

State of health, medicine and diet on the opposite sides of the Gulf of Corinth (Greece) in the Bronze Age

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This paper presents an overview and the subsequent comparison of population health status, medicine (and medical knowledge) and diet in the Bronze Age in the regions to the north and south of the Gulf of Corinth, Greece. The main sources for this study are the published reports on the preserved human skeletal remains, which can tell us a lot about the actual individuals and their life histories. Unfortunately, from the regions to the north of the Gulf of Corinth, only 3 human skeletal assemblages were processed anthropologically and published. These include 59 individuals from 3 sites in total – 20 subadults and 32 adults (7 males and 9 females). From the southern – Peloponnesian – side of the Gulf of Corinth, the preserved human skeletal material has been processed and published from 9 sites altogether. The stable isotopic analyses of nitrate and carbon for the discerning of the prevailing diet of the population were performed for 6 sites. The skeletal assemblage from these southern regions includes in total 1246 individuals (94 subadults and 629 adults (of which there are 307 males and 203 females)). Of special importance is the existence of 4 cases of trepanations – in Agia Triada, Achaia Klauus, Kirrha and Laganidia Kallithea – on both sides of the Gulf. All were successful, with clear signs of healing along the edge of the trepanation opening. The occurrence of this complicated and sophisticated surgical intervention gives evidence of the presence or availability of a sufficiently skilled physician and of personnel willing to look after the patient.

Keywords: human skeletal remains; palaeopathology; state of health; diet; Bronze Age; Greece; Gulf of Corinth

I. Introduction

This paper, which is based on the conference poster,¹ presents an overview of population health status, medicine and diet in the Bronze Age² in the regions to

¹ A poster on a similar topic was presented at the international conference “Archaeology of the Ionian Sea: Landscapes, seascapes and the circulation of people, goods and ideas (Palaeolithic – Bronze Age)”, 10th–11th January 2020 in Athens.

² Bronze Age culture in mainland Greece, c. 3000–1100/1050 BC, is labelled “Helladic” and divided into three main period: Early Helladic (EH), Middle Helladic (MH) and Late Helladic (LH; also known as “Mycenaean”).

the north and south of the Gulf of Corinth. The main sources for this study are the published reports on the preserved human skeletal remains, which can tell us a lot about the actual individuals and their life histories.³ The amount of data, which can be read from them, (i.e. the physical-anthropological, palaeodemographic and palaeopathological characteristics of the population), depend, however, on the state of preservation of the skeletal remains, reflecting a wide range of different factors (in particular the kind and details of a funeral rite and a type of grave, soil acidity and natural taphonomic processes).

This paper aims to present a regional synthesis summarizing the health and dietary characteristics of the Bronze Age populations buried in several necropoleis and the subsequent comparison of the state of health in those two main selected regions, with some reflections regarding the medical knowledge. First, the overview of the state of health and basic demographic indicators in both regions in question is presented (including a survey of prevailing diet, if applicable). Then an interregional comparison and analyses are performed and conclusions formulated.

II. Regions to the north of the Gulf of Corinth (Phocis and Thesprotia)

Unfortunately, from the regions to the north of the Gulf of Corinth, only 3 skeletal assemblages were processed anthropologically (at least in the preliminary way) and published – Goutsoura in Thesprotia and Kirrha and Kastrouli-Desfina in Phocis. No human skeletal assemblage has been published yet of other regions to the north of the Corinthian Gulf and in the Ionian Archipelago area (e.g., in Aetolo-Akarnania,

³ See e.g., Parker Pearson 1999; Bahn (ed.) 2002; Waldron 2008; Mays 2010; Roberts – Manchester 2010; Aufderheide – Rodríguez-Martín 2011. It is possible to find out a wide range of pathologies from human remains with the use of palaeopathological methods, but only those, which leave traces on bones, or on teeth respectively. Unfortunately, in the preserved skeletal remains it is neither possible to find out, for example, some serious illnesses of the circulatory system, nor injuries of soft tissues. Generally, it is possible to observe on bones, for example, congenital disorders, traumas, infectious diseases, tumours, metabolic, endocrine and other osteopathies, musculoskeletal markers of physical load, signs of degenerative disorders (above all arthrotic changes) and signs of physiological stress, reflecting anaemia and various episodes of malnutrition etc. Concerning dental pathologies, dental carries and calculus are the most frequent, dental enamel hypoplasia, periapical abscesses, and periodontitis (or paradontosis) are usually less common.

Preveza or the western coast of Boeotia). This state clearly reflects the state of osteoarchaeological research in this part of Greece.

