Araştırma Makalesi – Original Article

Congenital Tooth Deficiency (Hypodontia-Agenesis) and Supernumerary Teeth Observed in the Beybağ (Muğla) Byzantine Population*

Beybağ (Muğla) Bizans Popülasyonunda Gözlenen Konjenital Diş Eksikliği (Hipodonti-Agenesis) ve Süpernümerer Dişler

Seda Karaöz Arıhan[i], Ramazan Türkekul[ii]

[i]Assist.Prof.Dr., Van Yuzuncu Yil University, Faculty of Letters, Department of Anthropology, https://orcid.org/0000-0003-2791-1966

[ii]Anthropologist MSci., Istanbul University, Faculty of Letters, Department of Anthropology, https://orcid.org/0000-0001-5579-9831

ABSTRACT

Aim: The aim of this study was to investigate the hypodontic (agenesis) and supernumerary tooth formation observed in the Byzantine community of Beybağ, Muğla.

Material and Method: During the Beybağ excavations, 161 graves which were unearthed in 2008 were dated to the Byzantine Period. 97 (mandible and/or maxilla) jaw bones obtained from 171 individuals constitute our study material. It was determined that the jaw bones of these 97 individuals belonged to 39 male, 26 female and 32 infant-child. For this purpose, those jaw bones were examined and the jaw bones that were estimated to be hypodontic were radiographically visualized with Kavo 3D exam dental tomography device. In addition, the presence of supernumerary teeth was examined by macroscopic observation.

Results: Following examination of materials, hypodontia in five individuals and supernumerary tooth samples in one individual was determined. According to these findings, the incidence of supernumerary teeth in the Byzantine community of Beybağ was found to be 1.03% and the frequency of agenesis was 7.21%. However, only one case of a supernumerary tooth was observed in the maxilla (upper jaw).

Conclusion: It was observed that the results we obtained in both the frequency of supernumerary teeth and the frequency of hypodontia (agenesis) in the study yielded similar results with both recent studies and previous studies. We think that this study, which is one of the rare examples, will contribute to other studies in this research field.

Keywords: Supernumerary Teeth, Congenital Teeth Absence (Hypodontia-Agenesis), Teeth Variation, Dental Anthropology, Beybağ.

ÖZ

Amaç: Bu çalışmanın amacı Muğla ili Beybağ Bizans Topluluğu'nda gözlenen hipodonti (agenesis) ve süpernümerer diş oluşumlarını araştırmaktır.

Yöntem: Beybağ kazılarında 2008 yılında ortaya çıkarılan 161 adet mezar Bizans Dönemi'ne tarihlendirilmiştir. Çalışma materyalimizi 171 kişiden elde edilen 97 (mandibula ve/veya maksilla) çene kemiği oluşturmaktadır. Bu 97 kişinin çene kemiklerinin 39'unun erkek, 26'sının kız ve 32'sinin bebek-çocuk bireye ait olduğu belirlendi. Bu amaçla söz konusu 97 çene kemiği incelendi ve hipodonti olduğu tahmin edilen çene kemikleri Kavo 3D dental tomografi cihazı ile radyografik olarak görüntülendi. Ayrıca makroskopik gözlemle süpernümerer diş varlığı incelendi.

Bulgular: Materyallerin incelenmesinin ardından beş bireyde hipodonti, bir bireyde süpernümerer diş örneği tespit edildi. Bu bulgulara göre Beybağ Bizans toplumunda süpernümerer diş görülme sıklığı %1,03, agenezi sıklığı ise %7,21 olarak bulundu. Üst çenede olmak üzere bir süpernümerer diş vakası görüldü.

Sonuç: Çalışmada hem süpernümerer diş sıklığında hem de hipodonti (agenesis) sıklığında elde ettiğimiz sonuçların hem güncel çalışmalarla hem de geçmiş çalışmalarla benzer sonuçlar verdiği gözlendi. Bu alandaki az sayıdaki örneklerden biri olan bu çalışmanın araştırma alanındaki diğer çalışmalara katkı sağlayacağını düşünüyoruz.

Anahtar Kelimeler: Süpernümerer Dişler, Doğuştan Diş Eksikliği (Hipodonti-Agenesis), Diş Varyasyonu, Dental Antropoloji, Beybağ.

Mersin Üniversitesi Tıp Fakültesi Lokman Hekim Tıp Tarihi ve Folklorik Tıp Dergisi, 2021; 11 (3): 566-575
DOI: 10.31020/mutftd.949172
e-ISSN: 1309-8004, ISSN 1309-761X
Geliş Tarihi – Received: 7 Haziran 2021; Kabul Tarihi - Accepted: 9 Ağustos 2021
İletişim - Correspondence Author: Seda Karaöz Arıhan <sedaarihan@yyu.edu.tr>

