Ursidae: The Undergraduate Research Journal at the University of Northern Colorado

Volume 4
Number 2 *McNair Special Issue*

Article 14

January 2014

Reconstructing Activity Patterns at Epidamnus, Albania: Impacts of Greek and Roman Colonizations

Jennifer Wright

Reconstructing Activity Patterns at Epidamnus, Albania: Impacts of Greek and Roman Colonizations

Jennifer Wright, Anthropology
Mentor: Britney McIlvaine, Ph.D., Anthropology

Abstract: Colonization is often associated with exploitation of local laborers. However, the degree to which physical activity in local populations changes following colonization depends upon the policies of the colonizers, and the technologies that are locally available. This research tests the null hypothesis that levels of physical activity, as evidenced by osteoarthritis in human skeletons, remained constant at Epidamnus, Albania during Greek and Roman colonial occupation (620 BC-AD 378). To test this hypothesis, 80 skeletons from Epidamnus were examined for evidence of osteoarthritis, and scored according to international standardized protocols. Of these 80 individuals, 27 were adults that showed sufficient preservation for analysis of osteoarthritis. Results indicate osteoarthritis was more pronounced in all joint surfaces (shoulder, elbow, wrist, hip, knee, ankle, cervical vertebra, and temporomandibular joint) during the Greek rather than the Roman period, with the exception of the thoracic and lumbar vertebrae. Chi-square analysis indicated that this pattern is statistically significant in the shoulder (p = 0.02) and ankle (p = 0.003), and approached significance in the elbow (p = 0.09), wrist (p = 0.06), and temporomandibular joint (p = 0.06). These results suggest differences between the Greek to the Roman period. Historical documents indicate Greek colonization resulted in increased dependence on agriculture and largely replaced nomadic pastoralism in local Illyrians. The Romans then introduced new technologies to increase agricultural efficiency. The emerging pattern indicates that the introduction of new, sophisticated technology made life easier for Illyrians during the Roman period. However, the impacts of small sample size are also considered.

Keywords: *colonization, osteoarthritis, Illyria*

Many anthropologists have looked at how colonization impacted native populations, particularly during Europe's great colonial expansion (Klaus, Larsen, & Tam, 2009; Larsen, 1994; Larsen et al., 2001; Schrader, 2012). Exploration and dominion of unknown territories by the leading European powers began in the 15th century and concluded after the two great wars of the 20th century. There are multiple reasons European countries wanted to extend themselves into new territories, many of which were based upon economic gain (Belcastro et al., 2007; Klaus et al., 2009; Larsen, 1994; Larsen et al., 2001; Schrader, 2012). Specifically, colonization is hypothesized to have begun in order to facilitate the development of trade routes, tributes, taxation, and a surplus of raw goods (Belcastro et al., 2007; Galaty, 2002; Hammond, 1992; Harding, 1992; Klaus et al., 2009; Larsen, 1994; Larsen et al., 2001; Schrader, 2012; Stipčević, 1977; Wilkes, 1992).

Although colonization during the Age of Discovery (c. AD1400-1700) has been extensively studied, little research has investigated the colonization phenomenon in ancient populations. The purpose of this study was to examine the effects of Greek and Roman colonization of Epidamnus, Albania (627BC-AD378) by looking at osteoarthritis within skeletal remains of the local Illyrian population in order to document changes in physical activity.

The exchange of information between cultures was one of the few benefits to come from colonization (Galaty, 2002; Hammond, 1992; Harding, 1992; Stipčević, 1977; Wilkes, 1992). More often, the lives of native inhabitants were transformed negatively during this process (Klaus et al., 2009; Larsen, 1987; Larsen, 1994; Larsen et al., 2001). Frequently, political, economic, and social demands were placed upon the local populace. Normal everyday patterns of life become disrupted for the colonized, as a result of colonial expansion (Schrader, 2012:60). Those

who were conquered were subjected to inequality, racial discrimination, and a loss of their traditional behaviors (Klaus et al., 2009; Larsen, 1994; Larsen et al., 2001; Schrader, 2012). For example, Spanish colonization in Peru created a large labor force from the indigenous populace in order to extract goods from the region. The Spaniards also required locals to pay tributes and/or taxes (Klaus et al., 2009:205). Negative colonial impacts have been well documented in the skeletal remains of local populations from these regions (Klaus et al., 2009; Larsen et al., 2001).

The impacts of colonization can be studied through human skeletal remains, because they provide a direct record of the experiences of local populations throughout history. Bioarchaeologists use human skeletal remains from archeological contexts to help recreate human behavior in the past. The information learned from skeletal analysis can include the environment people lived in, their social structure, any illnesses experienced during life, as well as an understanding of what people ate, and how their diet changed through time (Klaus et al., 2009; Larsen, 1994; Larsen et al., 2001; Schrader, 2012).

Bioarchaeologists compare what they learn from the skeleton with other information, such as documents found amongst missionaries, civil recordings, and archaeological evidence, to contextualize their results. Sometimes these various data sources agree and provide support for specific conclusions. Other times, historical evidence is challenged by examination of human skeletal remains. For example, historical documents suggest that natives in the New World were used as a labor-force during Spanish colonial conquest (Larsen, 1994). Bioarchaeologists studying colonial Florida can verify that the natives' health and well-being worsened during Spanish control of the area using skeletal remains (Larsen, 1994; Larsen et al., 2001).

Studies of skeletal remains are important for documenting levels of physical activity within a variety of contexts. Bioarchaeologists can investigate whether or not a society was largely sedentary or mobile and in some cases, the types of work they were doing (Larsen, 1987:340; Ruff, 2008:183). Understanding physical activity levels in the past is possible because our movements leave markers upon our bones when these bones undergo repetitive motions. Markers of physical activity can occur at points where our muscles attach to the bone or on joint surfaces, resulting in bony changes we call osteoarthritis. A bioarchaeologist can then use these markers in order to identify if there was a change in physical activity during a period of cultural or economic transition, such as those that might occur following colonization. Recognizing changes in physical activities help bioarchaeologists understand how colonization has altered skeletal remains.