Kirrho was an important coastal settlement and is mostly known as the port of the famous panhellenic sanctuary of Apollo at Delphi in the historic (Archaic to Roman) periods. The prehistoric remains of a settlement and cemetery were found in the centre of the modern town (formerly known as Xeropigado).⁴ The site of Goutsoura is situated on the Liminari Hill near Sevasto and was found by The Thesprotia Expedition, under the auspices of the Finnish Institute at Athens. It is an Early to Late Bronze age settlement with cemetery.⁵ Only a preliminary study of the excavated skeletal remains was performed.⁶ Kastrouli-Desfina is a large Mycenaean (LH IIIA2–IIIC early) fortified citadel.⁷ During the recent research, a few chamber tombs with preserved skeletal remains were also excavated.⁸

The earliest skeletal assemblage, which dates to MH II–III (to LH) periods, comes from **Kirrho** in Phocis.⁹ Only the human remains from 5 tombs (MNI=14)¹⁰ have been published so far – 6 subadults and 2 adults. The skull of 1 subadult individual (4–5 years) bears traces of cribra orbitalia and his long bones show sc. Harris lines (both are a mark of physiological stress). One adult individual (35–45 years) shows degenerative changes on his spine and two dental pathologies – carious lesions on several teeth, some of his teeth were also lost ante mortem. In the skull – on the right parietal bone – of a 30–35-year-old male (from MH period) a small ellipsoid trepanation opening (8 x 7.5 mm) is visible, made by the scraping technique, presumably using a metal instrument. The edges of the trepanation show clear signs of a complete healing.

Goutsoura in Thesprotia is the northernmost site of these three. This anthropological set dates to the (Middle to) Late Bronze Age and contains the skeletal remains of at least 12 subadults and 15 adults (5 males and 8 females; MNI=28).¹¹ It was only preliminarily published, and no skeletal pathologies were mentioned. Regarding dental pathologies, only caries and (mostly strong) dental

⁴ See e.g., Dor et al. 1960.

⁵ Forsén et al. (eds.) 2016, 121–44, 157–244.

⁶ Niskanen 2016.

⁷ See e.g., Sideris et al. 2017; Southern Phokis Regional Project Web: <https://kastrouli.wordpress.com/>

⁸ Chovalopoulou et al. 2017.

⁹ Manolis et al. 1994; Zurbach et al. 2012–13; Papagrigrakis et al. 2014; Lagia et al. 2016.

¹⁰ MNI = minimum number of individuals.

¹¹ Niskanen 2016.

wear were recorded in the remains of a few individuals. The height of several males was calculated as 158.2 to 163.6 cm and of females as 143 to 158.06 cm.

The anthropological set from **Kastrouli-Desfina** (in Phocis) is, unfortunately, very fragmentary.¹² It dates from LH IIIA2–IIIC Early/Advanced and consists of the remains of 2 subadults (1 child younger than 11 years and a 1 foetus) and 15 adults (2 males and 1 female; MNI=17). Only Schmorl nodes were noticed from the skeletal pathologies on several vertebrae (mainly on thoracic ones), which is a degenerative condition of the spine. Regarding the dental pathologies, caries, periodontitis, and dental wear were documented.

III. Regions to the south of the Gulf of Corinth

From the southern – Peloponnesian – side of the Gulf of Corinth (the regions of Corinthia, Achaea and Ilia), the preserved human skeletal material has been processed and published from 9 sites in total. Stable isotopic analyses of nitrate (¹⁴N and ¹⁵N) and carbon (¹²C and ¹³C) for the discerning of the prevailing diet of the population were performed for 6 sites.¹³

These 12 sites (as stable isotopic analyses were performed in three sites together with the basic anthropological analyses) are of different kind. There are several large cemeteries (of chamber tombs) with a minimum number of individuals being at least 100 – Agia Triada,¹⁴ Voudeni,¹⁵ Achaea Klaus¹⁶ and Laganidia Kallithea¹⁷ – and small cemeteries as well (Agios Vasileios Chalandritsa,¹⁸ Spaliareika

¹² Chovalopoulou et al. 2017.

¹³ In 4 of them (Almyri, Kalamaki, Perachora and Voudeni), the skeletal assemblage was not studied and published with a primary focus on the population state of health, but only the mentioned isotopic analyses were done.

¹⁴ LH III cemetery (consisting of ca. 50 chamber tombs) is located on the summit of the mountain in north-east Ilia, above Peinios River.

¹⁵ Voudeni is located in western Achaea, a few kilometres from Patras, and consists of the LH IIB–IIIA cemetery of 55 tholos tombs and a few pit graves and an associated settlement. See e.g. Moutafi 2015, 12–26.

¹⁶ LH IIIA1–IIIC cemetery, consisting of 28 chamber tombs, is situated at the foot of the Koukouras hill, to the south and not far from Patras. See e.g. Paschalidis 2018.

