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PRELIMINARY REPORT ON THE PALEOPATHOLOGICAL RESEARCH OF THE SKELETAL MATERIAL FROM THE OPI-VAL FONDILLO SITE (L'AQUILA, VI-V B.C.E.)

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SUMMARY

This study focusses on some diseases that occurred in the human remains from the Samnitic necropolis of Opi Val Fondillo (AQ) by the river Sangro in the middle of the National Park of Abruzzo (Central Italy). Up to now, 89 people have undergone general anthropological investigations. Further inquiries were necessary. The most common pathological disorders were cervical, lumbar and sternoclavicular arthrosis. There were some skeletal evidences of identifiable traumas; particularly the fractures of ribs and upper limbs. The incidence of developmental defects in the skeletal population is moderate. Moreover, there is a case of cancer to report: a cranial osteoma, that is a benign tumor localized on the right side of the frontal bone, with a diameter of about 1 cm, formed by a dense, symptomatic lamellar bone with no consequences during life.

Introduction

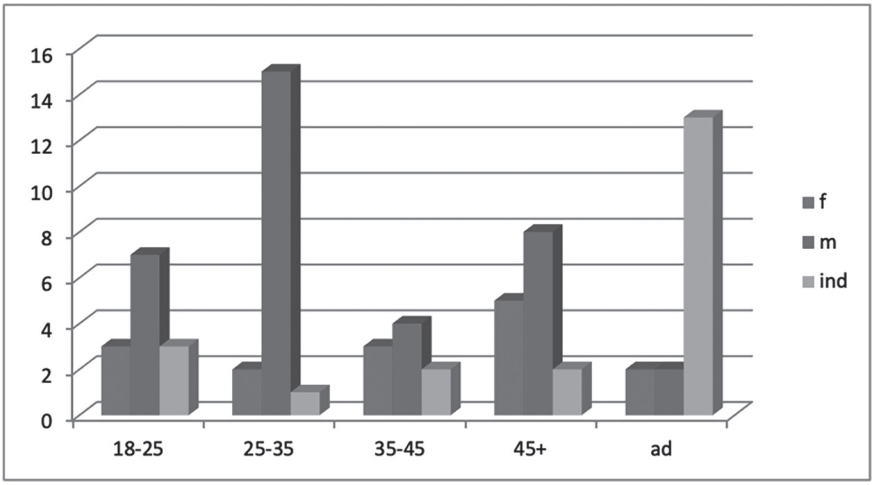
Most paleopathological studies analyze human remains from archaeological contexts and attempt to deduce some aspects of living conditions and diseases within the ancient populations. Recent advances have clearly shown that successful research on ancient human remains requires the application of a multitude of analytical tech-

Key words: Anthropology - Paleopathology - Abruzzo - Arthrosis

niques, depending on the available samples and their degree of conservation, but also on the applicable techniques. The present study is therefore carried out through the interdisciplinary analysis of a Samnitic population consisting of well-preserved skeletons from the necropolis of Opi Val Fondillo, located in the province of L'Aquila (Abruzzo, central Italy). The site was used for discontinuous funeral purposes from the VII century B.C.E. to the IV century B.C.E. and mostly burials are dated between the beginnings of the VI century B.C.E. and the first decades of the V century B.C.E. The necropolis was organized in 10 family circles: each probably belonged to a village clan. Almost all the tombs were structured in terraced or caisson pits[1]. The body was laid, supine, with arms and legs stretched out or crossed, in an East-West orientation. The kits were very uniform to each other. They were commonly composed of impasto crockery and iron fibulas. The study of settlements and grave goods confirmed the presence of a sedentary population, whose economy was linked to the pastoral world[2].

Materials and methods

The skeletons come from the circle tombs inside the Val Fondillo necropolis. The skeletal sample consists of 89 individuals: 72 adults and 17 *juvenes* (respectively 81% and 19% of the sample). The sex estimation of the adult subjects was carried out using the morphological methods of Ferembach et al[3]. The age at death was established by combining the methods of Brothwell[4] and Lovejoy[5] taking into account the wear of the occlusal surface of teeth which progressively increases with aging, and the odontometric method of Viciano et al[6]. For the age estimation of the subadult individuals were used the Uberlaker's[7] dental and skeletal development charts. The paleopathological study was based on macroscopic and radiological analyses, and compared then with known paleopathological examples[8].