EARLY COLONIZATION

Much of the research that has been done on the impacts of colonization by bioarchaeologists surrounds the events that took place after Columbus's discovery of the Americas (Klaus et al., 2009; Larsen, 1987; Larsen, 1994; Larsen et al., 2001). Less is known about the effects of colonization in other regions of the world, particularly before the 15th century. As civilizations developed and expanded in the Old World, various groups engaged in biocultural contact (human interaction). New connections were made due to trade and exploration. It is probable that these early episodes of cultural contact led to changes in health and lifestyle for each interacting group. However, this theory remains untested.

During the archaic through Roman periods (c. 750BC-AD400), the Mediterranean was heavily influenced by numerous waves of colonization. Voyages over land and sea meant that countless cultures were now interacting with one another. Two groups who would come to dominate this region were the Greeks and later the Romans. Both would encounter, and later colonize, the Illyrians on the coast of the Adriatic Sea at the port city of Epidamnus (Figure 1; Galaty, 2002; Hammond, 1992; Harding, 1992; Stipčević, 1977; Wilkes, 1992). This is significant because colonization by these groups changed the Illyrian

traditional way of life (Galaty, 2002:121; Wilkes, 1992:128). These changes in lifestyle following Greek and Roman colonization could conceivably be seen in the physical activity pattern found on the Illyrian skeletal remains. This paper investigates the degree to which levels of physical activity changed for Illyrians during Greek and Roman colonial occupation.

Figure 1. Map of Rome, Italy, Epidamnus, Albania, and Corinth, Greece.

BIOCULTURAL CONTEXT

The Illyrians

The Illyrians are the ancestors of today's modern Albanians, and were an Indo-European people who first migrated into the area between the Adriatic Sea and Sava River during the Bronze Age circa 1200BC (Harding, 1992; Stipčević, 1977; Wilkes, 1992:68). Today this expanse of former Illyrian territory is made up of Albania, Bosnia and Herzegovina, Slovenia, Croatia, Serbia, Macedonia, Montenegro, and Kosovo. As the Illyrian population grew into tribal societies, their lifestyle began to rely on transhumant pastoralism, grazing pastoral herds in the mountains during the summer and moving down to the coastal plains for winter grazing (Galaty, 2002:113; Hammond, 1992:29). The exceptional pasturage of the Illyrian landscape allowed them to herd mules, horses, cattle, sheep, and goats (Hammond, 1992:29; Wilkes, 1992:109). The Illyrians used the hides and wool from their flocks to produce goods, such as clothing and leather. The Illyrian daily diet was influenced by their animals, and consisted mainly of milk, cheese, and meat (Hammond, 1992:30).

Many of Illyria's exports were traded with Greece before the Greeks colonized the region. These items included slaves and byproducts from Illyrian herds. The slaves were usually gathered from the various warring tribes in Illyria (Galaty, 2002:112). Greek historians even made note of the savageness of Illyria's warring tribes (Wilkes, 1992), many of whom were used as mercenaries. During the Peloponnesian Wars, the Spartans, Lyncus, and Macedonians talked of these warriors (Wilkes, 1992:117). The Illyrians were known for aggressive fighting with their neighbors, in particular the Macedonians (Wilkes, 1992). Hostilities finally ended at the hands of Alexander the Great in 336/5BC (Wilkes, 1992:121). Around this time, the Illyrian transhumant pastoral lifestyle began to give way to settlements on the plains of Illyria. Prior to Greek colonization of the region, a few farmsteads coexisted with the pastoralists; however, agriculture became the dominant practice after colonization for the Illyrians (Hammond, 1992; Wilkes, 1992).

Greek colonization

The Greeks began to establish colonies in the Mediterranean in the eighth century BC (Wilkes, 1992:110). Initial Greek colonization may have been a way of establishing outposts to maintain trade networks in the area. Two of the earliest Greek colonies in Illyria were Epidamnus (established in 627BC), and Apollonia (established c. 600BC) on the coast of the Adriatic Sea (Hammond, 1992:31; Galaty, 2002:119; Stipčević, 1977:38; Wilkes, 1992:110). Exports from Illyria included hides, wool, bitumen, metal ores, stock, timber, cereal grains, mercenaries, and slaves (Hammond, 1992; Wilkes, 1992). Initially many Greeks were unwilling to put their lives in jeopardy by living amongst the Illyrians; nevertheless, financial gain would overrule their initial fears, allowing Greek settlements to increase in the region (Wilkes, 1992:109). Epidamnus became a flourishing port of commerce for the Greeks. Having such a successful port at this location brought many trade voyages to southern Italy under Greek control (Wilkes, 1992). The port city of Epidamnus was also used to secure control over silver deposits

from mines located within the interior of Illyria (Wilkes, 1992:110).

Trade goods may have shifted from slaves to agriculture during the tenure of Greek colonization. This switch resulted in larger swaths of farmland for the expanding Greek population in the area (Hammond, 1992:37; Galaty, 2002:121). The result of this changeover in subsistence practices meant taking away prime grazing land from many Illyrian pastoralists (Galaty, 2002:121). However, by this time, more and more Illyrians were no longer transhumant, but were living in and around the Greek colonies. Inter-marriages took place between the Greeks and Illyrians, and a syncretism of their cultures immerged, as evidenced by a mixture of Greek and Illyrian burial items (Galaty, 2002:120; Wilkes, 1992:105). This assimilation would have led to economic, political, and social gain for many Illyrians in the province of Epidamnus, and in other Greek colonies of the region (Galaty, 2002:120).

