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Short fieldwork report

Human remains from Pigi Athinas, Greece, 1999-2011

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The site of Pigi Athinas is located in the foothills of Mt. Olympus in Pieria, Central Macedonia (**Figure 1**), in the vicinity of the homonymous water source, 1,200m from the sea and it is surrounded by the ancient cities of Fila, Herakleion and Tria Platania (Poulaki 2003; Poulaki-Pantermali 2005, 2008, 2013). The rescue excavation at Pigi Athinas began in 1999 under the auspices of the 16th Ephorate of Prehistoric and Classical Antiquities (season 1999-2003) and subsequently by the 27th Ephorate of Prehistoric and Classical Antiquities (season 2008-2011), under the direction of Efi Poulaki-Pantermali (currently the director of the 27th EPCA).

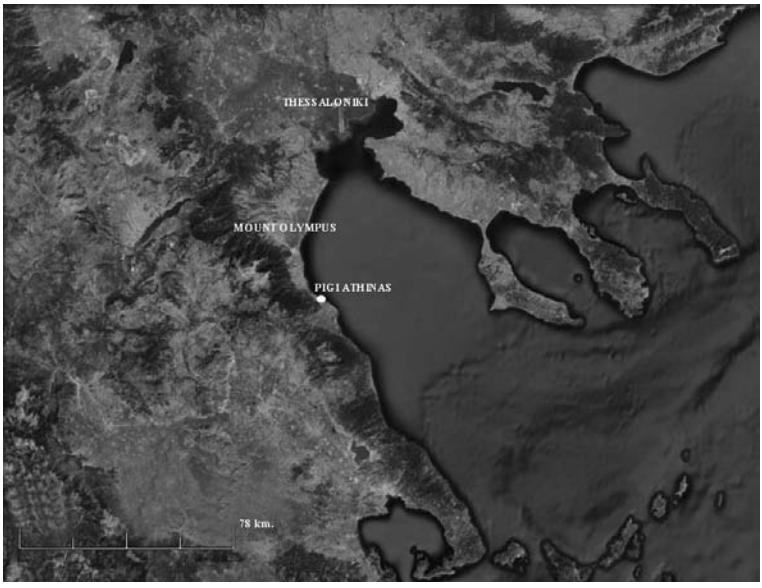

Figure 1. Map showing the location of Pigi Athinas, Greece.

Important archaeological evidence ranging from the Neolithic to the post-Byzantine era came to light, including five Middle/Late Bronze Age tumuli (1620/1500

BC) and sixteen Late Roman graves (first half of the 4th century A.D.). All skeletal remains are curated in Leivithra. The prehistoric human remains were analyzed by the author in 2007 (Tritsaroli 2010), and the Late Roman remains in 2009 in order to investigate demography, health, disease, lifestyle and burial customs. This report summarizes the results of the analysis of the Late Roman sample.

During the Late Roman period a farming community occupied the site of Pigi Athinas. Archaeological findings from the farmhouse cover the period from the 1st to 4th century A.D., which implies several phases of occupation (Poulaki-Pantermali 2005). Architectural remains and artifacts suggest an economy based on agriculture (Poulaki 2003:56; Poulaki-Pantermali 2005:460). The burials presented here correspond to the latest phase of occupation of the farmhouse (ca. first half of the 4th century A.D.) (**Figure 2**). The cemetery included 15 pit graves and a jar burial (N°VII). All the graves held primary burials while in four of them a second individual was identified. A total of 17 individuals have been studied, which came from 13 out of 16 burial structures excavated.

Figure 2. Burials from the Late Roman cemetery of Pigi Athinas. Archive of the 27th EPCA, Pieria.

Methods. The bones were examined macroscopically under normal light conditions. All data were collected by the author according to protocols outlined in *Standards for data collection from human skeletal remains* (Buikstra & Ubelaker 1994). Diagnosis of pathological conditions was made after Aufderheide and Rodriguez-Martin (1998) and Ortner (2003). Skeletal lesions were inventoried by presence-absence, by

individual and by skeletal element. The percentages reflect the observed (n) over the observable (N). The average of individuals by grave was also calculated (number of individuals/number of graves).