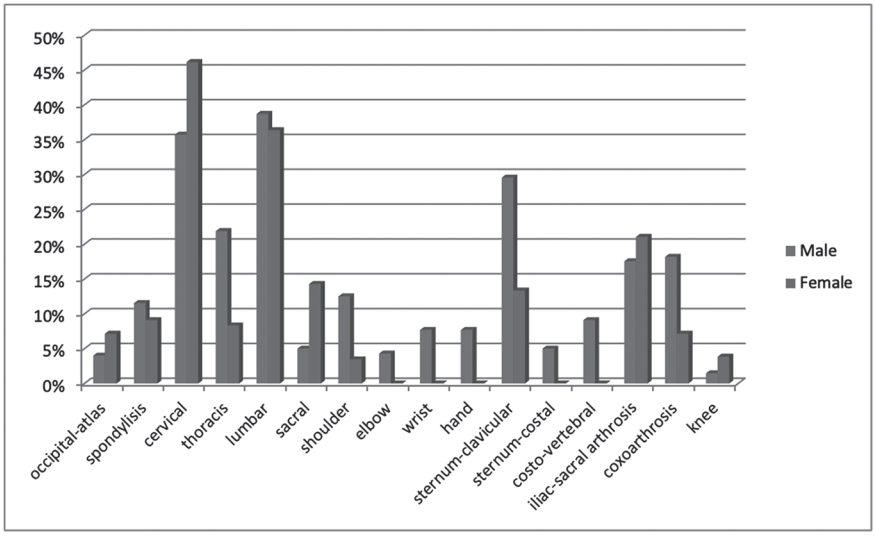


Tab.1. Sample distribution by age

The analysis of enthesopathies and syndesmopathies was performed according to the indications of Netter[9] for the analysis of movement, Capasso et al.[10] for the analysis of the causes and Mariotti et al.[11] for the analysis of the degree of development.

Table 1 shows the adult sample distribution by sex and age at death. The sample includes 15 female (F), 36 male (M) and 21 indeterminate (IND) subjects due to the fragmentation and incompleteness of the human remains (respectively 21%, 50% and 29%). The 19% of male individuals are distributed in the 18-25 age group, 42% in the 25-35 age group, 11% in the 35-45 age group, 34% more than 45 years old and the 6% are indeterminate. The 20% of female individuals are distributed in the 18-25 age group, 13% in the 25 to 35 age group, 20% in the 35-45 age group, 22% more than 45 years old and the 13% are indeterminate.

The male/female ratio (2:1) presents a preponderance of male individuals compared to female, a preponderance that commonly reflects the analysis of human remains from archaeological contexts



Tab.2. Arthrosis distribution according the sex of the individuals and the articular joints.

that tend to overrepresent male individuals[12]. In this case, the high percentage of individuals of undetermined sex could very well represent a part of the female population, but previous studies[13,14.] still show a preponderance of male subjects in this population that allows us to claim that the male/female ratio presented here is representative of the Opi population.

Paleopathology

The statistical analyzes were performed only on the most common pathologies, which usually present a greater incidence in archaeological remains (osteoarthritis, Schmörl hernias, nonspecific periostitis, ischial osteitis, *cribra orbitalia*).

Table 2 shows the frequency of arthrosis divided by type of articulation afflicted and sex. We can see how arthrosis diseases are present in 47,06% of Opi population. Male individuals are afflicted in the 61,11% of cases and female's in the 60%. The most affected region

is the spine and specifically the cervical and lumbar traits. Some individuals show severe cervical arthrosis. T51 (F, 45+ years) has 2 thoracic vertebrae fused at the level of the intervertebral articular facets (Fig. 1), as well as a severe osteoarthrosis of the cervical and lumbar spine. Probable cases of ankylosing spondylarthrosis involve the individuals T59 (M, 45+ years) and T189 (M, 35-45 years). The same pathology is present on the individual T96 (M, 45+ years), that shows an evident bone flows on the ventral margin of the lumbar vertebrae, although the fragmented bone does not allow a certain diagnosis. T112 (F, 45+ years) presents an incipient fusion of the sacrum with the coxa boner, severe arthrosis on the lumbar vertebrae as well as a rib fused with the corresponding vertebral body. T134 (M, 45+) and T188 (M, 25-35 years) are both affected by severe cervical arthrosis with 2 vertebrae fused together.