Roman colonization

Just as colonization by the Greeks changed the Illyrian ways of life, so did Roman colonization. The Romans colonized Epidamnus in 229BC and immediately changed the name of Epidamnus to Dyrrachium (Wilkes, 1992:126-128). At this time, the city became the western link to the Via Egnatia, or Roman road, which connected the west to the east (Hoti et al., 2008:367). It is believed that Rome made extensive use of the silver mines in the interior of Illyria, because of the abundance of silver coins that were minted in Dyrrachium (Wilkes, 1992:129). Besides silver, the Romans made further use of pastoralism and cereal agriculture, in addition to the use of timber from the interior of the region (Wilkes, 1992). As with all other colonies under Roman rule, the inhabitants of Dyrrachium were expected to pay taxes. Taxes could be extremely burdensome and had many guises, such as indirect assessments, which came from customs, sales tax, and even levying of slave manumissions (freeing of ones slaves) (Wilkes, 1992:211).

Romans brought with them the latest procedures for the creation of pottery, and metallurgy, along with new techniques for construction that included masonry, brick, and tile (Wilkes, 1992:128). The spread of iron technology brought by the Romans facilitated the creation of a variety of farming instruments, which helped to increase agricultural output and efficiency (Wilkes, 1992:221). This new technology was seen in the architecture found in the Romanized towns, as well as in the pavement of streets, market places, schools, workshops, theatres, and even the temples used by the citizens (Stipčević, 1977:66). Roman power ended in Illyria in 378 AD, leaving Dyrrachium, like much of the Empire itself, to the hands of various foreign invaders (Wilkes, 1992:265).

Studies of Levels of Physical Activity Using Osteoarthritis

As mentioned above, this paper documents changes in physical activity during Greek and Roman occupation of Epidamnus. One of the best ways to document levels of physical activity is through the assessment of osteoarthritis. Osteoarthritis is a degenerative disease of the bone, which can be found in the articulating joints that enable us to move (Cope et al., 2005; Eshed, Gopher, Pinhasi, & Hershkovitz, 2010; Jurmain and Kilgore, 1995; Klaus et al., 2009; Lieberman et al., 2001; Lieverse et al., 2007; Ortner, 1968; Papathanasiou, 2005; Radin, 1983; Weiss and Jurmain, 2007). This disease is marked by the chronic breakdown of cartilage in the joints, typically caused by an individual's aging, injury, or mechanical stressors. Mechanical stressors can be defined as repetitive use of the weight bearing joints of our body. These stressors leave their marks on the tissues of our joints, and result in the joint's inability to withstand long-term usage (Radin, 1983:20). Osteoarthritis can cause pain, stiffness, and swelling, which can lead to a loss of motion and strength in the affected joint (Cope et al., 2005:391). Mechanical stressors can be influenced by the handedness of the individual, their sex, and cultural practices within their society (Cope et al., 2005; Eshed et al., 2010; Klaus et al., 2009; Lieberman et al., 2001;

Lieverse et al., 2007; Ortner, 1968; Papathanasiou, 2005; Weiss and Jurmain, 2007).

Because repetitive mechanical stress causes osteoarthritis, osteoarthritis is an indicator of manual labor (Bridges, 1991:379; Weiss, 2006:690). Modern professions with recurring physical activities, as seen in construction work, firefighting, cleaning, and janitorial services, will often lead to a rise in osteoarthritis (Vingård, 1996:678). Activities performed by people living during the Greek and Roman periods that may have contributed to the development of osteoarthritis include, but are not limited to, fishing, farming, building, artistry of pottery, or even working with metal (Cope et al., 2005:396; Mays, 2002:439; Morrey, 1992:409). The repetitiveness of these jobs can put a strain on the human skeleton from kneeling, squatting, standing, grasping, grabbing, and lifting heavy loads multiple times a day (Sandmark et al., 2000:21).

By looking at the variation in levels of osteoarthritis in the Illyrian people during the colonial periods, we can gain a more enhanced understanding of their levels of activity, and begin to address questions such as: Did employment of the Illyrians change during colonial rule? Were the Illyrians the new labor force of the region? Examining changes in osteoarthritis can help in answering these questions building a better perception of Illyrian prehistory. Anthropologists and historians can use this research to understand colonial policies as they relate to local labor of the Greeks and Romans at Epidamnus, Albania.

PURPOSE AND SIGNIFICANCE

Much of what is accepted about the Illyrians comes from outside sources; therefore, very little is known about Illyrian history from the perspective of its inhabitants (Stipčević, 1977:35-36). The inability of the Illyrians to document their own history makes it difficult for modern-day Albanians to understand the prehistory of the Illyrian people. However, bioarchaeology has the unique ability to tell the story of local individuals despite the absence of written documents. By examining physical activity in local populations during the Greek and Roman period, this study documents the various changes in the activity of the Illyrians during colonial rule by the Hellenistic Greeks, and later the Romans. Specifically, we test the null hypothesis that physical activity, as evidenced by osteoarthritis of the joints, in the Illyrian population at Epidamnus, Albania remained constant during the Hellenistic Greek and Roman colonial periods. To test this hypothesis, levels of osteoarthritis amongst the local Illyrian population during the Greek and Roman periods were compared.

This research is important because it offers information about the lives of a little known group, the inhabitants of ancient Albania, and provides evidence about variations in the lives of local peoples in different colonial contexts. The knowledge gleaned from this study can assist in giving a better interpretation of the impacts of colonial policy on local inhabitants in the Old World. This study gives Albanians a comprehensive view of their ancestors, by giving additional information about the impacts of various social, economic, and political forces that may have shaped their modern population. The study of osteoarthritis is also important, because it is something that has affected all of humanity, no matter what generation they live in. The results of this research, will give people a more complete interpretation of the consequences of globalization and bioculturalism and their impacts on modern society.