Preservation and demography. Skeletal preservation, describing both bone completeness and surface quality, is poor for twelve individuals, while the remaining five individuals were classified as good and very good (**Table 1**). The sample comprises 13 adults and 4 subadults. Dental age-at-death for the subadults is estimated at 4, 6 and 7 years respectively (for one subadult the dental age is unknown but the skeletal development does not exceed 7 years). Almost half of the adults are aged over 40 years. Average height is estimated at 1.63m for males and 1.51m for females.

Table 1. List of individuals from the Late Roman cemetery of Pigi Athinas (F = female, M = male, U = unknown).

Area	Grave	Individuals	Preservation	Age	Sex	Stature
A	I	1	poor	adult	U	
A	II	1	poor	adult	U	
A	III	skeletal remains not found				
A	IV	1	good	[50+]	F	1.51m
A	V	1	poor	adult	U	
A	VI	1st	poor	[40-50]	F	
A		2nd	poor	adult	U	
A	VII	skeletal remains not found				
B	α	1	very good	[40-50]	M	1.61m
B	β	1st	poor	7y±24m	U	
B		2nd	poor	4y±12m	U	
B	γ	1st	poor	adult	U	
B		2nd	poor	subadult	U	
B	δ	skeletal remains not found				
B	ϵ	1	poor	6y±24m	U	
B	ζ	1	good	[50+]	F	1.50m
B	η	1st	poor	[20-30]	U	
B		2nd	poor	adult	U	
B	θ	1	good	[40-50]	M	1.68m
B	$\sigma\tau$	1	good	[40-50]	M	1.61m
Total	13	17				

Dental diseases. A high frequency of supragingival calculus, mainly of small extent, (49.8%) (**Figure 3**) and alveolar resorption (vertical and horizontal bone loss) (44%) (**Figures 3**, **4**) was recorded (**Table 2**). The overall frequency of caries appears high even for an agricultural population (Larsen 1999) affecting 21.9% of teeth. The subadult remains presented no signs of dental diseases. Despite the age factor, the distribution of dental lesions may be suggestive of poor dental hygiene and the

Figure 3. Horizontal bone loss and supragingival calculus in the right lower jaw, 50+ years-old female from grave ζ.

Figure 4. Vertical bone loss in the left first and second lower molars, 40-50 years-old male from grave θ.

consumption of foods that predispose the individual to plaque formation (i.e. a diet rich in sugar, carbohydrates and plant tissues) (Hillson 1979, 1986:291; Larsen et al. 1991:179; Touger-Decker & van Loveren 2003:888, 890). On the other hand, it is interesting to note that a similar pattern of dental diseases, especially a high inci-

dence of calculus, is also found among the prehistoric sample examined from the same site (Tritsaroli 2010). This may suggest that over time factors other than diet might have affected the oral health status of the people who lived at Pigi Athinas. Consequently, environmental and geological conditions such as water and soil quality in relation to dental diseases should be considered in future research. Linear enamel hypoplasia in Pigi Athinas affected 20.1% of the teeth examined, with 5 out of 13 individuals exhibiting this trait (**Table 3**). Hypoplasia occurred in four adults, and in the two permanent incisors of the 4 year-old subadult.

Table 2. Adults' oral health indicators distribution according to sex.

Condition	**Adults**			**Females**			**Males**		
	N	n	%	N	n	%	N	n	%
per individuals									
caries	10	9		3	3		3	3	
antemortem tooth loss	10	2		3	1		3	1	
alveolar bone resorption	9	5		3	1		3	3	
calculus	10	8		3	2		3	3	
per teeth / tooth sockets									
caries	210	46	21.9	77	16	20.8	77	10	13.0
antemortem tooth loss	231	3	1.3	83	2	2.4	90	1	1.1
alveolar bone resorption	157	69	44.0	52	30	57.7	82	39	47.6
calculus	211	105	49.8	77	30	39.0	78	52	66.7

Table 3. Dental enamel hypoplasia distribution according to age and sex.

