ANIMAL ECONOMY AND CONSUMPTION IN THE ADMINISTRATION SECTOR OF HITTITE CAPITAL ŠAPİNUWA

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Keywords: *Zooarchaeology •Animal Husbandry •Hittites •Ortaköy/Šapinuwa*

Abstract: During the excavations carried out in Ortaköy-Šapinuwa a large number of animal bones were found along with other finds and in various contexts. This article aims to discuss the animal husbandry and meat consumption patterns based on the zooarchaeological study of a bone assemblage recovered from the excavation area of Tepelerarası, Area G. The area represents a metal workshop dating to the 14th century BC. The materials recovered from this area, called Workshop I, are not *in situ.* It is thought that after the workshop fell into disuse, it was filled with debris, which was brought from other, likely nearby, locations of the city, for flattening the terrain. The results of our analysis showed that animal consumption was based on sheep and goats. Cattle are found in very low numbers. Pig and a few other species are minimally represented in the bone assemblage. While the mortality profile of cattle is dominated by young animals slaughtered for their meat, those of sheep and goat show evidence for a mixed economy where both secondary products and meat provision were important.

HİTİT BAŞKENTİ ŞAPİNUVA'NIN YÖNETİM BÖLGESİNDE HAYVAN EKONOMİSİ VE TÜKETİMİ

Anahtar Kelimeler: *Zooarkeoloji •Hayvancılık •Hititler •Ortaköy/Şapinuva*

Özet: Hititlerin bir diğer başkenti olan Ortaköy-Şapinuva'da yapılan kazılarda diğer buluntu grupları ile beraber oldukça fazla miktarda hayvan kemikleri de ele geçmiştir. Söz konusu kemiklerin büyük bir kısmının şehrin mutfak atıklarını temsil ettiği anlaşılmakla beraber ayrıca kurban kalıntıları da açığa çıkarılmıştır. Bu makale, Tepelerarası Bölgesi G Alanı kazı alanından ele geçen kemik grubu üzerinden şehrin hayvancılık ekonomisini ve tüketim modellerini açıklamayı amaçlamaktadır. Alan MÖ 14. yüzyıla tarihlenen bir metal atölyesini temsil etmektedir. İşlik I olarak adlandırılan bu alandan ele geçen malzeme grubunun *insitu* olmadığı

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belirtilmektedir. Atölyenin işlevini yitirmesinin ardından düzenleme amacıyla başka bölgelerden getirilen ve şehrin atıkları olarak nitelendirilen enkaz toprağı ile doldurulduğu düşünülmektedir. Yapılan analiz çalışmalarının ardından hayvancılık ekonomisinin temelinin koyun ve keçiye dayandığını söylemek mümkündür. Sığırın oldukça az bir miktarda temsil edildiği ve sığır tüketiminde daha çok genç bireylerin tercih edildiği gözlemlenmiştir. Domuz ve diğer birkaç tür ise topluluk içerisinde minimum düzeyde temsil edilmektedir. Sığır tüketiminde çoğunlukla daha genç hayvanların yer aldığını söylemek mümkündür. Koyun ve keçilerin ikincil ürünlerinden faydalanıldığı açıkça gözlemlenmesine rağmen et tüketim stratejisi için de temel türler oldukları söylemek mümkündür.

Introduction

The Late Bronze Age Hittite culture flourished on the Central Anatolian plateau between 1650 – 1190 BC. Many cities were established in the area with a high concentation in northern central Anatolia and around the contemporary province of Çorum. Here we study animal bone remains recovered from one such large city, namely Ortaköy-Šapinuwa. Our aim is to explain the livestock raising activities, which consitituted a large part of the Hittite economy, using the studies we have carried out on animal bones.

Area G, where the animal bones we examined were found, was used as a metal workshop during the 14th century BC. After the workshop lost its function, it was filled up with debris. Soil, ceramics and animal bones constitute the majority of this fill. Therefore, the animal bones we examined represent the food remains of a part of the city. Because Area G is located in the Tepelerarası sector of the city, where administrative buildings were found, and considering that the rulers of the city lived in this area, it is possible to say that the animal bones we examined represent the consumption of this elite class and/or the palace tradesmen and bureaucrats.

The location of the city on a high plateau dissected by small rivers and canyons and with cold winters and relatively hot summers provided a varied but harsh environment. Valleys formed by rivers in terms of proximity to water resources, plains that provide favorable conditions for economic activities, have often been the guiding factors for Anatolian people when choosing a living space, in all periods. At the same time, large plateaus and pastures became natural highland areas for livestock activities[1]. The harsh winter months of Central Anatolia would have completely obstructed the connections between the roads following the narrow valleys and the plains. This situation not only makes it difficult to keep the state together, but also brings various difficulties in terms of economy[2].

Archaeological background

Hitites

The Hittites came to Anatolia in small groups in the 2nd millennium BC and settled in the Kızılırmak river bend. It is thought that the Hittites, who politically united Anatolia and formed the first empire in these lands, were of Indo-

[1] Ünsal 2012, 209; Dörfler et al. 2011.
[2] Alpaslan 2013, 506; Dörfler et al. 2011.

European origin. Until the 20th century, there was very little information about them. However, as a result of the meticulous work of Hittitologists and archaeologists, it has been revealed that the Hittites established a complex political entity in Anatolian lands before the heyday of the Babylonian and Assyrian civilizations. The Hittites more likely descended from the east, through the Caucasus, and began to settle first in Southeastern Anatolia and then in Central Anatolia[3].

The Hittites, who firstly lived under the administration of local kingdoms already established in the regions they settled, gradually took Anatolia under their dominion[4]. The traditions of the Hattians, who comprised the majority of the native people, influenced the Hittites. With the establishment of the Hittite state, the Hatti principalities were connected to the state administration and a political unity was achieved in Anatolia. The Hittite state flourished between 1650-1190 BC and it is now known as the Great Hittite Empire[5].

Hattusha, the capital of the Hittite Empire, is located near the comtemporary Boğazkale district of Çorum province and flourished in the 2nd millennium BC. Hattuşili I, the first king of the Hittite State, chose this name, which means "man of Hattusha" and declared the establishment of such a powerful state for the first time in Central Anatolia.[6].

There are about 2000 place names in Hittite cuneiform texts, and archaeological research has revealed many settlements from the Late Bronze Age. Despite this, very little relationship has been established between archaeological sites and written sources mentioning cities. Among the most important cities are: Boğazköy= Hattusha, Ortaköy=Šapinuwa, Maşat Höyük=Tapikka, Kuşaklı=Šarišša, Oymaağaç=Nerik and Kayalıpınar=Šamuha[7].

The site of Šapinuwa

Ortaköy, in the vicinity of which Šapinuwa is to be found, is located 53 km southeast of Çorum, in north Central Anatolia, south of the Black Sea Mountains, and at the end of the Kelkit Valley, which forms a natural passage from Central Anatolia towards the Caucasus. The Hittitie city of Šapinuwa is located 3 km southwest of Ortaköy town center[8]. Šapinuwa is a wide-spread and flat settlement on a plateau extending as terraces on the northern slopes of a valley created by the Özderesi river, a branch of the Çekerek River. The Hittites did not settle on the nearby mound where local people were already living, but they created a new city on a wide flat area. The city extended to about 3 km in the east-west direction and 2.5 km in the north-south direction[9].

As a result of the studies on the tablets and other archaeological finds, it was determined that the name of this Hittite city was Šapinuwa[10]. The archives discovered in Šapinuwa showed that this was the second largest archive in Anatolia, after Boğazköy. In addition, the studies on

[3] Akurgal 2005, 36.
[4] Başoğlu 2010, 150.
[5] Sevinç 2008, 12.
[6] Schachner 2013, 156.
[7] Mielke 2013, 136.
[8] Süel 1996, 2.
[9] Süel 1996, 3.
[10] Süel 1995, 283.

the cuneiform tablets recovered from the excavations revealed that this city was another capital of the Hittite state[11]. Šapinuwa, which extends to 9 km^2, appears to have had administrative power over a very wide area around it, including further settlements[12].

The Hittite city of Ortaköy – Šapinuwa was discovered during a survey conducted in 1988-1989 under the direction of Prof. Dr. Aygül Süel and Dr. Mustafa Süel. In the Šapinuwa excavations, which started in 1990, many structures with administrative, commercial and religious characteristics have so far been identified. Excavations have been carried out in two separate areas: in the Tepelerarası area, which is defined as the "acropolis" where the administrative buildings are located, and the Ağılönü area, which is known as the ritual area of the city[13] (Fig. 1).

Tepelerarası, Area G

The highest point of the city, the Tepelerarası area, is the location where the most important structures are located[14]. The major structures in this sector are Building A, the largest building where royal materials and cuneiform archives have been exposed, Building B, where more than 70 pithoi are located, and religious buildings Buildings C and D[15] (Fig. 2).

Close to Building D is located Area G. Excavations in Area G, where the animal bones of our study were found, started in 2014 and continue to date (Fig. 3). In the first excavation season, 4 trenches measuring 5x5 m were dug. Among the finds, bellows, blowers, pieces of crucibles and materials interpreted as molds were found. In the excavations carried out in 2015, the discovery of two furnaces next to the bellows, a partially destroyed blower and copious amounts of slag showed that metal smelting activities were carried out in this area. As a result, it was concluded that Area G was used as a workshop[16].

The animal bones in our study include the material obtained from trenches 3, 4, 5 and 6 of Area G in the years 2014-2015 (Fig. 4). The animal bones found here represent some of the food waste of the city. In addition, bronze material residues, which were melted and poured into molds here, oxidized over time and gave a green color to the surrounding soil. This effect is clearly seen in the color of the soil as well as in other archaeological materials found in the area. This color change was also observed in 9.5% of the animal bones that were located closer to the workshop material. There is no difference between the other bones and the bones that have a green color found here, except for their color.