MATERIALS

In August 2013, a group of students and a UNC professor, Dr. McIlvaine, traveled to Durrës, Albania for two weeks to collect information related to this research project. During this trip, we collected data from approximately 80 human skeletons from the Greek and Roman periods at Epidamnus/Dyrrachium. These skeletal remains were excavated from the 1960s to early 2000s. In the hills northwest of Durrës, 29 burial sites containing remains from the Greek colonial period were found. Another area near the hills of Villa, Kokoman, and Dautaj, located north of the city, produced multiple graves. The remains found

north of Durrës were from the Greek through early Roman colonial periods (Davis, et al., 2003:45). The remains were housed at the Durrës museum in various containers. The skeletal remains were kept in individual boxes marked with burial information. This burial material gave us details about the period the remains dated to, where the individual was unearthed, what skeletal remains were found, and any other items enclosed in the graves (Table 1). The remains were divided by age, sex, and colonial period (Table 2; Table 3) to identify co-variation between these variables.

Table 1. List of Skeletal Materials.

Grave #	Identifying Burial Information	Age	Sex	Period
1	Nekropoli-Kodra E Dautes	30-70	F	Hellenistic
V 15	Nekropol 1965&1968 Eoikom	40-50	F	Hellenistic
5432	Dyrr. Nek. Kodra E Dautes	40-55	F	Hellenistic
Kafka 2	Kafka 2	30-45	U	Hellenistic
11	SW02-218	50-60	F	Hellenistic
Nekropol	K Dautes	25-35	M	Hellenistic
Vittima 2	Durres AMF. 07 US 642	25-35	F	Roman
V 12	AMF. 1966-1967-Eoikom	35-45	F	Roman
V 1	Amf. Durres	35-50	M	Roman
Tomba 2	AMF. 2007-Cassetta 10 US 698	35-45	F	Roman
417A	Amf. Durres	30-45	F	Roman
417B	Amf. Durres	20-50	U	Roman
V 8	G-Xh07	35-55	F	Late Roman
V 7	G-Xh07	30-40	F	Late Roman
V 10	G-Xh07	30-40	M	Late Roman
V 9	G-xh07	30-40	F	Late Roman
V 19	G-xh07	40-55	M	Late Roman
V 5	G-xh07	20-30	M	Late Roman
V 20	G-xh07	30-45	F	Late Roman
V 14	G-xh07	35-70	U	Late Roman
V 6	G-xh07	45-75	M	Late Roman
V 15	G-xh07	35-50	U	Late Roman
Kafka 19h	Termat Inventory #382	40-50	U	Late Roman
Kafka 19b	Termat Inventory #382	40-45	F	Late Roman
Kafka 19g	Termat Inventory #382	18-26	U	Late Roman
Kafka 19c	Termat Inventory #382	20-60	U	Late Roman
Kafka 19f	Termat Inventory #382	20-60	U	Late Roman

Table 2. Age distribution of Individuals.

Age	Total Greeks	Total Romans
Young Adult (21-34)	1	3
Mid Age Adult (35-49)	4	15
Older Adult (50+)	1	3

Table 3. Sex distribution of individuals.

Sex	Presence of OA	Without OA
Female	7	6
Male	4	2
Indeterminate	5	3

METHODS

All skeletal materials were scored according to the Standards for Data Collection (Buikstra and Ubelaker, 1994), and Global History of Health Project Codebook (Steckel et al. 2006), which are international standardized methods used by bioarchaeologists. All remains were inventoried, and notes were taken of skeletal and dental morphology and pathology. This information was used to determine skeletal age, sex, trauma, and disease.

This research project specifically documented osteoarthritis. To identify osteoarthritis, we examined all articulating joints of the skeletal remains. These joints included the shoulder, elbow, wrist, hip, knee, and ankle, cervical, thoracic, and lumbar vertebrae, along with the temporomandibular surface of the jaw (Buikstra and Ubelaker, 1994; Steckel et al. 2006). Osteoarthritis was then identified through marginal lipping (bony overgrowth), porosity (becomes porous, filled in with holes), eburnation (polishing of the bone, caused by bone on bone contact), or a combination of these three (Cope et al., 2005; Eshed et al., 2010; Jurmain and Kilgore, 1995; Klaus et al., 2009; Lieverse et al., 2007; Weiss, 2006). Figure 2 shows various forms of osteoarthritis found at Epidamnus/Dyrrachium.

We scored osteoarthritis for all individuals on a scale consisting of none/slight (1), moderate (2), and severe (3 or 4 depending on the severity) (Figure 3; Buikstra and Ubelaker, 1994; Steckel et al., 2006). It is important to use standardized methods to be able to compare the results of this study to other research on osteoarthritis (Jurmain and Kilgore, 1995:444). As we analyzed the remains, we also uploaded the information to the Global History of Health database, which will allow other physical anthropologists and bioarchaeologists to access the information. In order to determine statistically significant differences in osteoarthritis between the Greeks and Romans, chi-square tests were used to examine variation by colonial period for each joint. The *p*-value was set at 0.05, the standard level of significance. Chi-square *p*-values under 0.05 indicate significant changes in osteoarthritis among the Illyrian population during the Greek versus Roman periods.

Figure 2. Images showing: A (Left). porosity of the Ulna (elbow joint), B (Right). marginal lipping of the Thoracic vertebrae.