¹⁷ LH III cemetery of Laganidia Kallithea consists of 23 chamber tombs and 1 tholos tomb and is located to the south of Patras. See e.g. Graff 2011, 23–28.

¹⁸ The site consists of 29 chamber tombs, with the main burial horizons of LH IIIA1–IIIC date and a limited reuse at the beginning of the 1st mill. BC (Late Protogeometric to

(Lousikon),¹⁹ Kalamaki,²⁰ Almyri,²¹ Agia Sotira²² and a single tholos tomb at Barnavos²³). Specific burial contexts include the Cheliotomylos well at Corinth,²⁴ where the human skeletal remains were found in various depths, and a burial cave at Perachora.²⁵ These two last mentioned skeletal sets (and a few individuals from Kalamaki) are chronologically the oldest, dating back to the EH period. Other skeletal sets come only from the LH period.²⁶ Unfortunately, the anthropological assemblages from Agia Triada, Laganidia Kallithea and Achaea Klauss have not been studied and published as a whole yet and the assemblages from Perachora, Almyri and Kalamaki have not been studied and published at all. In the last 3 mentioned sites only stable isotopic analyses were performed.

III.1 Pathologies and basic demographic indicators

The oldest skeletal assemblage from the southern side of the Corinthian Gulf comes from **Corinth** (the area of Cheliotomylos; Corinthia) and is dated to EH III. Unfortunately, it has been published only as a preliminary report.²⁷ In total, the skeletal remains of 30 individuals were found in a former, 17.35 m deep well, in several layers of depth ranging from 2–10.75 m. Of the deceased, 9 were subadults

Early Geometric phases). It is located in central Achaea (Kalavryta region), on the southwestern foot of Mt. Panachaikon. See e.g. Aktypi 2017, 1–17.

- ¹⁹ LH III cemetery of Spaliareika Lousikon is situated in western Achaea, on the slopes of a low hill to the southeast of Rachi, and comprised of 9 chamber tombs. See e.g. Petropoulos 2000.
- ²⁰ This site is located ca. 30 km southwest of Patras in Achaea, at the foot of Movri Mountain. The cemetery was first constructed and used in EH period. Later in LH III, new chamber tombs were built over the earlier ones, partly disturbing them. See e.g. Vassilogamvrou 2008.
- ²¹ The author was unable to find any information regarding the exact location (within Corinthia) of this small LH cemetery, comprising a few chamber and tholos tombs.
- ²² A small LH IIIA1–B2 cemetery comprising of 4 chamber tombs is located outside of Koutsomodi, near Ancient Nemea archaeological site. See e.g. Smith et al. 2006–07.
- ²³ This looted LH IIIA2 chamber tomb is located west of the Ancient Nemea village. See e.g. Wright et al. 2008.
- ²⁴ This well is situated less than 2 km north of the centre of ancient Corinth.
- ²⁵ The burial cave is situated in the slope above Lake Vouliagmeni and not far from the famous ancient sanctuary of Hera.
- ²⁶ Including the most of individuals from Kalamaki.
- ²⁷ Waage 1949.

and at least 16 individuals were adults (9 females and at least 5 males).²⁸ The cause of death of these individuals has not been proved with certainty, as no pathologies were recorded (or at least described), but they could have been (among others) victims of epidemics.

The skeletal material from **Voudeni** (in Achaea), which dates to LH IIB–IIIA, has not been published in detail yet. It contains the remains of a minimum of 383 individuals (33 subadults and 255 adults – 175 males and 80 females), of which, however, only 206 were studied (31 subadults and 175 adults, of which 73 males and 69 females can be sexed) from a social bioarchaeology viewpoint.²⁹ As the main research focus was not related to the state of health, only a few cases of pathologies were noted. Several individuals show only minimal evidence for degenerative joint disease. Regarding dental pathologies, some individuals show enamel attrition. The most interesting case is, however, an individual T5/Δ (old adult male, c. 164 cm tall), who completely lost his dentition ante mortem. This is the only prehistoric example so far of an individual in Greece who was completely edentulous at the time of his death. The average age at death for both sexes was high for the Bronze Age Greece – 41.2 years for males and 35.7 years for females.

The other skeletal assemblages that were studied and published come only from the LH III period. A fragmentary set from **Agia Sotira** (in Corinthia) from LH IIIA1–B2 includes the remains of 34 individuals – 8 subadults and 26 adults (13 males and 5 females).³⁰ Musculoskeletal markers of physical exertion are the most numerous kinds of the skeletal pathologies, as they were documented in 7 individuals, mostly on the lower limbs. Individual 6.8 (young adult female, c. 17–25 years old) suffered from a spiral fracture of the distal third of her left tibia. It was healed, but the bone fragments were misaligned. Marks of posttraumatic osteomyelitis with a periosteal new bone formation is well visible on the afflicted bone surface. Two more cases of nonspecific infection are to be seen on the temporal bone of two adult male individuals (4.1 – 24–30 years old and 4.5 – c. 40 years old). Regarding dental pathologies, caries (9.91% frequency) is more prevalent in males. Ante-mortem tooth loss is less frequent (7.29%) and a dental wear and enamel hypoplasia (4 teeth; 1.16% frequency) are very rare.