Methodology

Analysis of some of the bones was carried out in the Ortaköy-Šapinuwa excavation laboratory as a preliminary study in the 2019 excavation season. The remaining material was divided into 2 sets. One set was brought to the Environmental Archaeology Research Unit of the

[11] Süel – Süel 2019, 300.
[12] Süel – Süel 2004, 61.
[13] Süel – Süel 2019, 312.
[14] Süel – Süel 2019, 300.
[15] Süel – Süel 2019, 303.
[16] Süel 2017, 66-70.

Department of Settlement Archeology of the Middle East Technical University (METU) after the necessary permits were obtained. The other set of materials was kept in the excavation house depot and studied in the 2020 excavation season.

Each bone and bone fragment (N=8112) was examined one by one according to standard zooarchaeological methods. The identification of the bone fragments was made using modern animal bone reference collections and atlases. The data were entered in the database (*Microsoft Access*) according to species, skeletal element, bone portions present (diagnostic zones), directions (right-left), age, malformations seen on the bone (pathology) and human modification marks (burning, butchery). In order to calculate the species proportions, the Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) methods were applied. To calculate the NISP, we counted all the bone and bone fragments one by one. For MNI calculations, we counted the minimum number of each element of each species present after taking into account the direction (right/left) and bone fusion. For each species the element that gave us the highest count according to these criteria was taken as the MNI of that species. We also performed a calculation based on NISP to indicate the frequency of each element in the skeleton representation tables.

Epiphyseal fusion of bones, tooth eruption and wear and horn growth stage methods are applied to determine the age at death of animals in archaeological sites[17]. In our study, Payne[18] and Grant's[19] methods were applied to record the tooth wear data. Hambleton's coding system was used in the evaluation of ages at death of sheep and goat because it offers a more accurate comparison and its ease of application (Table 1).

Skeletal elements' fusion is evaluated in the earliest and latest age ranges based on age estimates made by Zeder[20]. Estimated age ranges at which fusion occurred are tabulated for sheep/goat bones.

Species Proportions

Sheep, goats and cattle are the most frequently found domesticated species in the Hittite Age, and it is known that these species formed the basis of the Hittite livestock economy. Other domesticated species include donkeys, pigs, horses, mules and dogs[21]. Calculations for the species were made using NISP (Number of Identified Specimens) and MNI (Minimum Number of Individuals). The results of the calculations are shown in Graphs 1, 2, 3 and Tables 3, 4.

According to the NISP calculations in Table 1 and Graph 1, sheep/goat (*Ovis aries/Capra hircus*) bones constitute the most numerous bone group of the assemblage with 60.5% (Graph 1). Amongst sheep and goats, goats are more abundant (1.38%) than sheep (0.71%).

The second most commonly found animal is cattle (*Bos taurus*) which is

17 Greenfield – Arnold 2008, 836.
18 Payne 1973.
19 Grant 1975.
20 Zeder 2006.
21 Dörfler et al. 2011, 99-116.

represented with a low percentage of 6.04%. Clearly, goat, sheep and sheep/goat bones are considerably more abundant compared to cattle bones. Therefore, it is possible to say that sheep/goat husbandry constitutes the basis of the livestock economy at least as detected in the particular area under study. However, if we make a general assessment for the consumption of meat, as only one head of cattle offers much more meat than one sheep or goat, we could argue that all three animals contribute significantly to meat consumption.

Among domesticated species, after sheep, goats and cattle, pig (*Sus scrofa domesticus*) is also found represented by a tiny 0.1%. In addition, some bones of other animals were found. Dog (*Canis lupus familiaris*) is 0.05%, donkey (*Equus asinus*) is represented by 0.02% and horse (*Equus caballus*) by 0.01%. It is known that the Hittites did not consume horses and donkeys and that these species lived in areas far from human habitatation areas[22]. Given that this bone assemblage consists of kitchen waste, the low representation of these animals is not surprising. Since they did not consume these species, it is only logical that their bones were not found in large quantities[23].

Among the bones we could not identify at species level, large sized mammals (cattle and animals of equal size to cattle) constitute 5.52%, while medium sized mammals (sheep/goat sized animals) are represented by 1.31%. The higher fragmentation of cattle sized bones makes it difficult to identify them on a species basis. This may have caused some biases in the species proportions data. More of the sheep sized animals could be identified resulting in a higher NISP, as is also indicated in the literature[24](Table 2).

In Graph 2, the category "other species", which has the very low ratio of 0.67%, includes wild animals. The presence of wild species is important in terms of explaining hunting activities and as potential ecology indicators. The red deer (*Cervus elaphus*) whose remains are found at Šapinuwa is represented by only 0.2%. It is known that three deer species, namely red deer (*Cervus elaphus*), fallow deer (*Dama dama*) and roe deer (*Capreolus capreolus*) existed in Anatolia in the 2nd millennium BC. Among these three species, red deer are especially common. The high ratio of representation of red deer in studies conducted so far indicates that the species in question is abundant in Central Anatolia. According to the faunal data of Boğazköy, it is remarkable that 3.9% of all animal remains and more than half of wild animal remains are represented by red deer. Red deer ratios show that its hunting was favoured by the Hittites and it constitutes part of their diet[25]. At the same time, the presence of red deer in an area indicates the existence of open and wide forest lands and provides inferences about the local environment[26].

Another wild species is the hare (*Lepus europaeus*), represented by 0.14%. Among the animal bones we examined,

[22] Collins 2007, 121.
[23] Dörfler et al. 2011, 116.
[24] Marsall – Pilgram 1993, 261
[25] Collins 1989, 140-141.
[26] Dörfler et al. 2011, 119.

traces of the skinning process were found on one distal tibia bone of a hare.

Bird (*Aves*) remains in the area are represented by 0.07%. The presence of bird bones among food waste suggests that these animals were consumed (Graph 2). Amongst birds we recongised the patridge and perhaps goose or a goose sized bird.

When the MNI values in Graph 3 are examined, we observe some differences compared to the NISP values. Firstly, MNI percentages for all species are higher than those of NISP. This is because the NISP calculations included the generalised categories of cattle sized, sheep size, pig size and goose size bones. However, these categories are not included in the MNI table. Therefore, the reason that MNI ratios are higher than NISP can be explained by the inclusion of these generalized categories in the NISP calculations[27] (Graph 3).

A comparison of NISP and MNI is given in Table 4 and includes only the main domestic animals. This aims to eliminate the effect of other minor species and categories described above on calculations. Sheep/goat bones percentages drop by 13.7% by the MNI method whilst an increase of 8.8% for sheep and 5.5% for goats is observed in MNI calculations compared to NISP. This difference can partly be explained by the fact that the generalized categories mentioned in the previous paragraph are not included in the MNI calculations.

More importantly, in the MNI calculations, the sheep percentages are slightly higher than those of goat whilst in the NISP the opposite was true. The reason for this is that in the NISP calculations the horns of sheep and goat were included and it was clear that we had many more goat horns than sheep. Because sheep horns are more fragile than goat horns, the former are less likely to be preserved. Accordingly, we would consider the MNI results more reliable and propose that sheep bones were actually more abundant than those of goat. For cattle bones, only a 0.5% difference was observed between the MNI and NISP ratios (Table 3).

The general impression obtained from the species ratios regarding domesticated species is that caprines (sheep and goats) are the basis of animal husbandry. Perhaps cattle breeding is more troublesome as they need more water and food than caprines, hence they were not preferred[28]. Alternatively, these findings may only represent the meat consumption as reflected at this particular area of Šapinuwa. Since Šapinuwa is a very large settlement, data derived from one location of it are not sufficient to explain in full the livestock economy of the entire city.

Skeletal Elements Proportions

The skeletal element proportions of animal remains recovered from an archaeological site and the abundance of different skeletal fragments may represent selective transport or consumption[29] (Table 4). We applied this method to sheep/goat remains and cattle as the rest

[27] Ioannidou Pişkin 2012, 429.
[28] Çakırlar 2008, 257-259.
[29] Lupo 2006, 20.

of the species were present with very few bone fragments for such analysis to be meaningful.

Sheep/goat

The foreleg (scapula, humerus, radius, ulna, radius+ulna, metacarpal) is represented by 36.2%, the hind legs (pelvis, femur, tibia, astragalus, calcaneum, metatarsal) by 41%, the head (mandible and maxilla, teeth and eye orbits) % 11.3 and finger bones are represented by 11.5%. The hind legs appear to be represented with a higher ratio compared to other anatomical regions, neverthless this is due to the fact that we included in this calculation the astragalus and calcaneum whilst we did not include carpals for the front leg. When these tarsals are excluded from the calculation the hind leg scores 36.3% which is almost equal to the fore leg. The head region and finger bones are represented with a lower ratio compared to the fore and hind legs. A number of explanations can be proposed for this imbalance. First, the meaty portions of the carcass were selectively brought to the site for consumption after slaughtering, whilst less meaty parts such as the lower legs represented by fngers and head remained in the slaughter area. This, in turn, suggests that the slaughtering was not done in the location we studied and parts only of the carcass were transported in pieces and consumed[30]. Another possibility is that the better represented skeletal elements are less affected by taphonomic process. Especially the 2nd and 3rd phalanges may have been overseen and not collected during excavation due to their small size (Graph 4) whilst head elements, being more fragile, may have suffered higher destruction.

Cattle

The skeletal element representation of cattle, calculated on 490 bone fragments, is shown in Table 5 and Graph 5. The foreleg (scapula, humerus, radius, ulna, metacarpal) is represented by 31.6%, while the hind leg (pelvis, femur, tibia, astragalus, calcaneum, metatarsal) is represented by 31.5%. A difference of only 0.1% was observed between them. The phalanges are 26.4%, and the head (mandible and maxilla, teeth and orbits) 10.5%, which for both cases are lower compared to the legs. The 1st phalange bone is the most frequent skeletal element with 11.7%. The 2nd and 3rd phalanges are also abundant.