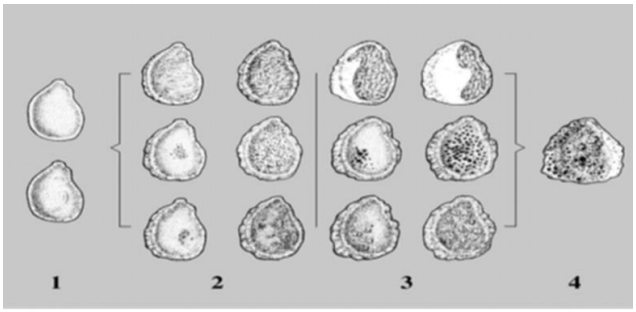

Figure 3. Standard for scoring osteoarthritis (image depicting shoulder socket) (from Steckel et al. 2006).

RESULTS

Of the 80 human skeletal remains analyzed, 27 were adults with long bones that could be observed for osteoarthritis (Table 4). Of these 27 individuals, six were from the Greek colonial period and 21 from the Roman period (as determined by the documentation found among each set of remains). We observed that osteoarthritis was more prevalent during the Greek colonial period, as opposed to the Roman, in all joints except thoracic and lumbar vertebrae (Figure 4).

As can be expected, osteoarthritis generally increased with the age of an individual (Figure 5). A higher number of individuals for the Roman period were of indeterminate sex. Nonetheless,

when comparing the known males to females, the females showed higher signs of osteoarthritis when compared to the males (Figure 6). However, these differences were not statistically significant.

Figure 7 shows the percentage of individual joints that were affected by osteoarthritis. Due to small sample size, we kept the joints affected by osteoarthritis together and did not divide them by right or left side.

As indicated above, osteoarthritis was more pronounced in all joint surfaces during the Greek than the Roman period. A Chi-square analysis indicated that this pattern was statistically significant in the shoulder ($p = 0.02$) and ankle ($p = 0.003$), and approaches significance in the elbow ($p = 0.09$), wrist ($p = 0.06$), and temporomandibular joint ($p = 0.06$) (Table 5).

Table 4. List of skeletal materials indicating presence of osteoarthritis (OA).

Grave #	Identifying Burial Information	OA	Location of OA
1	Nekropoli-Kodra E Dautes	No	
V 15	Nekropol 1965&1968 Eoikom	Yes	R shoulder L/R elbow, L/R knee, L/R wrist, L/R ankle, thoracic vert
5432	Dyrr. Nek. Kodra E Dautes	Yes	R elbow, L/R hip, R wrist, R ankle
Kafka 2	Kafka 2	No	
11	SW02-218	Yes	TMJ, L/R shoulder, L elbow, L hip, cervical vert
Nekropol	K Dautes	Yes	R ankle
Vittima 2	Durres AMF. 07 US 642	No	
V 12	AMF. 1966-1967-Eoikom	No	
V 1	Amf. Durres	No	
Tomba 2	AMF. 2007-Cassetta 10 US 698	Yes	R elbow, L hip, L knee, R wrist, thoracic vert
417A	Amf. Durres	No	
417B	Amf. Durres	No	
V 8	G-Xh07	Yes	L/R hip, thoracic & lumbar vert
V 7	G-Xh07	Yes	L elbow, thoracic vert
V 10	G-Xh07	No	
V 9	G-xh07	No	
V 19	G-xh07	Yes	L elbow, L knee, all vert
V 5	G-xh07	Yes	Thoracic vert
V 20	G-xh07	No	
V 14	G-xh07	Yes	L/R knee, R ankle
V 6	G-xh07	Yes	L/R shoulder, L/R elbow, L/R hip, L wrist, cervical vert
V 15	G-xh07	Yes	R knee
Kafka 19h	Termat Inventory #382	Yes	R hip, L ankle, thoracic & lumbar vert
Kafka 19b	Termat Inventory #382	Yes	R wrist
Kafka 19g	Termat Inventory #382	Yes	R knee
Kafka 19c	Termat Inventory #382	Yes	R elbow
Kafka 19f	Termat Inventory #382	No	

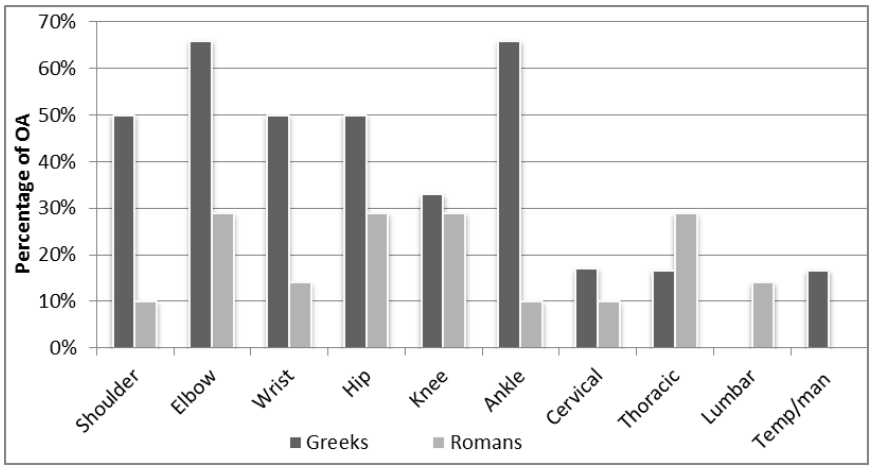

Figure 4. Percentage of individuals with osteoarthritis (OA) by period.