Category	**Individ.**		**Teeth**		
	N	**n**	**N**	**n**	**%**
Adults	10	4	205	45	22.0
Females	3	1	78	12	15.4
Males	3	2	72	29	40.3
Subadults	3	1	29	2	6.9
Total	13	5	234	47	20.1

Metabolic diseases. *Cribra orbitalia* were present on two out of eleven individuals (one adult and one subadult). For the adult male from grave θ the lesion affects the left orbit and it is characterized by porosity only. In the 7 years-old subadult the lesion is bilateral, ranging from porosity only (degree score 2) to porosity with coalescence of foramina (degree score 3) and perhaps some thickening (degree score 4) and a mixture of active and healed lesions at the time of death (activity score 3) (Buikstra & Ubelaker 1994:121) (**Figure 5**). Porotic hyperostosis was noted on 7 out of 12 individuals (5 adults and 2 subadults) being more frequent on the parietals than the

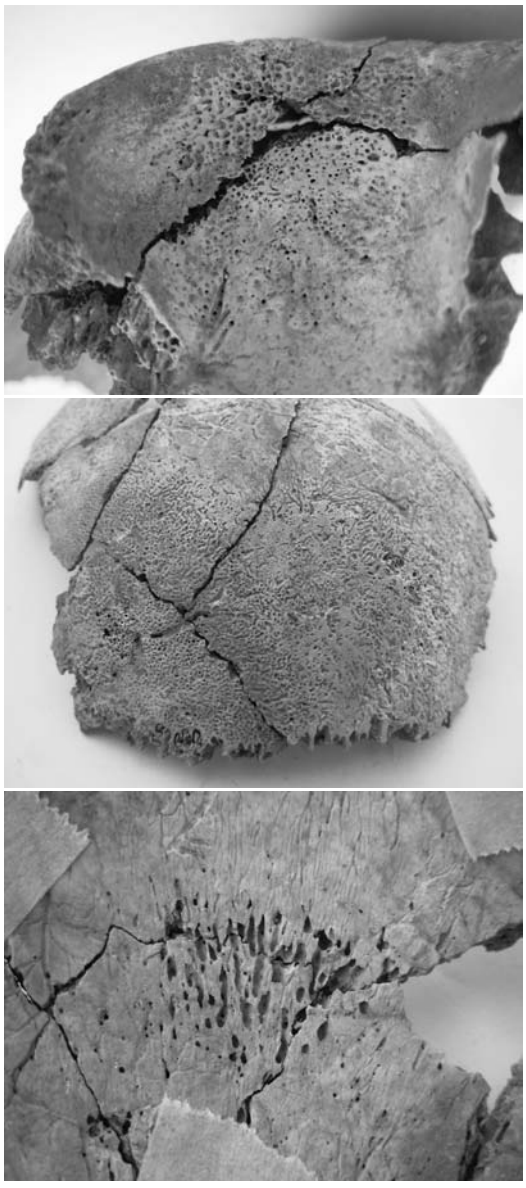

Figure 5. Right orbit exhibiting *cribra orbitalia* (top), left parietal exhibiting porotic hyperostosis (middle), osteolytic lesions on the internal surface of the left parietal (bottom) on the skull of the 7 year-old child from grave β.

occipitals (**Table 4**). The lesion is manifested mainly along the superficial vault surface, being slightly porotic in the form of a fine, regular pitting seen in small circumscribed

areas in the region of the parietal and less often the occipital bone, parallel to the lambdoid suture (Schultz 2003:103). Among adults, the overall prevalence of porotic hyperostosis is very high (48.1%) affecting more than half of the individuals.

Table 4. *Cribra orbitalia* and porotic hyperostosis distribution according to age and sex.

Condition	**Adults**			**Females**		**Males**		**Subadults**	
	N	n	%	N	n	N	n	N	n
per individuals									
cribra orbitalia	8	1	12.5	2	0	3	1	3	1
porotic hyperostosis	9	5	55.6	3	1	3	2	3	2
(parietals)	9	5	55.6	3	1	3	2	3	2
(occipitals)	9	3	33.3	3	1	3	1	2	2
per bones									
cribra orbitalia	13	1	7.7	4	0	6	1	6	2
porotic hyperostosis	27	13	48.1	9	3	9	6	8	6
(parietals)	18	10	55.6	6	2	6	4	6	4
(occipitals)	9	3	33.3	3	1	3	1	2	2

Figure 6. Possible healed fracture on the right frontal bone, 40-50 years-old male from grave θ.

