothers tried to breastfeed their children for as long as possible, because in that way they provided them with a better amount of nutrients and micronutrients, but subsequent (and frequent) pregnancies brought this to a stop. The interruption then presented the risk of parasitic and infectious diseases because, instead of sterile mother's milk, the children began to eat foods and drink water of questionable health value and often fell ill with various infectious diseases manifested in diarrhoea, which in turn reduced appetite and contributed to iron depletion.[30] It is during this period that *cribra orbitalia* frequency was extremely high: more than 60 %. What is more, it was active *cribra orbitalia*, or unhealed anaemia, as a result of which the children presumably did not manage to overcome other diseases. The risk of inadequate nutrition continued into later childhood periods; hence, the highest percentage of active *cribra orbitalia* has been recorded in children aged 11–15 years. In the cumulative sample of Dalmatia it amounts to 66.7 %, and

[28] NOVAK, ŠLAUS, PASARIĆ 2009: 261.
[29] JERSZYŃSKA 1991:106.
[30] ROWLAND, ROWLAND 1986: 115–119; ROWLAND, ROWLAND, COLE 1988: 134–138.

iznenađuje jer djeca u pubertetu doživljavaju snažan rast i razvoj, također gotovo ravnopravno počinju kroz težak rad doprinositi zajednici, a s druge strane njihov društveni položaj i dalje je pri dnu, pa pri podjeli hrane zasigurno ne dobivaju najbolje dijelove. Ovako visoke vrijednosti učestalosti *cribrae orbitaliae* kod djece u odnosu na odrasle osobe zabilježene su i na drugim nalazištima.[32] Kao i u uzorku kontinentalne Hrvatske, i u kumulativnom uzorku Dalmacije uočena je značajna korelacija između doživljene dobi i prisutnosti *cribrae orbitaliae* (uključujući fazu sanacije i aktivnu fazu). Nedostatak željeza utječe na opće stanje organizma, dovodi do smanjene radne sposobnosti, kao i do manje otpornosti organizma, stoga ne iznenađuje da osobe s aktivnom ili zaraslom *cribrae orbitaliae* žive kraće.

S druge strane, kada se sagledaju podatci povezani s pojavnosti hipoplazije zubne cakline, vidljivo je kako se u Dalmaciji navedeni pokazatelj pojavljuje nešto rjeđe, odnosno u kumulativnom uzorku Dalmacije pojavljuje se kod 12,75 % odraslih, dok se u kumulativnom uzorku kontinentalne Hrvatske pojavljuje kod 44,6% osoba. Na arheološkim lokalitetima u Poljskoj hipoplazija zubne cakline pojavljuje se u rasponu od 9,4 %[33] do 35,1 % na nalazištu Dolní Věstonice u Češkoj.[34] Visoke vrijednosti hipoplazije zubne cakline pojavljuju se kod sjedilačkih populacija koje orijentiraju svoju prehranu na biljnom podrijetlu, nasuprot zajednicama koje se pretežito bave lovom. Za razliku od *cribrae orbitaliae* hipoplazija zubne cakline nije utjecala na ukupnu doživljenu starost. Iako neki autori uočavaju povezanost hipoplazije zubne cakline i *cribrae orbitaliae*, u kompozitnom uzorku Dalmacije ona nije uočena kao ni u onom kontinentalne Hrvatske.[35] S druge strane, uočena je snažna korelacija između učestalosti

[32] CYBULSKI 1977: 31–41; STUART-MACADAM, 1985; ROBLEDO et al. 1995: 188; NOVAK, ŠLAUS 2007: 457.
[33] WOŹNIAK et al. 2005.
[34] JAROŠOVÁ 2006: 302–312.
[35] NOVAK, ŠLAUS, PASARIĆ 2009: 265.

in the cumulative sample of continental Croatia, 60 %.[31] This data is not surprising, given that children experienced strong growth and development during puberty, also beginning to contribute to the community through hard work almost equal to that of adults, while on the other hand their social position was still low-status, so when food was distributed, they certainly did not get the best share. Such high values of *cribra orbitalia* frequency in children compared to adults have also been recorded at other sites.[32] As in the sample of continental Croatia and in the cumulative sample of Dalmatia, a significant correlation was observed between lived age and the occurrence of *cribra orbitalia* (including both the healed and the active stages). Lack of iron affects the general condition of the organism, leading to reduced work capacity, as well as a weaker immune system. Therefore, it comes as no surprise that individuals with active or healed *cribra orbitalia* lived shorter lives.