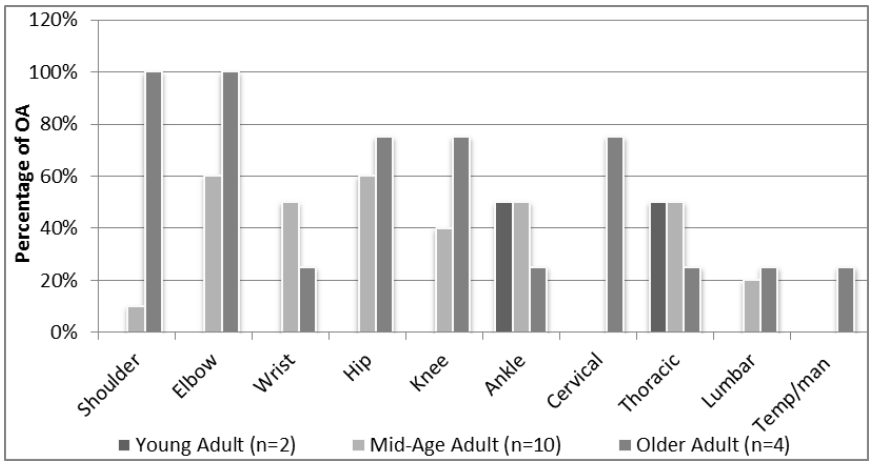

Figure 5. Percentage of individuals with osteoarthritis (OA) by age.

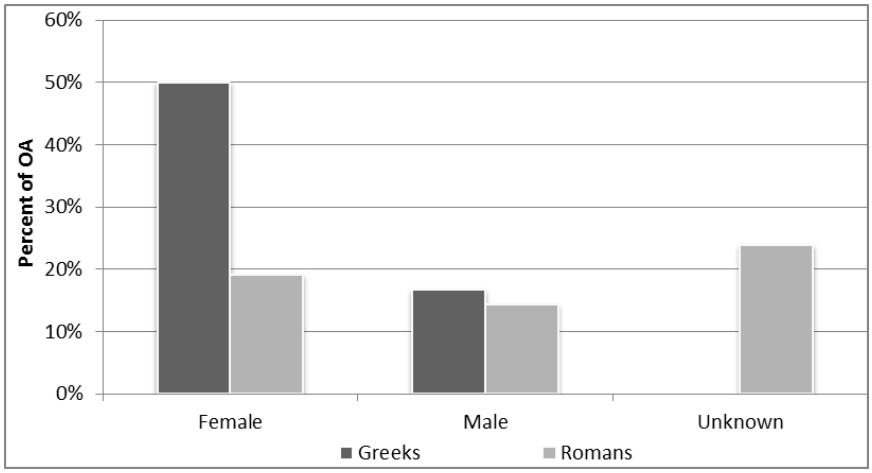

Figure 6. Percentage of individuals with osteoarthritis (OA) by sex.

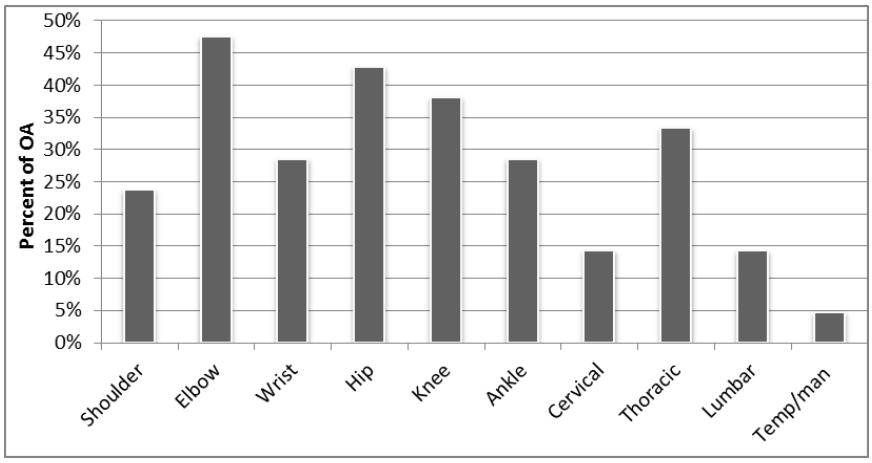

Figure 7. Percent of individuals with osteoarthritis (OA) per joint.

Table 5. Osteoarthritis (OA) during Greek and Roman colonization.

Joint %(n)	Greek	Roman	X_1^2	Significant Change
Shoulder	50 (6)	10 (21)	5.067	$p = 0.024$
Elbow	66 (6)	29 (21)	2.904	$p = 0.088$
Wrist	50 (6)	14 (21)	3.444	$p = 0.063$
Hip	50 (6)	29 (21)	0.964	$p = 0.326$
Knee	33 (6)	29 (21)	0.051	$p = 0.821$
Ankle	66 (6)	10 (21)	8.816	$p = 0.003$
Cervical	17 (6)	10 (21)	0.241	$p = 0.623$
Thoracic	17 (6)	29 (21)	0.344	$p = 0.558$
Lumbar	0 (6)	14 (21)	0.964	$p = 0.326$
Temp/mand	17 (6)	0 (21)	3.635	$p = 0.057$

DISCUSSION

The null hypothesis that levels of physical activity remained constant at Epidamnus, Albania during Greek and Roman colonial occupation (620-100BC) is not supported by these data. As indicated in Figure 4, Greek period individuals had a higher prevalence of osteoarthritis than individuals during the Roman period. This is comparable to what is seen in other regions following Roman colonization.

Following colonization by the Greeks at Apollonia (Albania), there was an increase in osteoarthritis in the upper body, but a decrease in osteoarthritis in the lower body (McIlvaine, 2012:181). As with the inhabitants at Epidamnus, the population at Apollonia changed from transhumant to a more sedentary lifestyle and this was reflected in osteoarthritis of the bones (McIlvaine, 2012:217).

After Roman colonization of Eboracum, the inhabitants of Britain showed an increase in osteoarthritis in the thoracic and lumbar vertebrae (Peck, 2009:131). According to Peck, "thoracic and lumbar vertebrae degeneration…suggest elevated load-bearing stresses being placed on the lower back…possibly exacerbated by heavy lifting" (2009:175). One of the reasons for the increase in thoracic and lumbar vertebral osteoarthritis following Roman colonization in Eboracum, Britain and Epidamnus, Albania could be related to Rome's roads being built from stone (Peck, 2009:175). The introduction of new road building and construction techniques could have caused of an increase in thoracic and lumbar

vertebral osteoarthritis in these Roman colonies (Stipčević, 1977:66).