Skeletal evidence of both conditions is recorded on the 7 years-old from grave β; this child shows lesions of *cribra orbitalia* coupled with porotic hyperostosis on the cranial vault, new bone formation on the temporal, zygomatic, mandible, palatine, sphenoid and basilar bones, and osteolytic lesions on the internal surface of the parietals. These lesions could be related to infection, scurvy (vitamin C deficiency), or rickets (vitamin D deficiency), which can occur in cases of malnutrition (Brickley & Ives 2006; Lewis 2002, 2004; Maat 2004; Mays et al. 2006; Melikian & Waldron 2003; Ortner & Mays 1998). No further etiological assessment can be made due to the bad preservation of the postcranial elements.

Cribra orbitalia and porotic hyperostosis at Pigi Athinas are slight to moderate in expression. In addition, they involve mainly adults and they show evidence of healing indicating survival of the individuals following a stress episode. A multifactorial etiology can be suggested for these lesions, involving the synergistic effects of dietary

Table 5. Adults' long bones DJD distribution according to sex.

Joint	**Adults**			**Females**		**Males**	
	N	n	%	N	n	N	n
per individuals							
temporomandibular	8	0	0.0	3	0	3	0
glenohumeral	8	1	12.5	3	0	3	1
sternoclavicular	5	3	60.0	2	1	3	2
acromioclavicular	4	0	0.0	2	0	2	0
elbow	9	3	33.3	3	1	3	1
wrist	9	2	22.2	3	1	3	1
hand	9	2	22.2	3	1	3	1
hip	8	3	37.5	3	0	3	2
knee	9	4	44.4	3	0	3	2
ankle	8	6	75.0	3	2	3	3
foot	10	4	40.0	3	1	3	2
per joints							
temporomandibular	9	0	0.0	3	0	3	0
glenohumeral	16	2	12.5	6	0	6	2
sternoclavicular	9	5	55.6	4	1	5	4
acromioclavicular	5	0	0.0	2	0	3	0
elbow	16	5	31.3	6	2	6	2
wrist	16	4	25.0	6	2	6	2
hand	18	4	22.2	6	2	6	2
hip	14	5	35.7	6	0	6	4
knee	15	6	40.0	6	0	6	4
ankle	15	11	73.3	5	4	6	6
foot	19	8	42.1	6	2	6	4

deficiencies, infections and parasite load. In addition to these conditions, results show a high frequency of enamel hypoplasia and skeletal infection that could be indicative of poor living conditions.

Trauma. Three cases of healed trauma were recorded on males. One possible trauma involved the skull (40-50 years-old male from grave θ) and another two to the hands (40-50 years-old males from graves $\sigma\tau$ and α). In the case of the skull, the lesion is described by a small depression on the external surface of the left frontal bone, not exceeding 12×7mm with no lesions associated (**Figure 6**). In the hand trauma cases, the lesions were present on the left (one proximal phalanx) and on the right side (5th metacarpal). Callus formation and angulation of the bone were observed in these cases. Traumatic incidents at Pigi Athinas indicate minor accidents, which could be related to everyday tasks and activities with risk of falls or direct blows (Galloway 1999:155-156).

Osteoarthritis (OA) and Degenerative Joint Diseases (DJD). The overall frequency of DJD is high, affecting mostly the clavicle and the lower limbs of males (**Table 5**). The lesions are generally manifested by surface porosity and lipping. The most affected joints are those of the lower limbs (knee 40%, ankle 73.3% and foot 42.1%) and the sterno-clavicular joint (55.6%). Vertebral OA is manifested by osteophytes, in some cases by syndesmophyte formations and by Schmorl's nodes. Looking at the segments of the vertebral column (**Table 6**), the lumbar vertebrae are more affected (4 out of 6 segments observed). One case of Schmorl's nodes was observed on a male. Signs of spinal mechanical stress occur mainly in males. In general, the distribution of degenerative and osteoarthritic lesions can be explained as the result of the physiological wear due to the advanced age and the stress applied upon the joints since almost all of the cases involve mature adults.

Infectious diseases. Infectious disease manifested mainly as periostitis generally expressed by mild woven bone deposits, thickened bone or by a longitudinally striated

Table 6. Adults' vertebral OA and Schmorl's nodes (SN) distribution according to sex (CV = cervical vertebrae, TV = thoracic vertebrae, LV = lumbar vertebrae).