The low representation of the skull bones indicate that, just like in the case of sheep/goats, the slaughtering might have been done outside the area we have studied and the portions of the carsass with much meat were preferentially transported here.

We should note here that we had many small fragments of mandible. We did not include these in the calculations. Instead we preferred to include only mandibles that retain their teeth. These small mandible pieces indicate that this bone might actually have been more abundant. In addition, metacarpals and metatarsals of cattle are very rare in the bone assemblage. This is more likely due to the selection and removal of these bones for bone working.

[30] Silibolatlaz Baykara 2014, 77.

Ageing

For zooarchaeologists, age data of mammal populations are of great importance in order to understand and explain the exploitation of animals[31]. The main purpose of determining the age at death of animals is to examine the economic aims of livestock management[32]. Epiphyseal fusion is one of the most common methods used for age determination. However, it is of limited use because it can only give age estimates for sub-adult individuals. In addition, bones of young individuals are more affected by taphonomic processes than the fused bones of adults. Therefore, the use of epiphyseal fusion data may overestimate the proportions of adults in a population[33]. Another and more reliable method of ageing is the eruption and wear stages of the teeth. The application of this method gives relatively more precise results compared to the epiphyseal fusion method[34].

Age data based on tooth wear stages are given in Graph 6 for sheep, Graph 7 for goat and Graph 9 for sheep/goat. Analyses were conducted on 50 mandibles in total. Sheep are represented by 20, goats 6 and sheep/goat by 24 mandibles. Since the cattle mandibles were very few (N:2), tooth ageing studies could not be performed. According to the ages obtained from the tooth wear stages, almost half of the sheep (45%) were killed between 1-2 years old. Considering this finding, it is thought that a large number of sheep were kept for meat production. 15% of the individuals were slaughtered at the age of 2-3 years old, 10% of them at the age of 4-6 years old and 20% of them at the age of 4-8 years old. Equal frequencies are found for the ages of 6-8 (5%) and 8-10 (5%) years. In total, the individuals slaughtered above 4 years old comprise a large enough percentage of the flocks (40%) to show that many animals were kept above the prime age for meat production. Hence secondary products such as milk and wool were also important[35] (Graph 6).

In contrast to sheep, goat samples consist of infants and young individuals. 66.7% of the samples represent newborns between 1-2 months and 33.3% of them represent young individuals between 6-12 months. Therefore, it can be assumed that goats were kept mostly for their milk and meat. However, in our study, many of the mandibles had missing teeth and could not be allocated within meaningful age ranges. These are excluded from this calculation. As a result, the workable sample was small and perhaps not suffiecient to draw firm conclusions.

In the group of sheep/goat, the ages coohorts of 1-2, 2-3 and 4-8 years' old all hold the same percentage of 21.4% while the 3-4 and 6-8 years olds score each 14.3%. An additional 7.2% consist of very young animals between 2-6 months. The fact that the age distribution includes all age ranges from infants to older individuals suggests that animals were not kept for a single economic output. Nevertheless, we can observe a reduction of

31 Grant 1978, 103.

32 Hambleton 1999, 61.

33 Hambleton 1999, 61.

34 Albarella et al. 2017, 758.

35 Alparslan 2013, 510; Dörfler et al. 2011, 116.

slaughter for animals at the age of 2-3 and 7-8 years. This indicates that most of the animals surviving to the age of 2 years, which is the maximum for economic meat harvesting, lived for a few more years, more likely for the expoitation of their secondary products. Also we see that we do not have many old animals slaughtered in our assemblage. This may be related to the fact that these animals were consumed in an elite context where the less palatable meat of old animals was not preferred. It is interesting to note that in the group sheep/goat we do not have many deaths of very young animals at 2-6 months and between 1-2 years. Nevertheless, if we look at the data given separately for sheep and goat we see that the majority of data fall exactly at these ages. We should better evaluate all these 3 groups of data together fromm which we can conclude that actually most of the data of the combined sheep/goat category indicate pleanty of deaths at an early age, which matches a "meat-consumption" mortality profile (Graph 8).

The mortality profile created on skeletal element fusion for sheep and goat is based on age estimates made by Zeder[36] (Table 4). Graph 9, 10, 11, 12 and 13 show the percentages of the epiphyseal fusion stages of sheep/goat bones. Here, we use the term "fusing" for epiphyses that are at the stage of completing their development and starting to fuse with the shaft of the bone. There are no bones belonging to Stage A (0-6 months/infant) and Stage F (over 48 months/adult). In Stage B, where the age of fusion is specified as between 6-12 months, the bones in the fusing stage are 12.50%. Half of the samples (50%) consists of unfused bones, therefore half of the individuals were slaughtered very young and under 12 months of age. Fused bones are represented by 37.5% (Graph 9).

In Stage C, (12-18 months), 17.40% is comprised of fusing bones, 76.10% of unfused bones and 6.50% of fused bones. It is clear that most of the individuals (76.10%) were slaughtered under the age of 18 months (Graph 10).

Unfused bones in Stage D, (18-30 months), are represented with a very high ratio of 92.8%. Bones at the fusing stage are 4.80%, while fused bones are only 2.40%. Almost all of the samples (92.8%) represent young individuals slaughtered bellow 30 months (Graph 11).

In Stage E, (30-48 months), we found only fused and unfused bones. Unfused bones are represented by 28.6% and fused bones by 71.4%. Accordingly, most of the bones (71.4%) represent individuals of 48 months and/or older (Graph 12).

According to these results, the peak in slauhtering is observed between 6 and 18 months of age. After this age, most of the animals appear to survive to at least 48 months old. These results agree by and large with the tooth wear analysis and suggest that caprines (sheep/goat) are kept for meat but also for secondary products (Graph 13).

[36] Zeder 2006.

Cattle

The bones of cattle that could be aged are very few. The majority of them (44) are unfused, therefore showing that these animals could not have been more than a maximum of 4 years old. In more detail, 1 proximal radius, 6 unfused proximal 1 phalanx and 1 proximal second phalange show an animal of less than 1.5 years old. One distal metacarpal, one distal metacarpal and 5 distal tibiae (3 of which are of the left side) indicate at least 3 animals of less than 2-2.5 years. We have 19 more bones that are unfused whose MNI is also 3 (5 proximal calcanea, 4 proximal femora and 2 distal femora, 1 proximal humerus, 1 proximal ulna 4 distal radii and 2 distal tibiae). These bones fuse around the age of 3.5 – 4 years old. Because this age is higher than the age of the bones we found to be fusing at the age of 2-2.5 years old we cannot confirm that they are different animals. They may have been the same. We can obtain more information from 4 bones that are at the fusing stage. 2 proximal first phalanges show an animal of around 1.5 years old and one distal femur and proximal calcaneum indicate another animal around the age of 3.5 years. Only 5 bones were found fused. These are 2 distal radii, a proximal tibia, one proximal and one distal femur. All these bones will fuse around the age of 3.5 to 4 years. They may belong to the same animal. We can conclude that at least one animal was killed after reaching maturity. We further had 1 3rd phalange, 1 humerus, 1 right and 1 left metacarpal, 1 metatarsal and 1 pelvis fragment, which are very small and have very porous surfaces. These come from a very young animal, perhaps a few weeks old. In addition, all the rib, neck and vertebra fragments we found were unfused. Combining all the above we could argue that the maority of the cattle consumed at the particular location were of young age. This fits well a strategy of the exploitation of meat. This is not to say that in Šapinuwa cattle were kept only for meat, instead this consumption type is very suitable for the "elite" place we are studying.

Butchery Marks

Cut marks on bones have been the subject of numerous studies[37]. In general, the frequency of cut marks is accepted as an indicator of the intensity of carcass exploitation by human groups. Within the context of our study, 8112 animal bones were examined one by one and butchery marks were found on only 237 bones, that is 3% of the bones. The low occurence of cut marks has important implications about the cooking technique[38]. Some cooking techniques such as boiling or roasting whole animals/large pieces do not nesseciate the removal of meat from the bone before cooking. Therefore, the low occurrence of cut marks suggest that the cooking technique used may have been boiling[39] or roasting in large pieces.

Studies have shown that the traces of skinning, which is the first stage of butchery activities, are more commonly found on the metatarsal, metacarpal bones and horns[40]. We do have such cut marks but it should not be forgotten that not all cut marks are related to butchery. Bones and

[37] Larje 1992, 23.
[38] Crabtree – Campana 2008, 323.
[39] Costamagno et al. 2019, 4.
[40] Costamagno et al. 2019, 99.

horns are important raw materials for bone tool production. We have light cut marks made by a knife as well as heavier chop marks. We think that lighter cut marks represent cuts done for skinning whilst heavier chops indicate the splitting of bones or removal of horns for bone working [41]. Among the bones we studied, such heavy cuts corresponding to preparation for bone working were observed only on one sheep/goat metatarsal bone and one goat's horn.

Pathology

Factors such as age, strenuous physical activity, injury and obesity are known to cause a number of diseases in animals. In our paleopathology studies, 2 examples of degenerative joint diseases, known as calcification, and displaying excess growth of bone that fits the criteria for osteoarthritis, were observed. One of the lessions was located in the distal part of the humerus bone of a sheep/goat, while the other case was observed on the proximal part of the metacarpal bone of a sheep/goat. This disease causes a number of conditions such as grooves on the joint surface, hardening and elongation of the joint surface, and benign growth of the cartilage tissue[42].