Fig. 1. T51 – Two fused thoracic vertebrae.

Regarding to the other skeletal regions, two severe cases of sterno-clavicular arthrosis affect 2 adult individuals (T159, IND, AD, T188, M, 35-45 years).
There are 3 cases of osteochondritis of the glenoid cavity (T58, F, AD, T133, M, 25-35 years, T201, F, 35-45 years). This particular form of osteoarthritis, that involves both the cartilage and the underlying bone in life, manifests itself as a porosity with consequent erosion of the articular surface. Another case of osteochondritis is diagnosable in the individual T100 (M, 18-25): it consists of a congenital bilateral osteochondritis of the knee (visible on the femoral condyles), characteristic of young subjects.
Cases of ischial osteitis due to sitting for long periods and limited movements are practically absent in males, while they are present in the 17% of female individuals.
Periostitis, a nonspecific infection mainly seen on the tibia and fibula diaphysis, is present in only in 20% of males and 13% of females of Opi sample. Periostitis could be related to an infectious disease, but is often due to a simple periosteum reaction following small traumas or mechanical stress[15].
There are few cases of *cribra orbitalia* on the orbital roof, caused by iron deficiency anemia. Although historically female individuals are more affected, in Opi Val Fondillo only about 14% of the populations present it. This data, together with the low percentage of individuals with hypoplasia of the dental enamel[16], confirm a good state of health of the population and, in particular, of the younger classes.
Some individuals from Opi present traumas that in some way certainly had consequences on the normal course of daily life. T102 (M, 45+ years) shows a severe oblique fracture of the left tibia and fibula (Fig. 2). No medical care was performed for the fracture reduction, with the consequent loss of length of the lower limb (lost about 27 mm in the tibia and 12 in the fibula) which made the individual limp.

Fig. 2. T102 – Consolidated displaced fracture of the tibia diaphysis and right fibula.

A similar bone fracture is present in the individual T107 (M, 35-45 years). In this case the left tibia and the fibula suffered from an antero-posterior displacement of the distal region (unlike the previous case where the displacement had occurred in the latero-medial direction). The trauma caused a loss of the tibial and peroneal length respectively of about 47 mm and 28 mm. T127 (M, 18-25 years) presents on the right parietal bone a small, oval-shaped, traumatic lesion with dimensions of about 15x10 mm, that presumably was caused by a blunt object. T134 (M, 45+ years) shows two smalls displaced, but consolidated, fractures of two right ribs in their central part. A small fracture of the distal third of the left ulna of T142 (M, 25-35) is visible as a slight swelling of the affected part. On the superior part of the glenoid cavity

of the right scapula of T151 (M, 25-35 years) there is a small homogeneous and smooth depressed area probably resulting in a slight compression trauma. T174 (F, 18-25 years) has a small fracture of the distal epiphysis of the left radius, with a lateral medial displacement of about 3 mm. T201 (F, 35-45 years) shows a compression fracture on a left rib with overlapping of the two parts and a length loss of about 11 mm. A particular traumatic case is present in T185 (M, 45+ years). The T185 individual presents an extensive trauma that involves the whole coracoid process of the left scapula. The surface of the coracoid process is very irregular with a deep groove in the middle, while the acromial joint has developed severe osteoarthritis. The macroscopic aspect of the scapula let us hypothesize an acromio-clavicular dislocation, probably of the III or IV type according to Rockwood[17], but the lack of the clavicle does not allow a more precise diagnosis. The individual T185 also has two fractured right ribs near their sternal end, with a loss of length of about 8 mm. The presence of these two traumas is probably the result of a bad fall.

Finally, traumas include the skeletal changes due to childbirth, particularly visible in the preauricular grooves of the coxal bones[18]. Two individuals show lesions caused by giving birth, T51 (F, 45+ years) and T1C (F, 25-35 years).