The skeletal remains in the current study showed that osteoarthritis generally increased with the age of an individual, though we did see an exception with the thoracic vertebrae, in which osteoarthritis was higher for young and middle aged individuals (Figure 5). The higher level of thoracic osteoarthritis could imply that the males were working load-bearing jobs that would have involved lifting heavy objects and placing additional stress on the lower spine (Peck, 2009:175). Overall, the increases in osteoarthritis that are seen with age is to be expected since osteoarthritis is marked by the chronic breakdown of cartilage, which worsens with age (Cope et al., 2005; Eshed et al., 2010; Jurmain and Kilgore, 1995; Klaus et al., 2009; Lieberman et al., 2001; Lieverse et al., 2007; Ortner, 1968; Papathanasiou, 2005; Radin, 1983; Weiss and Jurmain, 2007).

When comparing osteoarthritis in males versus females at Epidamnus, we saw higher levels of osteoarthritis in the female population (Figure 6). However, these differences were not statistically significant. This is similar to what was observed by Peck (2009), who showed a higher prevalence of osteoarthritis in females compared to their male counter parts in Roman Britain. As with our findings at Epidamnus, Peck's findings were not statistically significant (Peck, 2009:138). The higher rate of osteoarthritis among females could be related to the type of work they were involved in such as grinding of grain or artistry of goods. Other possible reasons could have been from starting difficult occupations at earlier stages in their lives or having a variety of difficult gender designated jobs, such as cooking and child rearing (Peck, 2009:173-175). However, these sex differences in the development of osteoarthritis are not universal. For example, in a study on the population at Tombos, Nubia after Egypt's expansion during the New Kingdom Period (1550–1069BC), men showed a higher rate of osteoarthritis than women. The main reason for these differences can be found in the socioeconomic structure of the colony. Tombos is believed to have been an administrative center inhabited by the middle and upper class bureaucrats and their families (Schrader, 2012:68), which could conceivably be the reasoning to the variations found in male-female activity patterns (Schrader, 2012:67).

Historical documentation tells us that the Illyrian standard of living and physical activity changed after colonization of Illyria. The Illyrians were traditionally transhumant pastoralists, with their existence based upon traveling from various regions seasonally with their herds (Galaty, 2002; Hammond, 1992). However, once colonization by the Greeks occurred, prime grazing lands were replaced by settlements. Agriculture and trade dominated commerce under Greek expansion in Illyria (Hammond, 1992; Galaty, 2002; Wilkes, 1992). This change in subsistence practice likely correlated with the high levels of physical activity found in the Illyrian skeletal remains at Epidamnus during Greek colonial occupation.

Later, after Rome colonized the region, many Illyrians learned new technologies for various crafts and construction (Stipčević, 1977:66; Wilkes, 1992:128/221). The decrease in osteoarthritis at Epidamnus during the Roman period suggests that, with the introduction of new technologies that aided in pottery production, construction, and metallurgy, life may have become easier for the Illyrians (Stipčević, 1977:66; Wilkes, 1992:128/221). Our data supports the assertion that the introduction of more sophisticated technology reduced physical activity for the Illyrians under their control.

Our small sample size of skeletal remains, especially from the Greek period, means that the results should be considered tentative, and may not be a reflection of the population as a whole. The limitation of our pilot data makes it difficult to say whether Greek colonial rule was physically more burdensome than Roman rule, for the Illyrian population at Epidamnus. Collecting a larger sample of the population in the future could either confirm or refute these initial findings.

CONCLUSION

By analyzing osteoarthritis, we can gain a better understanding of the changes in the Illyrian workload, behavior, and activity following the Greek, and later Roman, conquest of the region. We found that during the Greek period there was an increase in osteoarthritis in all joints except the thoracic and lumbar vertebrae. One of the reasons for the overall joints being affected could be that during Greek colonial rule, individuals may have had to work harder in order to sustain their families after the change over from traditional pastoralism to agriculture (Galaty, 2002:121). However, under Roman occupation, individuals may have had the freedom/ability to pursue a variety of commercial opportunities. One of the reasons for the changeover in workload could be the newer technologies brought by the Romans (Stipčević, 1977:66; Wilkes, 1992:128/221). These results suggest that life may have been less physically taxing for the Illyrians under Roman rule when compared to the Greek period.

Globalization today causes populations from around the world to engage in increasing levels of cultural contact. Therefore, this research can provide information about the changes in physical activity during periods of cultural and political transition, such as with colonization. Thus, understanding the biocultural consequences of culture contact in a variety of contexts may prove beneficial for modern societies.

ACKNOWLEDGMENTS

This research was funded in part by a Summer Undergraduate Research Stipend from the University of Northern Colorado Office of Undergraduate Research, awarded to Jennifer Wright, and a Summer Support Initiative and New Projects Program Grant from the University of Northern Colorado Office of Sponsored Programs, awarded to Dr. Britney McIlvaine.

I would also like to thank my mentor, Dr. McIlvaine, Kaytlyn Devers, Katelyn McEachern, and the McNair Scholars program for their assistance and contributions through the process of completing this research.

REFERENCES

Belcastro G, Rastelli E, Mariotti V, Consiglio C, Facchini F, Bonfiglioli, B. 2007. Continuity or discontinuity of the life-style in Central Italy during the Roman Imperial age-early Middle Ages transition: diet, health, and behavior. Am J Phys Anthropol 132:381-394.

Bridges PS. 1991. Degenerative joint disease in hunter–gatherers and agriculturalists from the Southeastern United States. Am J Phys Anthropol 85:379-391.

