The Periodontal Disease Status of the Historical Population of Hadrianapolis

• Nilsun Bagis (1), Asuman Alpagut (2), Nejat Arpak (3) •

1 - Assistant Professor, DDs.Phd, Department of Periodontology, Faculty of Dentistry, Ankara University, Ankara, Turkey

2 - Anthropologist, Anadolu Medeniyetleri Museum, Ankara, Turkey

3 - Professor, DDS, PhD, Private practice, Ankara, Turkey

Address for correspondence:

Nilsun Bagis

Department of Periodontology, School of Dentistry, Ankara University

06500-Beşevler

Ankara/Turkey

Phone: +90 532 5141218

Fax number: +90 312 212 3954

E-mail: nilsunbagis@yahoo.com

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Abstract

It was evaluated in this article relationship between two types of oral pathology, periodontal disease and ante-mortem tooth loss and age in past human populations. The skeletal remains found during the archeological investigations at Hadrianopolis region by Edirne Museum during 2002-2003 were related to Eastern Roman-Byzanteum period. From a total of 139 human skeletal remains were studied. The aim of this study was to determine the prevalence and the severity of periodontal diseases and ante-mortem tooth loss in the skeletal remains.

Keywords: Periodontal Diseases; Bone Loss, Tooth Loss

Introduction

Various oral and dental pathologies are frequently analyzed as part of bioarchaeological and paleopathological investigations of the skeletal remains of past populations. These pathologies include dental caries (i.e., cavities), enamel hypoplasia, periodontal disease, and antemortem tooth

loss. Of particular interest to researchers are the ways in which oral health varies within a population according to sex, age, and social status, how diet effects oral health, and how oral health has varied over time in human populations. (1-6) The focus of this article is the relationship between two types of oral pathology, periodontal disease and ante-mortem tooth loss and age in past human populations.

The aim of this study was to determine the prevalence and the severity of periodontal diseases and ante-mortem tooth loss in the skeletal remains of 37 Hadrianapolis inhabitants from the X. century AD.

Historical Background

The tower of Macedonia is located in the northwest of Turkey. The skeletal remains found during the archeological investigations at Hadrianopolis region by Edirne Museum during 2002-2003 were related to Eastern Roman-Byzanteum period (Fig.1).

Periodontal Disease

Periodontal disease (periodontitis) is characterized by a bacterial infection that causes inflammation and destruction of soft tissue (gingiva), periodontal ligament, root cementum, and alveolar bone. Periodontitis can be caused by a variety of pathogenic infectious agents that are found in oral biofilms, complex ecosystems including the oral microorganisms themselves and their by-products surrounded by an extracellular matrix. Many of the pathogens that cause periodontal disease are found in the mouths of healthy people, albeit at lower levels than are found in individuals with periodontitis (7). Because this disease can be identified in archaeological bones, it is possible to document its natural history.

Materials and methods

From a total of 139 human skeletal remains, 37 individuals with sufficient skeletal remains were studied. Among these, both jaws existed in 31 and only one jaw or ortions of one jaw were present in 6. One skeleton had total ante-mortem tooth loss on both jaws. The age of death and sex of the skeletons could not be identified due to poor storage conditions as well as bones being found seperately. For this reason in this study we have worked on upper and lower jaws of 37 young adult, adult and elderly sex identified intact skeletons.

In the previous paleoantropologic studies the age identifications of the skeletons of Hadrianopolis inhabitants was performed by analyzing body bone epiphyseal junction for young adults, costal, symphiseal, sutural and dental aging for adults (8). All morphological differences especially pelvic and

cranial were taken into consideration regarding sex determination. This study was carried out on the upper and lower jaws of young adults (age 18-25), adults (age 25-45) and elderly (age over 45) individuals.

The extent of alveolar bone loss

The measurements to determine alveolar bone destruction included two distances as suggested by Mitsis & Taramidis (9) 1. the distance between the occlusal surface and the cemento enamel junction (CEJ); and 2. the distance between the occlusal surface and the alveolar bone crest (AC). The extent of bone loss was designated by the subtraction of these two measurements. The measurements were made with a periodontal probe from three points on the buccal surfaces (mesial, midbuccal, distal) and from the middle of palatinal or lingual surfaces of all existing teeth which did not have post-mortem bone defects. Periodontitis was recorded using a range of three levels. First, “no periodontitis” was indicated if the alveolar crest was any distance from the CEJ, provided there were no changes in the form and especially no signs of osteoporosis in the texture of the bone. Second, “mild periodontitis” was recorded if the AC was 3-6mm from the CEJ of the tooth on the presupposition that the characteristic changes of periodontitis were revealed. Finally, the third category is “severe periodontitis” that damaged the bone at a depth of 6mm or more from the CEJ. In this study, we also measured infrabony pockets as an additional criterion of severe periodontitis. As Mitsis & Taramidis (9) have noted, the differentiation of bone loss due to ante-mortem periodontal disease and post-mortem defects is entirely the subjective evaluation of the examiners. If any kind of post-mortem artefact was suspected in the examined region, the measurements of that region were not included in the study. The measurement of ante-mortem tooth loss was the proportion of extracted teeth to the total of the existing alveoli plus the ante-mortem teeth (10-12).

Results

Of the total 139 individuals; 17.99% were babies, 17.27% children, 3.59% teenagers, 10.08% young adults, 22.31% adults, 7.91% elderly and 18.70% of them were unidentified age group. Regarding the general age of the population; the baby and child age of death percentage is significantly higher than other identified age of death groups. Young adults are the following group and the lowest percentage belongs to teenage and the elderly group. Adults together with the unidentified age of death group are more crowded than young adults and elderly. Regarding this distribution only 7.91% of the population can live over the age of 45.