²⁸ These numbers are copied from the original publication (Waage 1949). The new information table in the Prehistoric room of the Ancient Corinth Museum states a slightly different demographic profile: 9 subadults and 21 adult individuals, of these 12 males and 9 females.

²⁹ Moutafi 2015 and 2021.

³⁰ Smith et al. 2006–07, 2013 and 2017.

A small and fragmentary skeletal assemblage from another site in Corinthia – **Barnavos** – dates to LH IIIA2–B1. It contains the remains of only 4 individuals (1 subadult and 3 adults). Due to the very bad state of preservation, only the dental pathologies can be identified. The subadult individual (9–10-year-old child) suffered from 2 carious teeth and dental enamel hypoplasia.

Less than a half (39) of the preserved individuals' skeletal remains (MNI=100) from **Laganidia Kallithea** in Achaea were examined and published.³¹ These are 5 subadults and 33 adults (10 males and 17 females), dated to LH IIIA–C. Among the most frequent pathologies belong physiological stress (15 cases in 12 individuals; both in the form of the porotic hyperostosis and cribra orbitalia), infections and trauma (5 individuals, including 3 cases of healed cranial depressed fractures). 14 individuals suffered from bacterial infections – there were 10 cases of otitis media, 5 cases of sinus infections and 3 cases of meningitis recorded in this skeletal assemblage. Specific endocranial lesions in the skeletal remains of 9 individuals were also interpreted as the results of infections.³² The endocranial surface of several bone fragments is very smooth and has a resurfaced ivory appearance. As Graff states, brucellosis could be the cause of this lesions, but the most typical symptom of this disease – the specific lesions of the vertebrae, often in combination with a vertebral fusion – is missing (also due to the very few surviving vertebral bodies).³³ So, these individuals cannot be regarded as suffering from brucellosis. As Graff pointed out, 7 of these 9 individuals with endocranial lesions show signs of otitis media and this correlation must be taken into account during the establishing of the differential diagnosis and cause of these lesions.³⁴ On the contrary, only 1 case of periosteal infection (non-specific inflammation) was noticed, as well as 1 case of the musculoskeletal markers of physical load (in the form of the bilateral femoral enthesopathies). 2 individuals suffered from hyperostosis frontalis interna and 1 individual from a congenital disorder – a mild case of bilateral mandibular hypoplasia. Neoplastic activity is represented by 1 case of benign osteoma on the frontal bone (in 1 older male). Surprisingly, no case of degenerative arthrosis (or other rheumatic diseases) was mentioned. On the left parietal bone of 1 individual (older female), a probable case of trepanation was described. The trepanation opening, located c. 6.5 cm from the coronal suture and c. 4.8 cm from the sagittal suture, was made by the scraping technique and is, unfortunately, not completely preserved. Its diameter was slightly more than 1 cm and there are clear signs of

³¹ Graff 2011; Liston et al. 2016.

³² Graff 2011, 44–45, 93–95, fig. 5.1–5.3.

³³ Graff 2011, 94.

³⁴ Graff 2011, 95–96.

healing along its edges, indicating that the intervention was successful. Dental pathologies include caries (high occurrence), ante-mortem tooth loss (10 individuals), periapical abscesses, periodontitis, and enamel attrition (both mild and severe form). Dental enamel hypoplasia is very rare.

The preserved skeletal remains from the LH III site of **Agia Triada** (in Ilia) unfortunately have not been described and published as a whole. Of the minimum number of 350 individuals there are at least 9 subadults and 163 adults (of which 50 males and 48 females could be sexed). Probably the most noticeable skeletal remains are those of an adult male from tomb no. 2, whose skull preserves a trepanation opening (32.53 x 25.37 mm) on his right parietal bone at coronal suture (sutura coronalis).³⁵ The trepanation was made by the scraping technique and its edges show (along the full length) clear signs of healing. Worth noting is also the results of a study on the state of dentition of 172 individuals.³⁶ Of these 172 individuals, periodontitis was found in 37 individuals (of 107 with sufficiently preserved jaws; 34.58% frequency) – 39% females and 32% males. The incidence of this disease increases with age, so the most cases were documented in the group of 36 years of age and above. Although the occurrence is high, most of the afflicted individuals suffered only from a mild form of this disease and only 10% from a serious form (i.e., generalized destructive periodontitis). The frequency of the ante-mortem tooth loss is also very high – 53% of individuals lost at least 1 tooth, 24% lost 3 and more teeth, which makes 300 lost teeth of 1737 preserved alveoli and the mean tooth loss 11 teeth per 1 complete dentition. It is not sufficiently clear what the main cause of such a high ante-mortem tooth loss was. The caries was less frequent, and it was documented in 65 cases (7.68%). The enamel of a lot of teeth was also quite worn. In general, the local population shows one of the worst states of dentition within prehistoric Greece. A surprising fact is a relatively high (for the period) average age of the population – 38 years – despite such a very bad state of dentition.