Buikstra JE, Ubelaker DH. 1994. Standards for data collection from human skeletal remains. Arkansas Archaeological Survey Research Series 44.

Cope JM, Berryman AC, Martin DL, Potts DD. 2005. Robusticity and osteoarthritis at the trapeziometacarpal joint in a Bronze Age population from Tell Abraq United Arab Emirates. Am J Phys Anthropol 126:391-400.

Davis JL, Hoti A, Pojani I, Stocker SR, Wolpert AD, Acheson PE, Hayes JW. 2003. The Durrës Regional Archaeological Project: Archaeological Survey in the Territory of Epidamnus/Dyrrachium in Albania. *Hesperia*. 72:41-119.

Eshed V, Gopher A, Pinhasi R, Hershkovitz I. 2010. Paleopathology and the origin of agriculture in the Levant. Am J Phys Anthropol 143:121-133.

Galaty ML. 2002. Modeling the formation and evolution of an Illyrian Tribal System: ethnographic and archaeological analogs. In: Parkinson WA editor. The Archaeology of Tribal Societies. Ann Arbor MI: International Monographs in Prehistory. 109-122.

Hammond N. 1992. The Relations of Illyrian Albania with the Greeks and Romans. In: Winnifrith T editor. Perspectives on Albania. New York: St. Martin's Press. 29-39.

Harding A. 1992. The Prehistoric Background of Illyrian Albania. In: Winnifrith T editor. Perspectives on Albania. New York: St. Martin's Press. 14-28.

Hoti A, Metalla E, Shkodra B, Wilkes J. 2008. The Early Byzantine Circular Forum in Dyrrachium (Durrës, Albania) in 2002 and 2004-2005: Recent Recording and Excavation. Ann Br Sch Athens. 103:367-397.

Jurmain RD, Kilgore L. 1995. Skeletal evidence of osteoarthritis: A paleopathological perspective. Ann Rheum Dis 54:443-450.

Klaus HD, Larsen CS, Tam ME. 2009. Economic intensification and degenerative joint disease: Life and labor on the postcontact north coast of Peru. Am J Phys Anthropol 139:204-221.

Larsen CS. 1987. Bioarchaeological interpretations of subsistence economy and behavior from human skeletal remains. Adv Archaeol Method Th 10:339-445.

Larsen CS. 1994. In the wake of Columbus: Native population biology in the Postcontact Americas. Am J Phys Anthropol. 37:109-154.

Larsen CS, Griffin MC, Hutchinson DL, Noble VE, Norr L, Pastor RF, Ruff CB, Russell KF, Schoeninger MJ, Schultz M, Simpson SW, Teaford MF. 2001. Frontiers of contact: Bioarchaeology of Spanish Florida. J World Prehist 15:69-123.

Lieberman DE, Devlin MJ, Pearson OM. 2001. Articular area responses to mechanical loading: Effects of exercise age and skeletal location. Am J Phys Anthropol 116:266- 277.

Lieverse AR, Weber AW, Bazaliiskiy VI, Goriunova OI, Savel'ev NA. 2007. Osteoarthritis in Siberia's Cis-Baikal: Skeletal indicators of hunter-gatherer adaptation and cultural change. Am J Phys Anthropol 132:1-16.

Mays SA. 2002. Asymmetry in metacarpal cortical bone in a collection of British Post-Mediaeval human skeletons. J Archaeol Sci 29:435-441.

McIlvaine BK. 2012. Greek Colonization of the Balkans: Bioarchaeological Reconstruction of Behavior and Lifestyle during Corinthian Colonial Expansion into Ancient Apollonia, Albania. PhD Dissertation. OH: The Ohio State University.

Morrey BF. 1992. Primary degenerative arthritis of the elbow. J Bone Joint Surg Am 74-B:409-413.

Ortner DJ. 1968. Description and classification of degenerative bone changes in the distal joint surfaces of the humerus. Am J Phys Anthropol 28:139-155.

Papathanasiou A. 2005. Health status of the Neolithic population of Alepotrypa Cave Greece. Am J Phys Anthropol 126:377-390.

Peck JJ. 2009. The biological impact of culture contact: a bioarchaeological study of Roman colonialism in Britain. PhD Dissertation. OH: The Ohio State University.

Radin EL. 1983. The relationship between biological and mechanical factors in the etiology of osteoarthritis. J Rheumatol 95:20-21.

Ruff CB. 2008. Biomechanical Analyses of Archaeological Human Skeletons. In: Katzenberg MA & Saunders SR Authors. Biological Anthropology of the Human Skeleton Second Edition. Hoboken NJ: Wiley-LISS. 183-201.

Sandmark H, Hogstedt C, Vingård E. 2000. Primary osteoarthrosis of the knee in men and women as a result of lifelong physical load from work. Scand J Work Environ Health 26:20-25.

Schrader SA. 2012. Activity patterns in New Kingdom Nubia: An examination of entheseal remodeling and osteoarthritis at Tombos. Am J Phys Anthropol 149:60-70.

Steckel RH, Larsen CS, Sciulli PW, Walker PL. 2006. Data collection codebook for the Global History of Health Project.

Stipčević A. 1977. The Illyrians: History and culture. Park Ridge, NJ: Noyes Press.

Vingård E. 1996. Osteoarthrosis of the knee and physical load from occupation. Ann Rheum Dis 55:677-678.

Weiss E. 2006. Osteoarthritis and body mass. J Archaeol Sci. 33:690-695.

Weiss E, Jurmain R. 2007. Osteoarthritis revisited a contemporary review of etiology. Int J Osteoarchaeol 17:437-450.

Wilkes J. 1992. The Illyrians. Oxford UK & Cambridge USA: Blackwell. 3-213.