Vertebrae	Adults			Females		Males	
	N	n	%	N	n	N	n
All	8	4	50.0	3	1	3	3
CV OA	8	4	50.0	3	1	3	3
TV OA	8	4	50.0	3	1	3	3
LV OA	6	4	66.7	3	1	3	3
CV SN	7	0	0.0	3	0	3	0
TV SN	7	1	14.3	3	0	3	1
LV SN	6	0	0.0	3	0	3	0

appearance without evidence of cloacae; it affected 20.8% of long bones observed, being present in 8 out of 11 individuals (**Table** 7). Periostitis affects adults' bones, especially the tibia (anterior and lateral surfaces) (68.8%) and the fibula (50%). Porotic new bone formation is noted on the dorsal aspect of the right ischial tuberosity of the 40-50 years-old female from grave VI and the left ischial tuberosity of the 40-50 years-old male from grave α; the lesion suggests the ossified tendon of the ischiocrural muscles (responsible for the extension of the thigh at the hip) caused by the extensive physical strain or trauma (Ortner 2003:Figs.6-11,6-63). In the first case the individual also exhibits periostitis on three areas at the distal half of the right tibia including an area of reactive bone (**Figure** 7) and two thickened, non porous, smooth lesions. No periosteal lesions were recorded among the subadults. The morphology and location of the periostitis is suggestive of non-specific infections or minor trauma (Manchester 1983:37; Ortner 2003:209). Its incidence could be linked to accidents and infections resulting from heavy and repetitive labor performed by a large part of the sample.

Table 7. Periostitis distribution according to age and sex.

Bone	**Adults**			**Females**		**Males**		**Subadults**	
	N	n	%	N	n	N	n	N	n
per individuals									
all locations	11	8	73	3	3	3	3	2	0
humerus	9	0	0	3	0	3	0	1	0
radius	9	0	0	3	0	3	0	1	0
ulna	9	0	0	3	0	3	0	1	0
femur	10	1	10	3	0	3	0	2	0
tibia	10	6	60	3	3	3	2	2	0
fibula	9	6	67	3	2	3	3	1	0
per bones									
all locations	96	20	20.8	36	7	36	9	12	0
humerus	16	0	0.0	6	0	6	0	2	0
radius	16	0	0.0	6	0	6	0	2	0
ulna	16	0	0.0	6	0	6	0	0	0
femur	16	1	6.3	6	0	6	0	4	0
tibia	16	11	68.8	6	5	6	4	3	0
fibula	16	8	50.0	6	2	6	5	1	0

Burials. They are generally single and primary, holding an average of 1.3 individuals per grave. No variability is observed regarding grave architecture. Females are placed with the head to the East or to the North while orientation for males is less variable with the head placed either to the North or to the North-West of the grave. Similar variations are observed for the position of the skeleton: all males are extended on their back with the lower limbs fully extended and the forearms along the

Figure 7. Active periosteal reaction (21×16mm) on the lateral side of the right tibia, distal to the midshaft; on the same bone there are two thickened areas on the posterior and the anterior surface with no foci of active reaction, 40-50 years-old female from grave VI.

sides; among females, one was found with the forearms folded across the abdomen. Subadult burials seem to follow the adults orientation; two subadult skeletons for whom position is discernable, are found extended with a NW-SE orientation (the same orientation is recorded for males). There is little material evidence indicating the preparation of the dead body for burial: offerings, accompanying objects and few personal jewelry including small clay vessels, coins, a necklace (grave γ), and clothes accessories such as a bronze foil (grave VI), a bracelet and a buckle (grave $\sigma\tau$). In three

pits the deceased's lower limbs are framed by two stones: one pit holds the burial of an adult male (grave α) and two other pits hold the skeletons of subadults (grave β and ϵ). The male skeleton from burial θ is framed with stones placed symmetrically around him.

Conclusion. Intensive archaeological investigation at the region of East Macedonian Olympus during the last twenty years brought into light significant archaeological evidence; this new data suggest the presence of an important coastal network of sites from prehistoric to historical times. The human sample from Pigi Athinas, although limited in size, represents an important source of data for the bioarchaeology of southern Pieria. On the one hand, this study presents the initial stage of research on people and mortuary practices during the Roman times; future work designed to address questions of health, status and burial treatment is yet to come and will shed more light on living conditions and funerary practices of people in central Macedonia and northern Greece during the Roman era. On the other hand, analysis of larger skeletal samples from other periods will help to progressively reconstruct the human past and to elucidate cultural changes that took place in southern Pieria though time.

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