Unfortunately, a fragmentary LH IIIA1–IIIC late³⁷ skeletal assemblage (MNI=57) from **Agios Vasileios-Chalandritsa** (in Achaia) has been only preliminarily published.³⁸ It contains the remains of at least 5 subadults and 52 adults (11 males and 10 females). Most subadults died between the 5th and 12th year of age, the adults between 24th and 35th year of age. From the pathologies, only the dental ones were

³⁵ Mountrakis et al. 2011.

³⁶ Petroutsas et al. 2002; Tsilivakos et al. 2002.

³⁷ There is also a limited Late Protogeometric to Early Geometric (beginning of 1st mill. BC) activity in some tombs.

³⁸ Jones 2014 and 2017.

mentioned in the skeletal remains of 1 individual (from LH period) – he lost several teeth ante mortem.

Unfortunately, the skeletal remains from **Achaia Klauss** (in Achaea), dating to LH IIIA1 to LH IIIC final, haven't been published as a whole.³⁹ Of the minimum number of 129 individuals (including 1, who was cremated) there are 20 subadults (1 newborn, 1 child c. 18 months old and 18 children 3+ years) and 55 adults (of which 29 males and 26 females can be sexed). The most interesting case of pathologies was recorded in the remains of individual Γ (from Tomb E; female 17–23 years old; LH IIIC middle). In her sacral bone a spina bifida occulta⁴⁰ of the sacral vertebrae – which is a congenital disorder, a malformation of the spine – is well visible (Fig. 1). This woman also suffered from a bacterial infection – TBC or brucellosis – of the 12th thoracic and of the lumbar vertebrae. Individual Z (adult male from Tomb ΣΤ; LH IIIC late) underwent a complicated surgical intervention – a trepanation. Unfortunately, only a segment of his calva is preserved, with a part of the trepanation opening (Fig. 2). It was made by the scraping technique and the signs of healing are clearly noticeable. In the remains of a few other individuals, degenerative arthrotic changes (degenerative joint disease on humerus – Individual 1, Burial A (adult female, 25–30 years) of Tomb N; osteophytes on several vertebrae – Individual 1, Burial I (older adult male(?), 40+ years) of Tomb N), trauma (fracture of metacarpal – Individual 1, Burial A (adult female, 25–30 years) of Tomb N) and possibly periostitis (Individual 2, Burial A of Tomb Ma) were described, too. Dental pathologies include caries, periapical abscess, ante-mortem tooth loss and enamel attrition. The average age of males was 33.25 years and 25.26 years in females. The average stature of males reached 168.32 cm and 156.07 cm in females.

Finally, a small LH IIIA–C skeletal assemblage (MNI=25) from **Spaliareika** (in Achaea) contains remains of 4 subadults and 21 adults (7 males and 8 females).⁴¹ The most frequent skeletal pathologies were manifestations of physiological stress (porotic hyperostosis and cribra orbitalia; 26.8%), non-specific infections (periostitis; 24%) and osteoarthritis. Also 1 case of healed cranial trauma was recorded. Dental pathologies include a high occurrence of ante-mortem tooth loss (26.1%; 24 afflicted teeth of 92 preserved teeth/alveoli) and of the dental enamel hypoplasia (10.8%; 10 afflicted teeth of 92). On the contrary, the frequency of caries is low (3.3%; 3 afflicted teeth of 92). The average age of this population was 35.7 years; the average stature of males was 167 cm and of females 157 cm.

³⁹ Paschalidis – McGeorge 2009, 101ff; McGeorge 2018; Wieckowski 2018.

⁴⁰ It is a vertebral cleft, where the vertebral (neural) arch is not closed. Usually, this condition does not cause any disabilities.

⁴¹ Papathanasiou 2002–2005.

III.2 Diet

As bone collagen reflects the isotopic composition of an individual's dietary protein intake over a long period, it is possible to perform stable isotopic analyses of nitrate and carbon for the discerning of his/her prevailing diet.⁴² Carbon stable isotope analysis (¹²C and ¹³C) can differentiate between marine versus terrestrial ecosystems, or C₃ (mostly plants adapted to tempered environments) versus C₄ plants (plants adapted to arid, hot environments). Nitrogen isotope ratio (¹⁴N and ¹⁵N) can help to define the consumption of aquatic (marine and freshwater) food. Analyses of the bone tissue samples were performed for the following six sites.