Discussion

In general, the meat consumption pattern reflected in the studied bone assemblage is based on goat, sheep and cattle, with sheep and goat being much more numerous and representing the main component of it. Perhaps the reasons why cattle were not preferred are that they need more water and food than caprines and their raising requires more effort[43]. Pig, dog, horse and donkey are represented with very few bones. Considering that the bone assemblage we examined represents part of the food waste of the city, the scarcity of dog, horse and donkey bones is understandable. The important thing here is that pig bones are almost absent in the area. The pig is acknowledged as a dirty animal for the Hittites. However, there are pigs in other Hittite settlements and Ağılönü sector of Šapinuwa[44]. In addition, it was observed that wild species, that is red deer, hare and patridge, were represented at very low rates among animal bones. This situation shows that hunting played a minimal role in the meat provision.

It is possible to draw inferences about slaughtering activities by quantifying the frequency of different skeletal elements among the animal remains unearthed from an archaeological site[45]. Our examination of sheep/goat and cattle skeletal element proportions showed more or less the same pattern. Elements of head and phalanges are rather few compared to the fore and hind legs. This may indicate that slaughter of animals was not regularly taking place in the locality we studied, instead at least some dressed carcasses may often have been brought there for cooking. On the other hand, elements of the fore and hind leg are found in more or less similar frequencies. This indicates that complete but

[41] Larje 1992, 23-26; Costamagno et al. 2019, 99-100.

[42] Stevanovic et al. 2015, 3; Sapir – Hen et al. 2008, 64-65.

[43] Çakırlar 2008, 257-259.

[44] (Pişkin - unpublished data)

[45] Lupo 2006, 20.

dressed carcasses were consumed, without any particular preference for certain parts of the animal.

The mortality profiles we obtained for sheep and goat showed that all age cohorts, from newborn to old individuals were slaughtered at different rates. We have a clear peak of slaughter at the prime age for meat production, which can be considered expected since we are dealing with a city that obviously demands meat to cover the nutritional needs of its inhabitants. Amongst the animals slaughterd we also have a number of very young animals, indicative of early slaughter to save the milk of the mother. Additionaly, we have a good number of older animals, above the age of 3 and up to 8, which points to animals kept for wool and/or reproduction. Therefore, we could argue that even if the age of most of the animals slaughtered at the site represent an economic strategy targeting the procurment of meat, secondary products were also important. In the case of cattle, in contrast, our finds represent young individuals slaughtered for their meat.

The analysis of butchery marks showed a very low occurrence of such traces leading us to think that the favoured cooking methods were boiling or roasting in large pieces and removing the meat from the bone after it was cooked and had become soft. Pathological cases were minimal showing that the flocks of Šapinuwa comprised of animals in good health and nutrition.

Zooarchaeological studies have been carried out in several other Hittite sites. In addition, many researchers, whether archaeologists, historians or philologists have discussed the matter of subsistence and animal economy in Hittite times. It is not our aim here to make an exhaustive discussion of this very wide topic but we would like to refer to some that we consider important and helpful for contextualising our finds.

The most famous Hittite site is perhaps Boğazköy/Hattusa, the capital of the Hittite empire. The site was discovered in the 19th century by a French explorer and has seen many years of excavation under different directors and teams[46]. The current excavations are run by the DAI under Andreas Schachner. There are several zooarchaeological studies carried out by Adcock 2020, Berthon 2017, Hollstein and Middea 2014, von den Driesch and Boessneck 1981, von den Driesch and Pöllath 2004. Based on these we will attempt a comparison of the finds despite the fact that, since we deal with large cities with areas with different functions, we cannot be sure that the assemblages under consideration can be considered to represent equivalent contexts. Considering the species proportions of Boğazköy/Hattusa, which served as the capital of the Hittite Empire at certain intervals for 450 years, we see that sheep, goats, cattle and pigs are the basis of the livestock economy[47]. It has been observed that caprines (sheep/goat) are represented with a very high rate in all the assemblages examined[48]. Among the wild

[46] Bryce 2002; Chantre 1898; Seeher,1995.

[47] von den Driesch – Boessneck 1981, 33; Adcock 2020; Berthon 2017; Hollstein – Middea 2014; von den Driesch – Boessneck 1981; von den Driesch – Pöllath 2004.

[48] Adcock 2020, 130-137.

species, the presence of red deer and hare in both capitals stands out. Many more species of wild animals were also reported from Hattusa such as lion, leopard, wild shep, wild goat and wild pig which we did not find in our research. In addition, fish bones were found in the Middle and Late Bronze Age layers of Hattusa[49]. No fish remains were found in the faunal assemblage of Šapinuwa. The first publication of animal bone finds from Hattusa [50] attracted the attention of Hittitologist A. Ünal [51]. He provided very interesting comparisons between the zooarchaeological finds and cuneiform texts. Worth noting is his disagreement with Driesch and Boessneck's suggestion that the wild animals mentioned above were actually eaten by the Hittites. To his view these animals had a different role, more likely related to ritual and magic rather than being table fare. The lack of wild species in our assemblage, which we consider to be comprised of kitchen waste, agrees very well with Ünal's observation.

Another site in the area is Çadır Höyük. There, caprines (sheep/goats) are the most commonly found animals, followed by cattle and pigs[52]. There is a difference with Šapinuwa in terms of the abundance of the pigs. Whilst at Çadır Höyük pigs are third in importance, in Šapinuwa they are so rare that they rank 10th in the species sequence. An important Hittite city and religious center is Kuşaklı/Šarišša. The site was reported to be a very important religious, military and administration center and a place where Hittite kings came in the summer from Hattusha to carry out religious festivals[53]. Domestic species in Kuşaklı/Šarišša, ranked in order of importance, are sheep, goat, cattle, pig, horse, donkey and mule. It was also stated that among these species, sheep bones were most abundant[54]. Amongst the wild species recovered red deer, aurochs, wild sheep and wild goat are mentioned. Red deer is widely found in settlements of the Hittite Age, but the presence of aurochs, wild sheep and wild goats is striking.

A religious center, the Hittite sacred city of Nerik was excavated at Oymaağaç[55]. In the zooarchaeological finds of the city, it was reported that almost all of the animal bones in the Late Bronze Age layers at Oymaağaç Höyük consisted of sheep/goat bones (85-90%). Few remains of cattle and pigs were identified. The basis of the livestock economy in the area consists of sheep and goat rearing and, in this respect, the findings of the zooarchaeological study at this settlement are similar to ours. Other species include hare, wolf, wild cat, bear, weasel, and various small mammals[56].

In the Late Bronze Age layer of Yumuktepe in Mersin, first cattle, then sheep and finally goats are the most frequently found animals, while the importance of pigs decreased compared to other periods excavated at this site. Contrary to finds at Šapinuwa, cattle occur in

[49] Bursa 2007, 72.
[50] von den Driesch – Boessneck 1981.
[51] Ünal 1985.
[52] Adcock 2020, 142.
[53] Müller-Karpe 1995; Müller-Karpe 2002.
[54] von den Driesch – Vagedes 1997, 122 -134.
[55] Czichon – Klinger 2005; Mielke – Czichon 2019.
[56] Kunst – Böhm 2016, 89-92 ; Kunst et al. 2016, 193-224.

high rates at Yumuktepe. While the wild species assemblage is dominated by the Mesopotamian fallow deer in Yumuktepe, only red deer and hare are found among the wild species in Šapinuwa[57]. The presence of this species in Yumuktepe can be explained by the geographical location of the site within the range of the natural habitat of Mesopotamian fallow deer.

Sheep, goat and cattle form the basis of meat consumption at Tell Atchana. Pig is found in lesser amounts. While the majority of the examples represent adults, a small number of examples represent infants and young individuals[58]. High representation of adult individuals at Tell Atchana shows that the secondary products of animals were very important at the site. A significant amount of terrestrial, freshwater and marine mollusks have been recovered from Tell Atchana showing that mollusks were also important in the diet of its inhabitants[59]. This is not surprising given the geographical location of Tell Atchana. No remains of mollusks were found in the area we studied. In another zooarcheology study report conducted at Tell Atchana in 2007, it was stated that the majority of mammal remains represent cattle[60]. This shows that, unlike Šapinuwa, at Tell Atchana cattle were more numerous.

Turning to another area, that of the Upper Tigris, we see a different pattern of animal exploitation present at Kavuşan Höyük, Giricano, Müslümantepe, Hirbemerdon Tepe and Türbe Höyük. Given in order of importance pig, cattle, sheep and goat dominate in the livestock economy in these five settlements. Among these settlements, especially in Kavuşan Höyük and Giricano, pig provides the bulk of meat[61]. In the other three settlements, the pig representation is at a considerably higher rate than in Šapinuwa. In general, when evaluated together with both Šapinuwa and other Hittite settlements, the consumption of pigs in the settlements in the Upper Tigris Region is quite high. This may be either explained by the different geographical/ecological zones the sites are located in or by cultural differences as the above sites are in the Mittani sphere of influence rather than the Hittite.

At Gordion/Yassı Höyük, whilst in the 8th layer (1200 BC) we have equal proportions of cattle and pig, in the 9th layer (1400 BC, Hittite Empire period) we have an increase in cattle and decrease in pig[62]. Considering these data, we think that the attitudes of the Hittites towards pigs probably affected the pig husbandry in the settlements under their influence.

It is doubtful whether the chicken was present in Anatolia in the Hittite Age. The oldest and only record of the feeding of chickens in the Late Bronze Age is known from the settlement of Korucutepe, near Elazığ, in the easternmost part of the Hittite Empire[63]. In the samples we examined, no chickens were found

57 Minniti 2014, 97.
58 Çakırlar – Rossel 2010, 141-146.
59 Çakırlar – Rossel 2010, 141-146.
60 Çakırlar 2008, 257-259.
61 Berthon 2013, 148-250.
62 Zeder – Arter 1994, 109.
63 Dörfler et al. 2011, 115.

among the species observed at the Šapinuwa settlement.