Although occupational markers are not considered clinical-importance pathologies, some particularly serious enthesopathies that had consequences on bone morphology, are described. T35 (IND, AD) has an elongated and fairly deep groove on the medial side of the left tibial tuberosity. This is the insertion site of the terminal head of the common tendon of sartorial, gracile and semitendinosus muscles which, due to its shape, is called "goose leg". This enthesopathy is caused by repeated flexion, extrarotation and abduction of the thigh, in particular it enters into action in the movement of a lower limb above the other in the sitting position. T47 (M, 25-35 years) presents a bipartite acromion, also called *Os acromiale*, on the right scapula

Fig. 3. T47 – Bipartite acromion (*Os acromiale*) of the right scapula.

(Fig. 3). The non-fusion of the acromial process is mainly due to the tearing of the rotator cuff due to a continuous overload of the right arm[19]. T127 presents a severe pectoral enthesopathy on both the humeri with cortical erosion and remodeling of the margins of the tendon insertion area. T130 shows on the postero-inferior margin of the right talus a small articular facet due to the lack of fusion of the astragalic tubercle. T152 (M, AD) shows a calcified trauma of the deltoid ligament of the right tibia and, in particular, of the tibio-calcaneal ligament. This trauma is probably due to a severe distortion of the right ankle. T159 (IND, AD), on the other hand, shows a calcified hematoma along the rough line of the right femur.
Finally, there is a single case of neoplastic pathology affecting the individual of T100 (M, 18-25 years). This is a case of ivory osteoma (Fig. 4), a benign tumor localized on the right side of the frontal

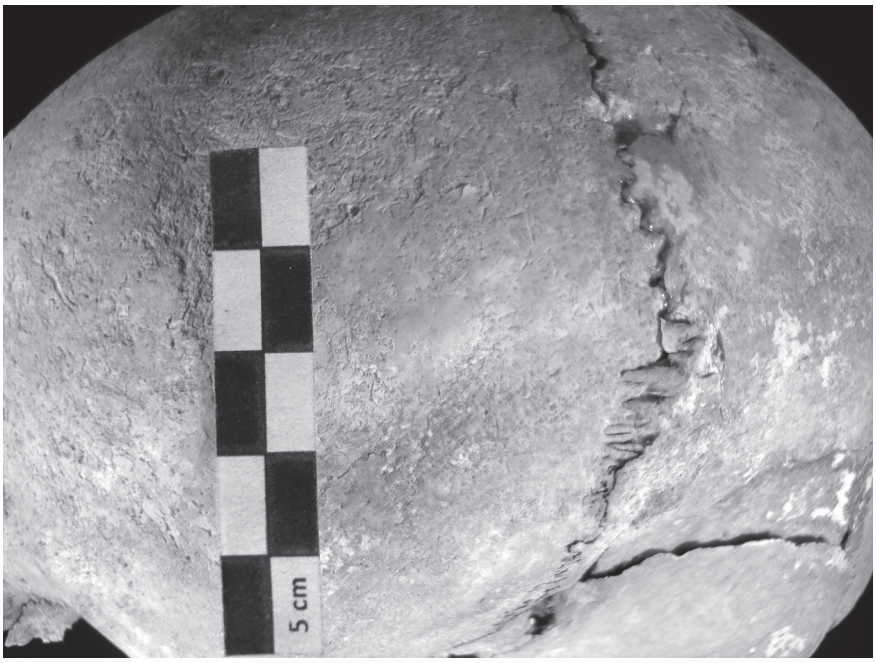


Fig. 4. T100 – Ivory osteoma on the frontal bone.

bone with a diameter of about 1 cm, formed by dense lamellar bone, asymptomatic and without consequences during life[20,21].

Discussion

Males from Opi show high incidence of cervical and lumbar arthrosis, sacroiliac joint and coxarthrosis. In addition, sternoclavicular arthrosis is also very frequent.

Excluding osteoarthritis of the lumbar spine, which is a bone segment more prone to age-related degenerative changes, given that all the weight of the trunk is loaded on it, the topographical distribution of the other affected joints follows the work activities of individuals. Opi's female population was often involved in the transport of weights, although static manual labor was their main activity[22].