The EH skeletal assemblage from the burial cave at **Perachora** (in Corinthia) has not been studied and published yet.⁴³ Only samples were taken for stable isotopic analyses discerning the prevailing diet. The results showed that most of individuals consumed C₃ terrestrial plant-based diet with certain amount of animal protein. A few individuals, however, consumed C₄ plant-based food as well, or possibly marine protein.⁴⁴

The LH fragmentary skeletal assemblage (MNI=23) from **Almyri** (in Corinthia) hasn't been studied and published yet. Only stable isotopic analyses were performed to discern the prevailing diet. These proved C₃ terrestrial plant-based diet as the basic nourishment, but with a substantial intake of animal protein (meat or dairy products) and a low percentage of C₄ terrestrial plant-based food (e.g., millet).⁴⁵

In **Voudeni**, the results of 36 samples proved that the local population in LH IIB–IIIA consumed a mainly C₃ terrestrial plant-based diet (e.g. wheat), but with a substantial amount of animal protein (in the form of meat from goats, sheep or cattle or dairy products).⁴⁶ The values differ in some individuals, which means that certain individuals consumed a more plant-based diet and others more animal products. There are no relevant differences in the diet among males and females.⁴⁷

Analyses of stable isotopes of nitrogen and carbon levels in the bone tissue of some individuals from LH III **Agia Triada** proved that these individuals mostly consumed a C₃ terrestrial plant-based diet (e.g. wheat) with a certain amount of

⁴² See e.g., Mays 2010, 265–289; Papathanasiou et al. 2013; Voutsaki – Valamoti (eds.) 2013; Richards 2015.

⁴³ Unfortunately, the minimum number of individuals of this skeletal set is not stated anywhere. The only published information is that samples of bone tissue from 34 individuals were taken; however, the total MNI can be up to several times higher.

⁴⁴ Petroutsas et al. 2007.

⁴⁵ Petroutsas – Manolis 2010.

⁴⁶ The skeletal remains are described above in III.1.

⁴⁷ Petroutsas et al. 2009.

animal protein (in a form of meat from goats, sheeps or cattle or dairy products).⁴⁸ Some individuals also consumed a C₄ plant-based diet (e.g. millet). It is certain that the diet of this population was rich in carbons, which contributed to the bad state of dentition.⁴⁹

The local population of **Spaliareika** consumed in LH IIIA–C almost exclusively C₃ terrestrial plant-based diet (e.g. wheat), with only a limited amount of animal protein.⁵⁰

The human skeletal remains (MNI=77) from **Kalamaki** (in Achaea), which are dated to EH and LH III, have not been published yet. Only the analyses of stable isotopes of nitrogen and carbon levels in the bone tissue of some individuals were conducted in order to reconstruct the prevailing diet. The results of 32 samples proved that the local population consumed almost exclusively a C₃ terrestrial plant-based diet (e.g. wheat), with only a limited amount of animal protein (in a form of meat from goats, sheeps or cattle or dairy products).⁵¹ Only 1 adult individual (whose dating was not stated) also consumed a significant amount of C₄ plant-based diet (most probably millet).

IV. Analyses and discussion

IV.1 Regions to the north of the Gulf of Corinth (see Graph 1)

The published skeletal material from the regions to the north of the Corinthian Gulf is, unfortunately, rather limited and includes 59 individuals from 3 sites in total – 20 subadults and 32 adults (7 males and 9 females). It dates to MH and LH periods. From the skeletal pathologies only vertebral arthrosis (in 2 sites) and manifestations of physiological stress (in 1 site; in the form of cribra orbitalia and “Harris lines”) were described. Dental pathologies were more often. Caries was recorded in all 3 sites, dental wear in 2 sites and periodontitis and ante-mortem tooth loss were noted in 1 site. Unfortunately, the frequency rates of all kinds of pathologies were not stated. The arithmetic means of the stature range in Goutsoura are 160.9 cm for males and 150.53 cm for females. These values cannot be taken as definitive, but they show that Goutsoura population was generally considerably shorter than other Greek populations of Middle to Late Bronze Ages (for example,

⁴⁸ The overview of the state of health of this population is stated above in III.1.

⁴⁹ Petroutsa – Manolis 2010.

⁵⁰ Richards – Vika 2008. The overview of the state of health of this population is stated above in III.1.

⁵¹ Richards – Vika 2008.

the mean male stature is c. 7–8 cm shorter and the mean female stature c. 6–7 cm shorter than in Ilia and Achaia).