Conclusion

Our study of the animal bone assemblage recovered in a particular location in Šapinuwa demonstrated that meat consumption was reliant on sheep and goats. Cattle appear to have a much lesser contribution, whilst striking is the minimal presence of pig. Very few remains of red deer, hare and patridge were also identified. The animal husbandry practices as testified by the mortality profiles, reveal a diverse economic structure aiming to harvest both meat and secondry products. Only two cases of pathology were observed amongst the bones examined, speaking of flocks in good health and nutritional status. Similarities between Šapinuwa animal exploitation and other cities under the influence of the Hittite regime are observed even though local ecosystems/cultural traits define some diversification.

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Uzun Özet

Anadolu coğrafyası konumu itibariyle Avrupa ve Asya'yı birbirine bağlayan bir köprü durumundadır. Bu durum göz önüne alındığında, tarih boyunca birçok medeniyet için uğrak ve yerleşim yeri olması anlaşılır bir durumdur. Bu medeniyetler arasında yer alan Hitit İmparatorluğu, MÖ 2.binde Anadolu'ya küçük topluluklar halinde gelmiş ve Kızılırmak kavsi içerisine yerleşmişlerdir. Yerleştikleri bölgelerdeki yerel krallıkların yönetiminde kendini var etmeye başlayan Hititler, zamanla Anadolu'yu egemenlikleri altına almışlardır. Bugün Çorum ilinin Boğazkale ilçesi yakınlarında bulunan ve MÖ 2. binyılda Orta Anadolu'da var olan Hitit İmparatorluğu'nun başkenti Hattuşa'dır.

Hitit çivi yazılı metinlerde 2000 kadar yer adı bulunmaktadır ve arkeolojik araştırmalar Geç Tunç Çağı'na ait çok sayıda yerleşim ortaya çıkarmıştır. Söz konusu bu yerleşim yerleri arasında bulunan Ortaköy/Şapinuva'da ele geçen tabletler üzerinde yapılan çalışmalar sonucunda, bu kentin Hititlerin bir diğer başkenti olduğu anlaşılmıştır. Ortaköy/Şapinuva'da bugüne kadar yapılan kazı çalışmaları idari binaların yer aldığı "akropol" olarak tanımlanan Tepelerarası Bölgesi ve kutsal alan olarak bilinen Ağılönü Bölgesi olmak üzere iki ayrı bölgede yürütülmüştür. Bu makale, Tepelerarası Bölgesi G Alanı kazı alanından ele geçen kemik grubu üzerinden şehrin hayvancılık ekonomisini ve tüketim modellerini açıklamayı amaçlamaktadır. Alan MÖ 14. Yüzyıla tarihlenen bir metal atölyesini temsil etmektedir. İşlik I olarak adlandırılan bu alandan ele geçen malzeme grubunun *insitu* olmadığı belirtilmektedir. Atölyenin işlevini yitirmesinin ardından düzenleme amacıyla başka bölgelerden getirilen ve şehrin atıkları olarak nitelendirilen enkaz toprağı ile doldurulduğu düşünülmektedir.

Çalışmamız kapsamında incelenen hayvan kemikleri üzerinde morfolojik analiz çalışmaları (kemik ve dişlerin sınıflandırılması, karşılaştırmalı osteomorfoloji, kasaplık izleri, karnivor diş izleri, paleopatoloji ve yaşlandırma) ve sayısal yöntemler (NISP, MNI) olmak üzere bir takım zooarkeoloji yöntemleri uygulanmıştır. Morfolojik analiz çalışmaları kapsamında yer alan kasaplık izlerinin %3 gibi oldukça düşük bir oranla temsil edildiği gözlemlenmiştir. Bu durum alandaki pişirme tekniğinin haşlama olabileceği gibi pişirmenin ardından bir kesici alet kullanıma gerek kalmaksızın etin kemikten kolayca ayrılmış olabileceği sonucuna varmamıza neden olmuştur. Paleopatoloji sonuçlarına göre bir adet koyun/keçiye ait humerus kemiği ile bir adet metakarpal kemiği üzerinde "osteoartrit" olarak adlandırılan, halk dilinde kireçlenme olarak bilinen, romatizmal bir hastalığa dair kanıtlar mevcuttur. Yalnızca 2 örnek üzerinde söz konusu hastalığa ait verilerin olması alanda bulunan hayvanların genel olarak sağlıklı oldukları ve alan insanları tarafından iyi bakıldıklarını düşündürmektedir. Dişler ve kemikler üzerinde yapılan yaşlandırma çalışmalarının sonuçlarına göre tüm yaş aralıklarının dağılım içerisinde temsil edildiği gözlemlenmiştir. Bu durum hayvanların alanda belli bir strateji olmaksızın, hem et ihtiyacını karşılamak hem de ikincil ürünlerinden (yün,süt vb.) yararlanmak gibi bir dizi ekonomik amaç için tutulduğunu göstermektedir. Sayısal yöntemlerin sonuçları göz önüne alındığında, hayvancılık ekonomisinin temelinin koyun ve keçiye dayandığını söylemek mümkündür. Sığırın oldukça az bir miktarda temsil edildiği ve sığır tüketiminde daha çok genç bireylerin tercih edildiği gözlemlenmiştir. Domuz ve diğer birkaç tür ise topluluk içerisinde minimum düzeyde temsil edilmektedir.

Yapmış olduğumuz çalışmada Ortaköy/Şapinuva ile Anadolu'daki diğer Hitit ve Hitit Çağı yaşamış yerleşimlerin hayvancılık ekonomileri karşılaştırılmış ve birtakım sonuçlara ulaşılmıştır. Bu sonuçlar göz önüne alındığında, karşılaştırmaları yapılan yerleşimler ile Ortaköy/Şapinuva yerleşimi arasında benzerlikler olduğu kadar ekonomi modelleri ve ekoloji bağlamında da birtakım farklılıkların olduğu açıkça gözlemlenmiştir. Yapılan karşılaştırmalar sonucunda, Geç Tunç Çağı'nda gelişmiş bir hayvancılık ekonomisi ile evcilleştirme uygulamalarının olduğu ortaya koyulmuştur.

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Figure 1

Figure 2

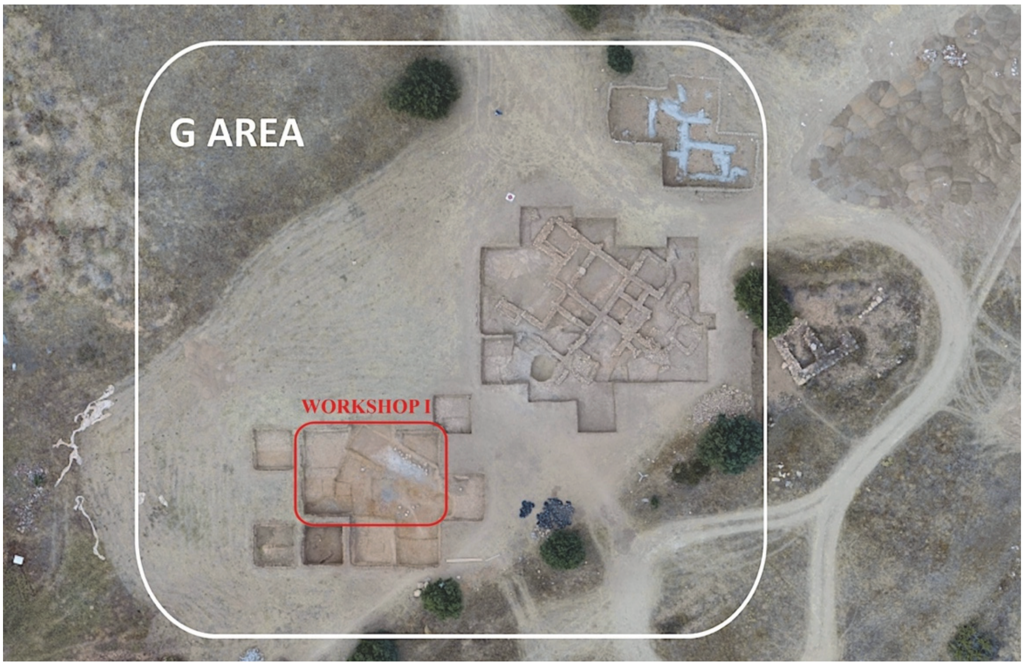


Figure 3

Figure 4

Payne MWS	Grant MWS	Recommended absolute age (Payne, 1973)	Deniz and Payne (1982)	Generalized age class
A	1-2	0-2 months		Newborn
B	3-7	2-6 months	5 months	Infant
C	8-18	6-12 months	3-14 months	Young
D	19-28	1-2 years	11-30 months	Pre-adult
E	29-33	2-3 years	24-47 months	Pre-adult
F	34-37	3-4 years	33 months -6 years	Adult
G	38-41	4-6 years	4-7.5 years	Adult
H	42-44	6-8 years	5-9.5 years	Adult
I	45+	8-10 years	7-10+ years	Adult

Table 1

Species	NISP	%
(Ovis aries) Sheep	58	%0,71
(Capra hircus) Goat	112	%1,38
(Ovis/Capra) Sheep/goat	4908	%60,50
(Bos taurus) Cattle	490	%6,04
(Sus scrofa domesticus) Pig	8	%0,10
(Canis lupus familiaris) Dog	4	%0,05
(Equus caballus) Horse	1	%0,01
(Equus asinus) Donkey	2	%0,02
(Cervus elaphus) Red deer	15	%0,20
(Lepus europaeus) Hare	11	%0,14
(Aves) Bird	6	%0,07
(Perdixperdix) Partridge	3	%0,04
(Testudinidae) Turtle	2	%0,02
(Equidae) Equidae	1	%0,01
Cattle size	448	%5,52
Sheep size	106	%1,31
Pig size	46	%0,57
Goose size	1	%0,01
Unidentified parts	1890	%23,30
Total	**8112**	**%100**