On the other hand, when the data related to the incidence of dental enamel hypoplasia is examined, it is evident that in Dalmatia the mentioned indicator appears somewhat less often: in the cumulative sample of Dalmatia it appears in 12.75 % of adults, while in the cumulative sample of continental Croatia it appears in 44.6 % of individuals. At other European archaeological sites, dental enamel hypoplasia occurs in a range from 9.4 % in Poland[33] to 35.1 % at the Dolní Věstonice site in the Czech Republic.[34] High values of dental enamel hypoplasia appear in sedentary populations that orient their diet on foods of plant origin, as opposed to communities that are predominantly engaged in hunting. In contrast to *cribra orbitalia*, dental enamel hypoplasia did not affect total lived age. Although some authors have observed a connection be-

[31] NOVAK, ŠLAUS, PASARIĆ 2009: 262.
[32] CYBULSKI 1977: 31–41; STUART-MACADAM, 1985; ROBLEDO et al. 1995: 188; NOVAK, ŠLAUS 2007: 457.
[33] WOŹNIAK et al. 2005.
[34] JAROŠOVÁ 2006: 302-312.

cribrae orbitaliae i periostitisa, te osobito kod djece sugerira na visoki stupanj pothranjenosti. Ovakvi podatci dobiveni su i kod drugih autora.[36] Ukupno gledajući, navedeni podatci upućuju na iznimno teške uvjete života djece i njihove male izglede da dožive odraslu dob. Uspoređujući ih s podatcima dobivenim za kumulativni uzorak kontinentalne Hrvatske, može se zaključiti da su životni uvjeti djece u srednjovjekovnoj i novovjekovnoj Dalmaciji bili nešto bolji od uvjeta u kontinentalnoj Hrvatskoj. No djeca su i u Dalmaciji kao i u kontinentalnoj Hrvatskoj, ali i diljem Europe u ovim razdobljima doživljavala znatni stres uzrokovan niskim životnim standardom, lošim higijenskim i zdravstvenim uvjetima. Proučavanje srednjovjekovnog i novovjekovnog kompozitnog uzorka u Dalmaciji potrebno je proširiti i na cijelu istočnu obalu Jadrana kako bi se dobila jasnija slika životnih uvjeta, što je osobito važno za ove populacije koje nemaju ostavljenih pisanih podataka o životu zajednice.

[36] LALLO, ARMELAGOS, MENSFORTH 1977; MENSFORTH et al. 1978: 1–59; LARSEN, HUTCHINSON 1992.

tween dental enamel hypoplasia and *cribra oritalia*, it was neither observed in the composite sample of Dalmatia, nor in that of continental Croatia.[35] On the other hand, a strong correlation was observed between *cribra orbitalia* frequency and periostitis, suggesting a high degree of malnutrition especially in children. The same findings have also been made by other authors.[36] On the whole, the mentioned data suggest extremely difficult living conditions among children and the statistically low chance of them reaching adulthood. A comparison with the data obtained for the cumulative sample of continental Croatia suggests that the living conditions of children in medieval and modern era Dalmatia were somewhat better than those in continental Croatia. However, in these periods, children in both Dalmatia and continental Croatia (and throughout Europe) experienced significant stress caused by low living standards, and poor hygiene and health conditions. The study of the medieval and modern era composite sample in Dalmatia should be extended to the entire eastern Adriatic coast to get a clearer picture of the living conditions, which is particularly important for these populations who have no written information on the life of the community.

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[35] NOVAK, ŠLAUS, PASARIĆ 2009: 265.

[36] LALLO, ARMELAGOS, MENSFORTH 1977; MENSFORTH et al. 1978: 1–59; LARSEN, HUTCHINSON 1992.

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