From the viewpoint of the health status of the population to the north of the Gulf of Corinth in the Bronze Age, it is necessary to mention the existence of healed trepanation in MH Kirrha. The occurrence of this complicated and sophisticated surgical intervention, often carried out as a result of the treatment of cranial trauma, gives evidence of the presence or availability of a sufficiently skilled physician. For the successful performance of it and the successful healing of the cranium it is necessary to have both the medical and caring knowledge and abilities.

IV.2 Regions on the southern side of the Gulf of Corinth (see Graph 1)

The published skeletal material from the regions on the southern – Peloponnesian – side of the Corinthian Gulf (Ilia, Achaia and Corinthia) is ca. 20 times more numerous than in the opposite side of the Gulf and includes in total 1246 individuals from 12 sites. It is dated mostly to LH III period, with some individuals of EH and LH II date. Of these 1246 individuals, there are 94 subadults and 629 adults (307 males and 203 females). The variability of skeletal and dental pathologies is bigger.

The most numerous kinds of skeletal pathologies are traumatic injuries and non-specific inflammations, which were proved in 4 sites each (although the case of periostitis in Achaia Klauss is not entirely clear). The degenerative arthrotic changes were proved in 3 sites (although rather in a low rate) and the manifestations of the physiological stress (in the form of the porotic hyperostosis and cribra orbitalia) in 2 sites (notable is the high occurrence in Spaliareika – 26.8%). The musculoskeletal markers of physical load were also described in 2 sites. However, the most interesting category includes the generally less common skeletal pathologies, such as congenital disorders (1 site; vertebral cleft), bacterial infections (altogether 15 afflicted individuals from 2 sites, who suffered from otitis media, sinusitis, meningitis and TBC or brucellosis), internal diseases (2 cases of hyperostosis frontalis interna in 1 site) and a (benign) neoplastic activity (1 case in 1 site).

The most numerous kind of dental pathology was ante-mortem tooth loss, documented in 7 sites. Its occurrence was mostly high, especially in Agia Triada (53% of individuals and 11 lost teeth per 1 dentition) and Spaliareika (26.8%). In Voudeni, individual T5/Δ was completely edentulous at the time of his death – the only such case in prehistoric Greece. Caries was noted in 6 sites, with a different frequency rate (both low and high). Dental wear and dental enamel hypoplasia occurred in 4 sites, periodontitis, and periapical abscesses in 2 sites each.

The average age of the population in Ilia and Achaia was 35.37 years (based on the populations from Agia Triada, Achaia Klauss, Spaliareika and Voudeni). The

average male stature was 167.66 cm and average female stature 156.535 cm (both based on the populations in Achaia Klauss and Spaliareika).

The populations of the southern side of the Gulf of Corinth consumed mainly a C₃ terrestrial plant-based diet (e.g. wheat), with low to substantial amounts of animal protein (local differences among the individual sites). In Agia Triada, Almyri, Kalamaki and Perachora several individuals consumed also a significant amount of C₄ plant-based diet (e.g. millet).

In the regions on the southern side of the Corinthian Gulf 3 cases of trepanations were recorded – and all were successful (the patients survived). This is an important fact documenting the high level of medical practice (availability of a skilled physician and subsequent care) on the Peloponnese in the LH III period.

V. Conclusions

From the occurrence of the main types of skeletal and dental pathologies it might seem that the populations to the north of the Gulf of Corinth were healthier than those on its southern side (e.g. there are no cases of bacterial infections or congenital disorders to the north of the Gulf). But this impression is caused by the uneven state of research and publication. It is certain that after the studies of the, as yet unpublished, human skeletal assemblages from the regions to the north of the Gulf new cases of pathologies will be discovered and described. New stable isotopic analyses for discerning the prevailing diet of the populations should be also performed.

Of special importance is the existence of 3 cases of trepanations – in Agia Triada, Achaia Klauss and Laganidia Kallithea – in the regions on the south side of the Gulf. All were successful, with clear signs of healing along the edge of the trepanation opening. The occurrence of this complicated and sophisticated surgical intervention gives evidence for the presence or availability of a sufficiently skilled physician and also of personnel willing to look after the patient. In total, there are 6 fully proven Bronze Age trepanations known from the Peloponnese (of 9 prehistoric Greek trepanations). In contrast, only 1 case of Bronze Age trepanation comes from the northern regions of the Greek mainland – to the north of the Gulf of Corinth and Attica – it is the already mentioned trepanation from Kirrha. Even though there are less published Bronze Age human skeletal assemblages from the north of Greece than from its southern regions, such a high difference in the known number of complex surgical interventions is striking. A possible explanation of this fact could be a transfer of medical knowledge regarding complex surgical interventions and subsequent (postoperative) care from the “core areas” of the Mycenaean civilization

(Peloponnese – Attica – Boeotia) to the peripheral regions on the northern side/ to the north of the Gulf of Corinth.⁵²

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⁵² The oldest certain case of trepanation from the Greek mainland comes from Asine in the Argolid (Peloponnese) and dates back to the MH period (male individual 107 As, c. 30–40 years old; Angel 1982, 109, fig. 1, 14). It is thus more or less contemporary with the Kirra trepanation (or at least both cases come from the same general (MH) period).