Table 2

	NISP	%	MNI	%
Sheep/goat	4908	%88,1	99	%74,4
Sheep	58	%1	13	%9,8
Goat	112	%2	10	%7,5
Cattle	490	%8,8	11	%8,3
Total	**5568**	**%100**	**133**	**%100**

Table 6

Table 3

Skeletal element	NISP	NISP (%)
Scapula	141	%10,4
Humerus	86	%6,3
Radius	92	%6,8
Ulna	72	%5,3
Radius+ulna	12	%0,9
Metacarpal	89	%6,5
Pelvis	194	%14,3
Femur	92	%6,8
Tibia	139	%10,2
Astragalus	13	%1,0
Calcaneum	51	%3,7
Metatarsal	78	%5,0
1.phalange	120	%8,8
2.phalange	27	%2,0
3.phalange	10	%0,7
Mandible	60	%4,4
Mandible+teeth	46	%3,4
Maxilla	2	%0,1
Maxilla+teeth	23	%1,7
Upper orbit	2	%0,1
Lower orbit	22	%1,6

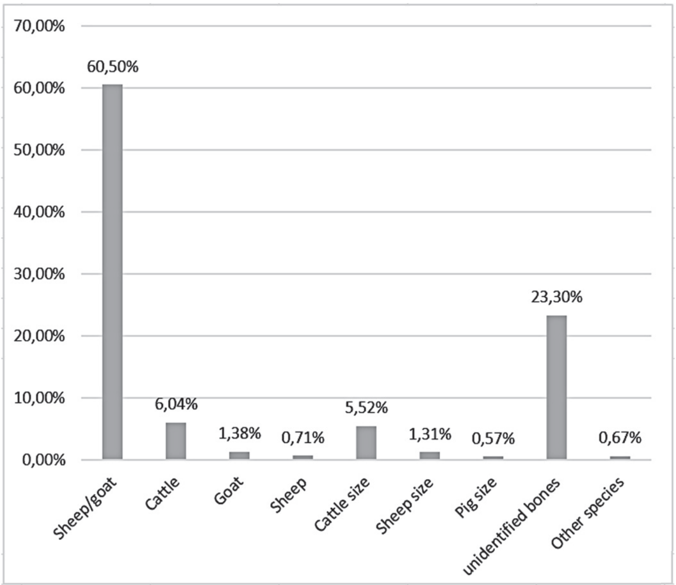
Table 4

Skeleton element	NISP	NISP (%)
Scapula	11	%4,8
Humerus	24	%10,4
Radius	17	%7,4
Ulna	10	%4,3
Metacarpal	10	%4,3
Pelvis	15	%6,5
Femur	13	%5,7
Tibia	19	%8,3
Astragalus	9	%3,6
Calcaneum	14	%6,1
Metatarsal	3	%1,3
1.phalange	27	%11,7
2.phalange	18	%7,8
3.phalange	16	%7,3
Mandible	11	%4,8
Mandible+teeth	6	%2,6
Maxilla+teeth	5	%2,2
Lower orbit	2	%0,9

Table 5

Fusion phase	Skeletal part		Age of fusion (month)
A	Prox. Radius		0-6 month
B	dis.Scapula dis.Humerus	Pelvis	6- 12 month
C	Prox.1.phalange prox. 2.phalange		12- 18 month
D	dis.Tibia dis.Metapodia		18- 30 month
E	Calcaneum prox.Femur dis.Femur dis.Radius prox.Tibia		30- 48 month
F	prox.Humerus		> 48

Table 6



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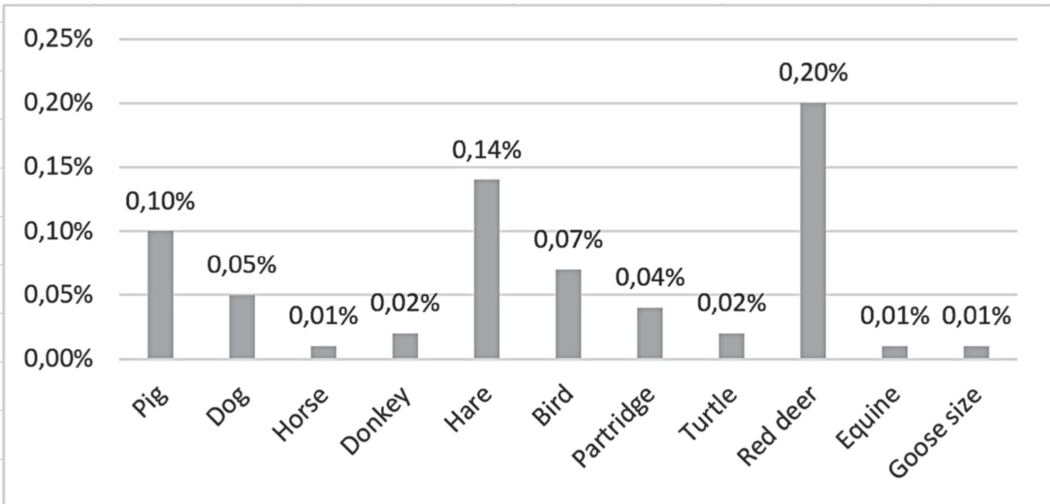

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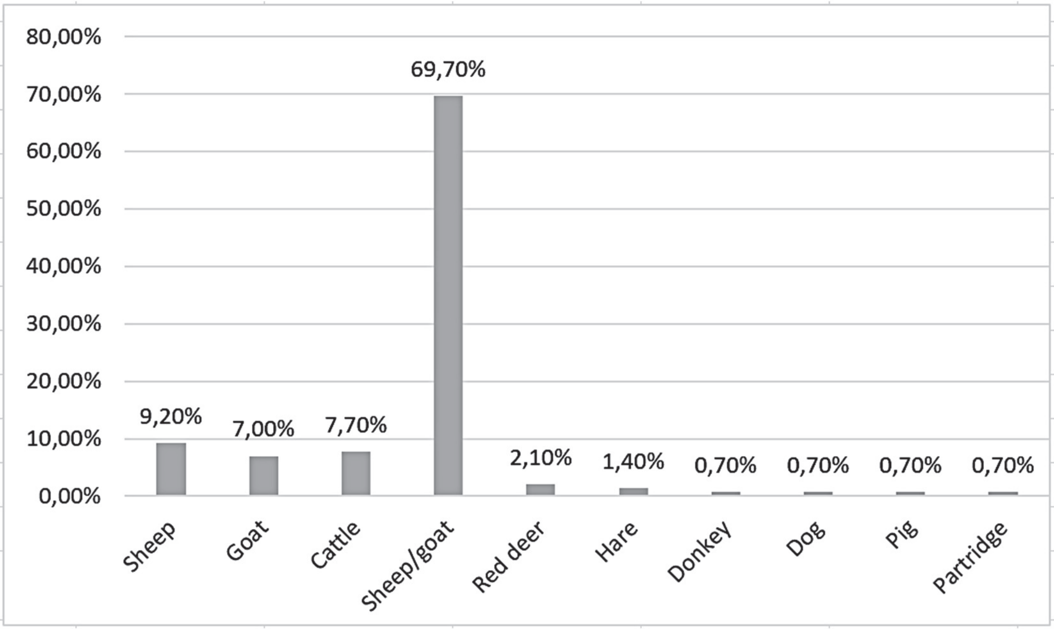

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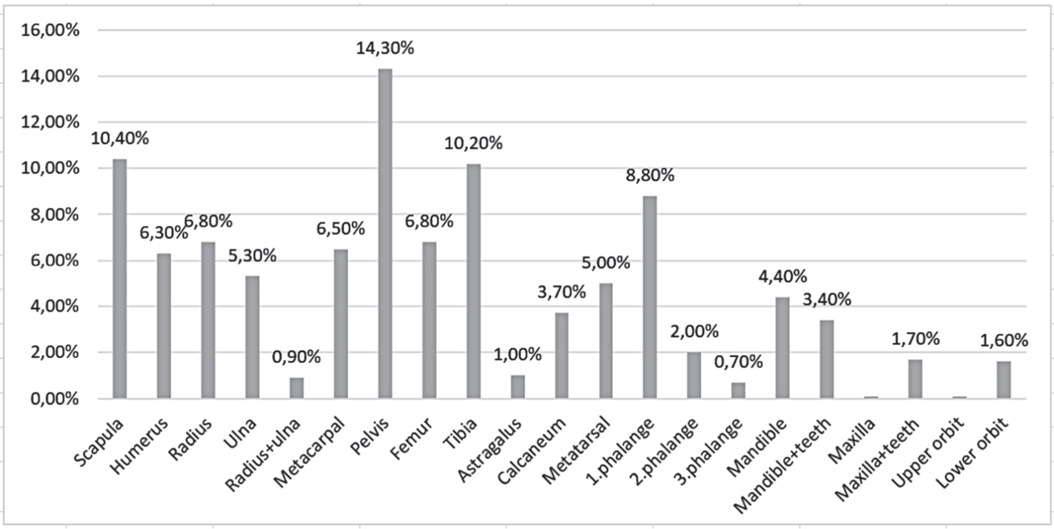