From a total of 139 human skeletal remains, 37 individuals with sufficient skeletal remains were studied. In this population, 13 of the skeletons were females and 24 of them were males. The average age of death was 30,88 for females and 36,96 for males. The average age of death for the population

is 34,82. Table.1 shows the age groups, number of individuals, number of teeth, number of post-mortem and ante-mortem teeth. Regarding these findings; there is significant relevance between age and amount of ante-mortem teeth loss and significant relevance between aging and ante-mortem teeth loss ($p<0.05$).

The alveolar bone destruction measurements were divided into 3 groups regarding the CEJ-AC distance; <3mm: no periodontitis, 3-6mm: mild periodontitis, >6mm: severe periodontitis. The relevance between age increase and the severity of the periodontal disease classified by determining the loss of alveolar bone (Table.2) is statistically significant ($p<0.05$)..

Discussion

In the present study, 37 individuals with sufficient skeletal remains were studied. In most of the studies (9,11,12), alveolar bone resorption was recorded as positive when the linear difference between CEJ and AC exceeded 2 or 3 mm. However, there now appears to be doubts of the reliability of this measurement as an indicator of alveolar bone loss (12,13). In this study, the assessment of periodontal disease was based on the method of Kerr (11) in which the textural and architectural variations of interdental septa were analyzed. By using this method, it was possible to distinguish an individual with a healthy periodontium from those with gingivitis or periodontitis.

The highest prevalence of destructive periodontitis was found in the oldest age group and similarly, highest ante-mortem tooth loss prevalence in the oldest group also. In this group, severe periodontitis prevalence was 8,18% and mild periodontitis prevalence was 69,38%. Additionally, in elderly group ante-mortem tooth loss prevalence was very high (36.6%) and this difference statistically significance ($p<0.05$). These results are in agreement with previous studies (15,16) conducted throughout the world on a variety of populations and different Anatolian population. This result support the view that the prevalence of periodontitis increases with age. According to our information periodontitis severity increases with age but in ancient populations might be different factors effective bone and tooth loss such as diet or using their teeth different purposes. It is well known from archaeological data that the population was largely reliant upon dried meat or fish. Severe occlusal forces caused by the nutrition may account for the progression of the disease, especially for molar teeth. Additionally, other kind of foods, like dry figs and honey, might be the cause of the increasing number of caries and ante-mortem tooth loss. Another risk factor for the population might be the probable use of teeth as tools. The shape of wear and enamel cracks observed on the anterior teeth of some samples suggests a pulling action, possibly fibres for fish-net or rope making (16). These factors may explain the high ante-mortem teeth loss prevalence in elderly group. Ante mortem teeth loss prevalence are less in young and young adult groups than elderly group. This result might be related to the short of their life.

In this study, the amounts of supra- and subgingival calculus deposits and the amount of tooth loss were not analyzed. The amount of calculus formation on the teeth of skeletal material is difficult to estimate, since deposits suffer post-mortem loss.

In conclusion, there is a special interest to study the frequency of periodontitis and other tooth diseases in different ancient populations. The differences may lead us to useful conclusions about the conditions of life in antiquity. This study may be a useful topic for further research in this direction.

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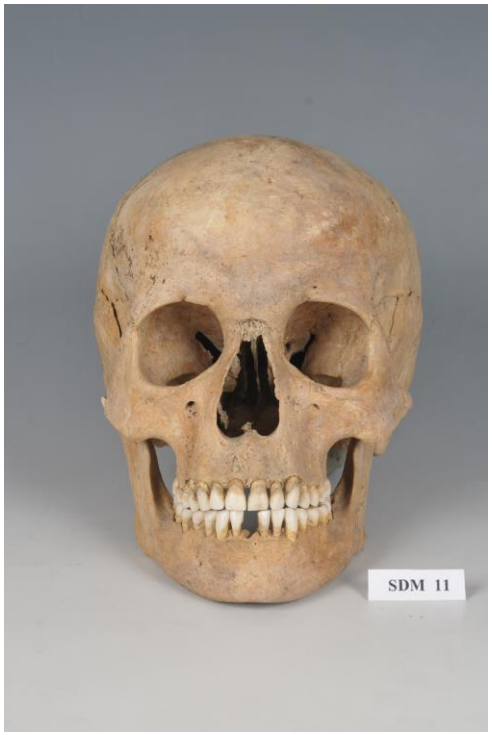

Figure1. Hadrianopolis skeleton by Edirne Museum during 2002-2003 were related to Eastern Roman-Byzanteum period.

Age (year)	Number of individuals	Number of teeth / %	Number of post-mortem teeth / %	Number of ante-mortem teeth/ %
18-25 (young adults)	9	163 64.7%	88 34.9%	1 0.4%
25-45 (adults)	20	335 59.8%	201 35.9%	24 4.3%
>45 (elderly)	8	98 43.8%	44 19.6%	82 36.6%
Total	37	596	333	107

Table 1. According to age groups; number of individuals, number of teeth, number of post-mortem and ante-mortem teeth.

Age (year)	No periodontitis Number of teeth/ %	Mild periodontitis Number of teeth/ %	Severe periodontitis Number of teeth/ %	Total
18-25 (young adults)	121 74,23%	37 22,69%	5 3,08%	163 100%
25-45 (adults)	155 46,26%	170 50,74%	10 3,0%	335 100%
>45 (elderly)	22 22,44%	68 69,38%	8 8,18%	98 100%

Table 2. According to age groups, distribution of alveolar bone destruction