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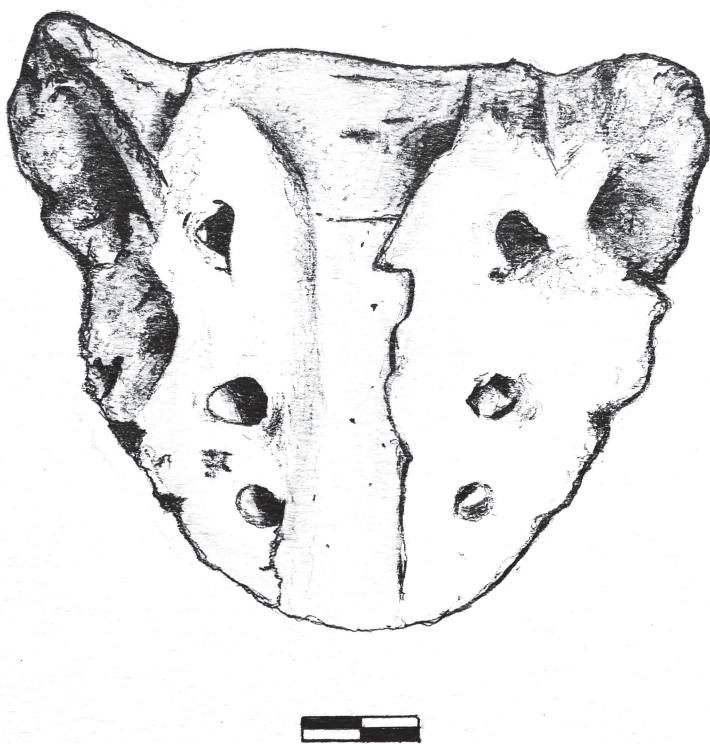
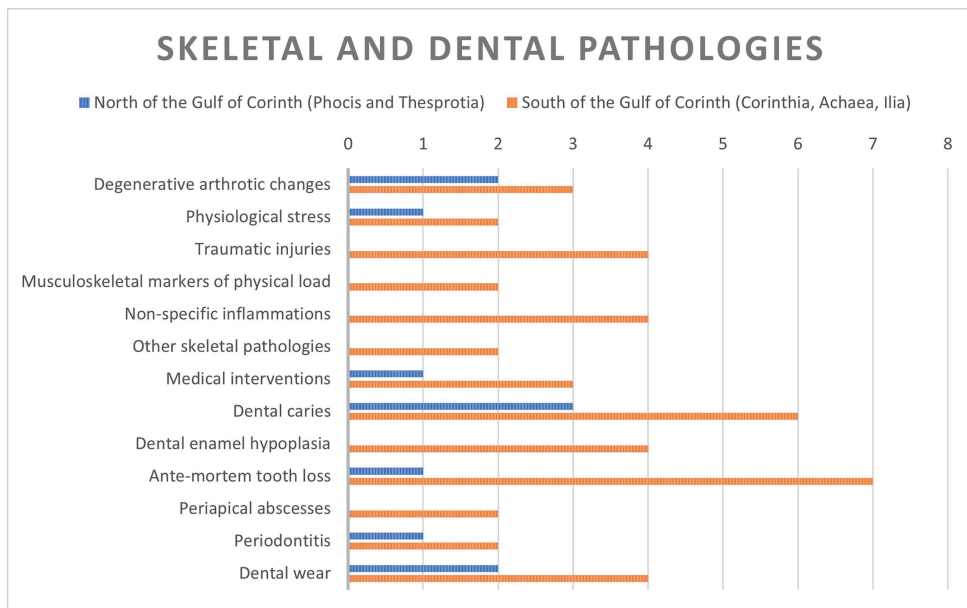


Fig. 1: Sacral bone showing congenital spina bifida occulta (a vertebral cleft, where the vertebral arch is not closed). Achaia Klauss, Tomb E, Individual Γ (female, 17-23 years), LH III C middle. Drawing by Pavla Alušíková Dostalíková.



Fig. 2: Segment of calva with a part of the trepanation opening with evidence of healing. Achaia Klauß, Tomb ΣΤ, Individual Z (adult male), LH IIIC late. Drawing by Pavla Alušíková Dostalíková.



Graph 1: Numbers of sites with cases of skeletal and dental pathologies in both main studied regions. Created by the author.