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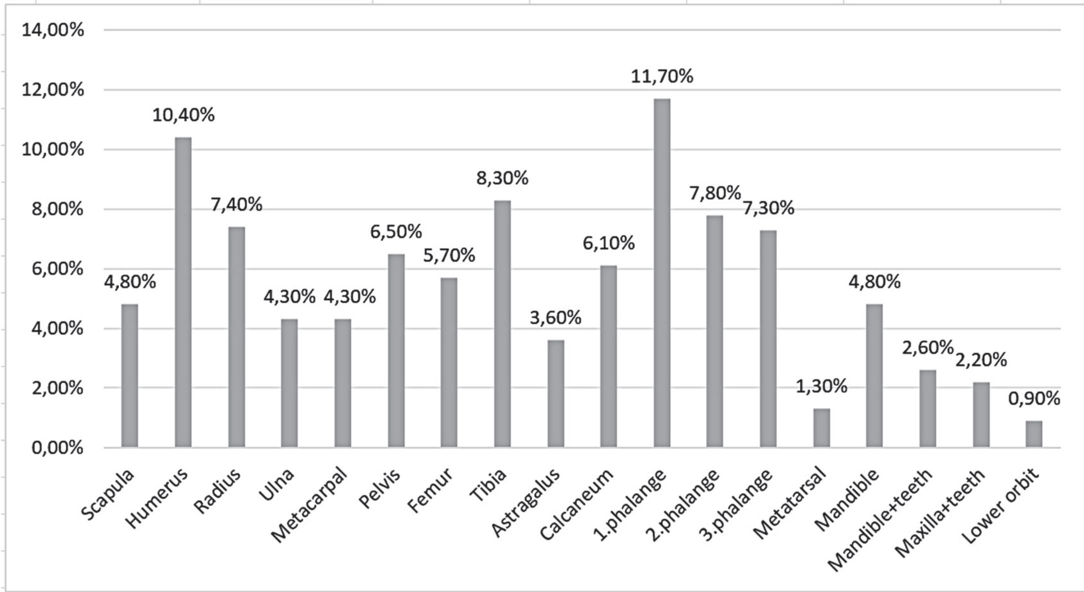

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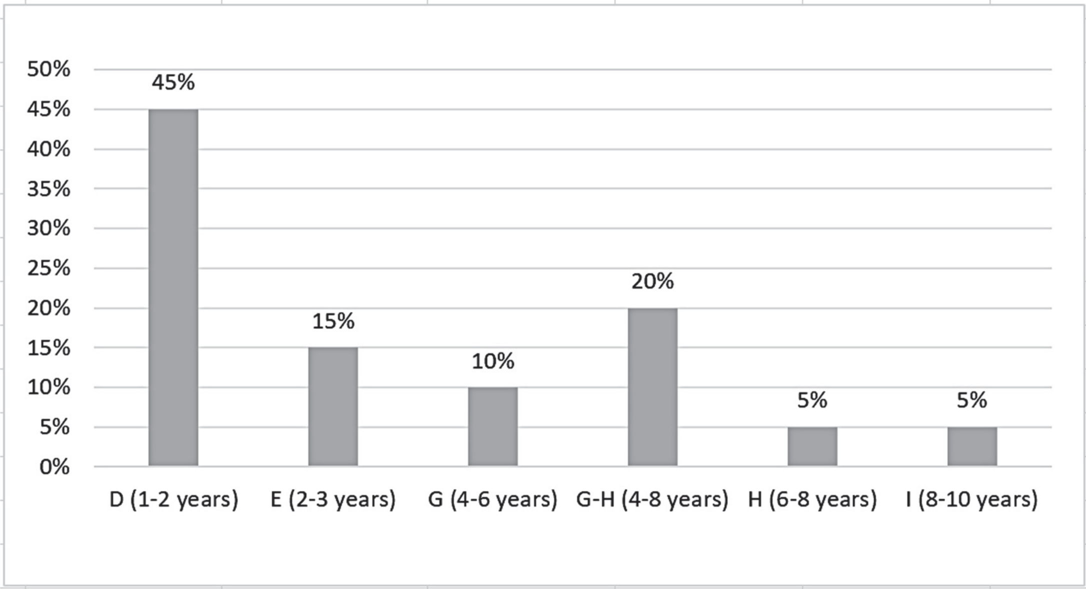

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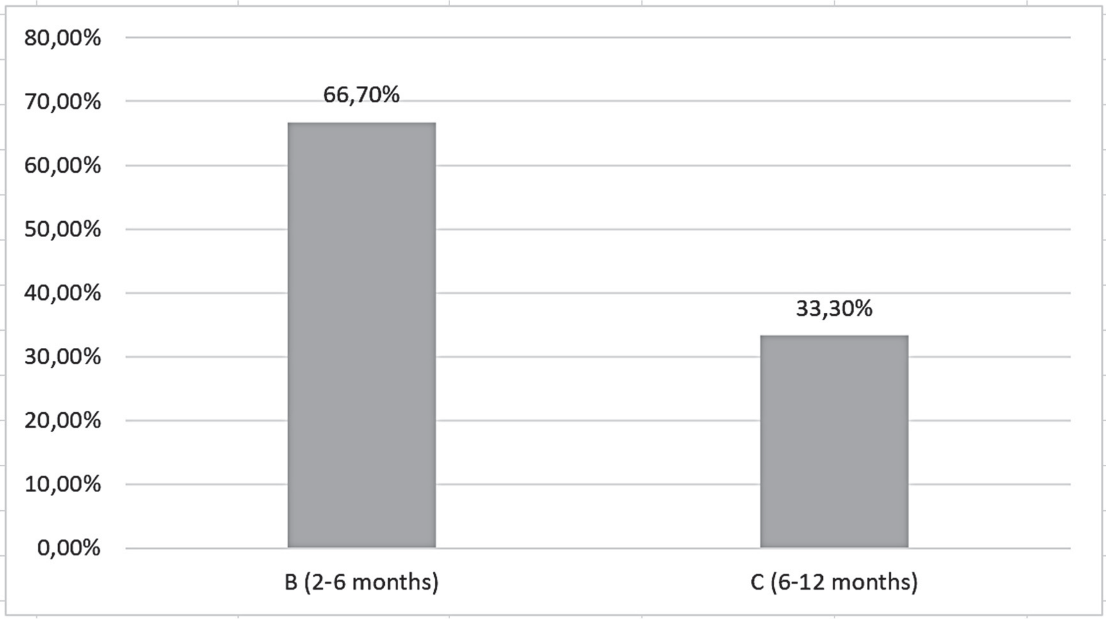

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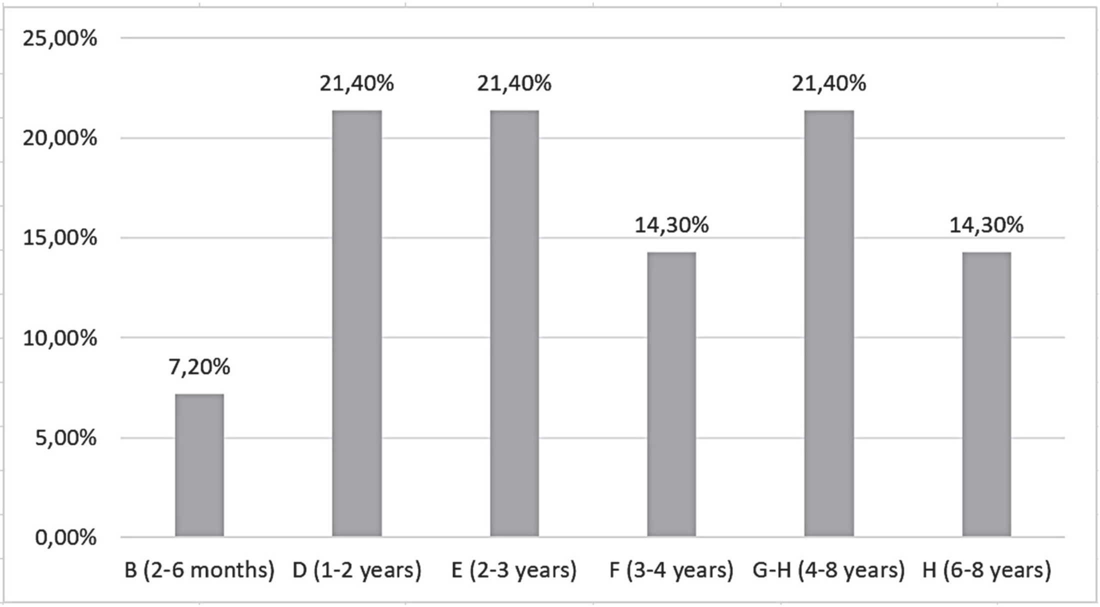