The transport hypothesis is supported both by the presence of Schmörl hernias, usually caused by a lateral flexion and bending of the spine, especially during weight lifting[23], and by the presence of some cases of osteochondritis of the glenoidal cavity caused by the extension of the arm against a compressive force directed towards the shoulder, for example in the flexion of the forearm on the arm in an overload condition in the act of carrying weights[24].

Male individuals, on the other hand, perform work that overloads the upper and lower limbs, probably linked to work in agriculture and sheep farming. Even if the frequency is quite low, the data on ischial osteitis, caused by sitting for a long time on hard material, confirm that part of the female population was dedicated to static work activities.

Cribra orbitalia, a skeletal sign of metabolic anemic pathology, while absent in other coeval Abruzzo's inhabitants[25] is found in low percentages within the population of Opi - Val Fondillo, probably due to a particularly poor diet in nutrients caused by a difficulty in the cultivation of food related to the altitude of the site and the conditions of the soil.

Traumatic injuries, especially fractures, are found in a similar percentage in both males and females. Failure to treat trauma - The failure to reduce trauma is consistent with the absence of cases of medical treatment in the Opi population. In the literature the case of a child from Herculaneum[26], dating back to the 1st century C.E., is cited as the first case of reduction of a fracture, therefore 5 centuries later than the dating of our population. This allows us to hypothesize the absence of medical knowledge, or at least of individuals with such knowledge, within the mountain Sabine populations, and in particular within the population of Opi.

The picture that emerges from the analysis of pathologies is also confirmed by the analysis of enthesopathies and syndesmopathies[27]. The development of the entheses and syndesmoses confirm an in-

tense use of the lower limbs by male individuals (in particular the gluteus maximus, the adductors, the soleus, and the Achilles tendon). At the level of the upper limbs, the males do not show great muscle development. This analysis allows us to confirm that the male population, who had the heaviest tasks, was mainly dedicated to hunting, given the area's wildlife wealth[28]. This hypothesis is confirmed by the strong development of the muscles of the lower limbs which implies long journeys on foot in areas with high differences in altitude, as could have been the mountainous area of Opi.

The female population shows moderate development of the trapezius muscle, the gluteus maximus and the adductors and flexors of the fingers. The development of these muscles allows us to confirm that the main work done by women is that of transporting weights (foodstuffs, agricultural tools, etc ...); hypothesis also supported by the presence of accessory joint facets on the sacrum and coxals. These articular facets are consequent to an axial compression of the vertebral column probably caused precisely by the transport of heavy objects[29]. In addition to transport, Opi women were also reserved for the "artisan" activity, that of processing food and tools, as can be seen from the signs of the strong and repeated use of the hands (flexor tendon) to hold tools together the formation of exostoses in the trochanteric fossa of the femurs caused by the maintenance of a sitting position with elongated legs for a prolonged period[30].

In conclusion we can say that there was a clear division of work activities between male and female individuals. In general, the males carried out demanding work activities at the muscular level, while the females carried out more static and lighter activities. The development of some ergonomic characters (see Achille's tendon) is due more to an adaptation to the mountain environment than to particular physical activities. Finally, if in general the female individuals took care of the processing of raw materials, in Opi they also took care of their transport probably from the place of production to that of processing.

Conclusions

The paleopathological study of the human osteoarchaeological material from Opi - Val Fondillo (AQ) excavation has provided information concerning the health status of the inhabitants of Opi. However, as the investigation is still undergone, no definitive conclusions can be drawn yet. Still, fortunately, some of the most frequent paleopathological cases could be detected and also some general tendencies related to their occurrence were recognized in the Opi material. These findings provide the first insight into the everyday life of the people of Opi. The diseases present in the population give a fairly significant picture which suggests some of the greatest activities carried on by the inhabitants of Opi. The male individuals conducted a dynamic and heavy work activities while the female individuals led a fairly permanent work activity linked above all to craftsmanship. The cases of arthrosis could be the consequence of physiological aging with the contribution of work activities, while traumatic pathologies are essentially linked to work activity.

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