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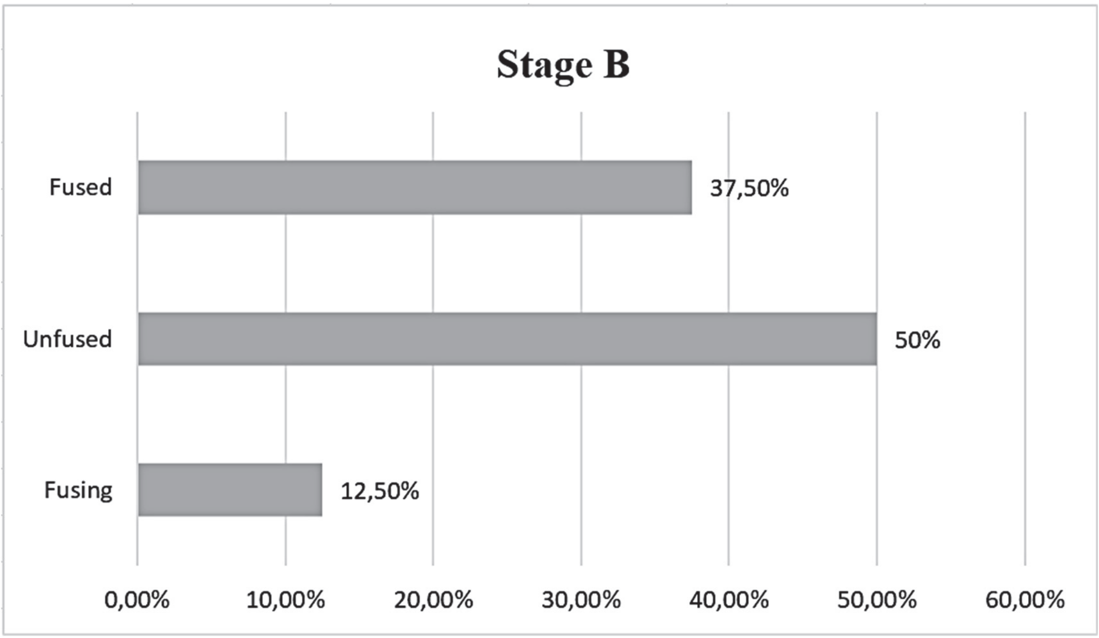
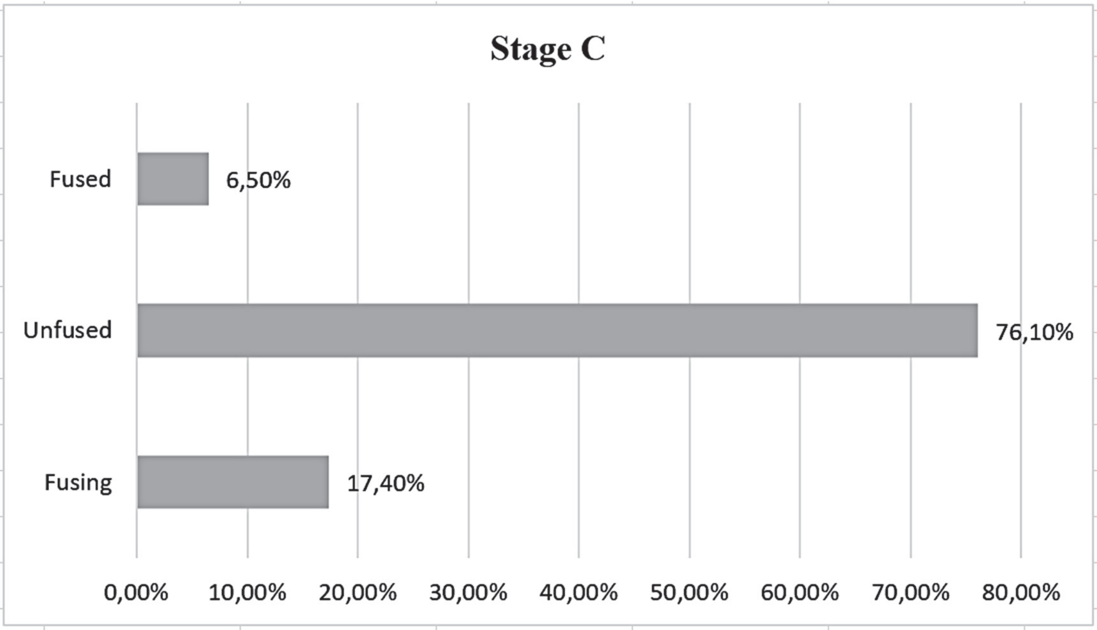
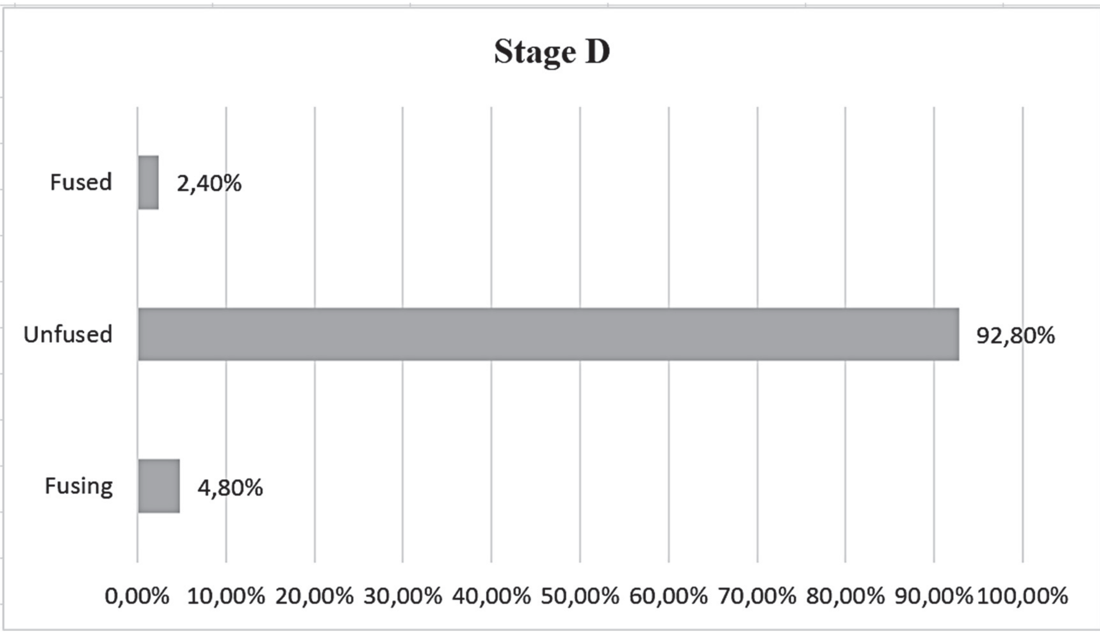


Graph 9



Graph 10



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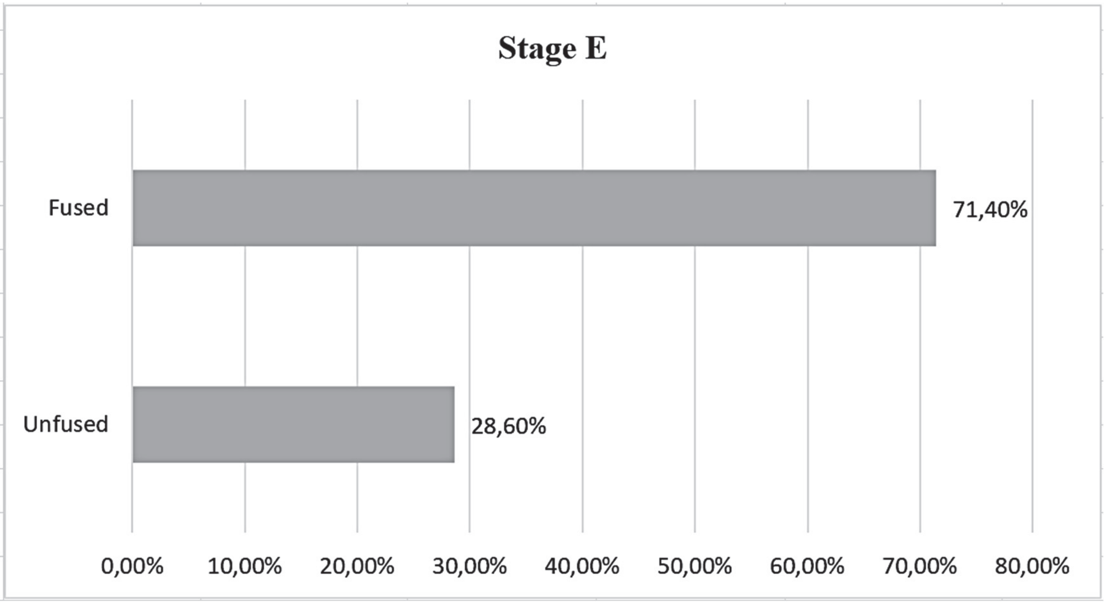
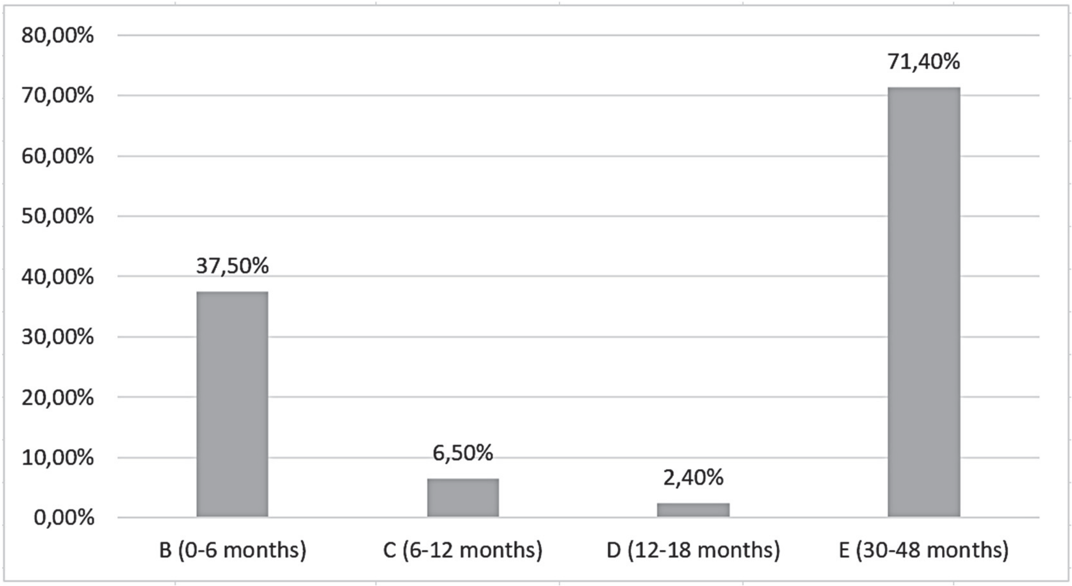


Graph 12


80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
37,50%
6,50%
2,40%
71,40%
B (0-6 months)
C (6-12 months)
D (12-18 months)
E (30-48 months)

Graph 13