Introduction

A healthy child has 20 deciduous teeth. For an adult, this number is 32 permanent teeth. However, in some cases, different variations can be seen in individuals with the effect of genetic and environmental factors. One of these variations is observed in number of teeth. Such variations are among the most frequently observed dental anomalies and represent missing or additional tooth formation than is normally expected in the mouth. Lack of one or more teeth in the mouth is expressed as hypodontia (agenesis). The most common tooth deficiency was reported as the loss of the third molar tooth.[1] Having more than the normal expected number of teeth (20 for deciduous teeth and 32 for permanent teeth) is expressed as supernumerary teeth (hyperdontia) and can be seen in all teeth except canine teeth. In general, hypodontia is more common than supernumerary teeth and is more common in permanent teeth than in deciduous teeth.[2]

Congenital Tooth Deficiency (Hypodontia-Agenesis)

Congenital tooth deficiency, expressed as hypodontia or agenesis, is one of the important developmental anomalies. Although it is said that environmental factors are partly among the causes of hypodontia, it is stated that genetics is the main factor. It has been demonstrated by studies that family genetic inheritance is effective in this situation.[3] Kotecha reported that some researchers conducted studies to reveal the relationship between hypodontia and familial inheritance, and in most of these studies, more hypodontia were observed in close relatives.[4] However, there are researchers who have considered hypodontia (agenesis) as part of the shrinkage process observed in the jaw and all teeth since the beginning of the Pleistocene period (approximately two million years ago). It is also suggested that factors including biological processes such as natural selection and growth patterns of communities are associated with hypodontia.[5]

When evaluated in general, it is stated that there is a relationship between the formation of agenesis (especially the third molar) and the reduction in the size of the teeth and jaw. Researchers explain this relationship with the observed increase in the incidence of agenesis as we approach today's societies, although the early ancestors of humans did not encounter such a problem. Since the end of the Pleistocene period, jaw and tooth reduction has been observed in almost all populations. The same is true for Anatolian populations. However, agenesis cannot be explained only by the reduction in tooth and jaw size, because agenesis is also associated with natural selection, genetic and environmental factors, growth patterns of populations and eruption chronology of teeth.[5]

It is reported that congenital teeth deficiency seen in deciduous teeth is rare and its incidence is less than 1%. The frequency of congenital deficiency in permanent teeth is around 3-7%. The most common hypodontic deficiency regions in the mouth are the third molar region, the upper (maxilla) lateral incisions, the lower (mandible) second premolars and the upper (maxilla) second premolars. It is also reported that congenital tooth deficiency is more common in women than in men.[6]

Supernumerary Teeth (Hyperdontia)

Compared to a healthy child with 20 deciduous teeth, adult individuals have 32 permanent teeth. However, in some cases, extra teeth may occur in individuals due to environmental and genetic factors. These teeth are defined as supernumerary teeth. These teeth can be seen as a single tooth in the mouth or as multiple teeth. However, it is mostly regarded as a single tooth excess.[7, 8] These teeth are classified as rudimentary if they are morphologically small and conical and supplemental teeth if they are in normal tooth morphology.[9] Supernumerary teeth can be buried in the mouth for years without causing any trouble. For this reason, the detection of buried teeth can mostly be done by taking radiographic images.[1]

There are many thoughts about the formation of supernumerary teeth. According to one view, it is formed due to the dental lamina activation, which continues after completely separating the tooth bud or forming a normal number of tooth buds. Another view emphasizes the effect of genetic factors.[10,11] In addition, some researchers have reported that environmental factors and familial inheritance. These researchers base the effect of familial inheritance on presence of similar cases affecting the same relative group more than other groups.[12]

Researchers often associate supernumerary teeth to be seen in the same individual with a systematic disorder or various syndromes. Some syndromes that cause these extra teeth are known as Gardner's syndrome, Fabry Anderson syndrome, Cleidocranial dysostosis and Ehlers-Danlos syndrome.[13]

Supernumerary teeth can be seen in both permanent teeth and deciduous teeth. The prevalence of supernumerary teeth in deciduous teeth has been reported to be 0.3–1.7% (10). The prevalence of supernumerary teeth determined in permanent teeth is 0.1%-3.9%.[14] Supernumerary teeth are seen in the maxilla in 80% of deciduous teeth and 90% of permanent teeth.[2,9] Regions most prone to supernumerary tooth formation are reported as; Upper (maxilla) lateral incisors, lower (mandible) second premolar, upper (maxilla) second premolar and third molar.[6] The incidence of supernumerary teeth is higher in males than females, and in premolars this rate is three times more in males.[15]

Some researchers have classified supernumerary teeth in four different ways, namely mesiodens, paramolar, parapremolar, and distomolar according to their presence within the mouth.[16,17] According to this classification, supernumerary teeth between the two central incisions in the maxillary region are expressed as mesiodens. Mesiodens are usually seen in permanent teeth and have a short triangular or conical shape.[17] Mesiodenses are the most common supernumerary teeth. These teeth can also come turned in the opposite direction. These teeth, turned upside down and protruding in the nasal cavity, are also called nasal teeth. The incidence of the nose tooth (0.01%) is very low.[18] According to localization, parapremolar teeth are between the small molars, paramolar teeth are between the greater molars and the distamolar teeth are distal to the third big molar.[19]

Materials and Methods

The Beybağ excavations carried out by Ahmet Tırpan (Prof. Dr. Konya Selçuk University Department of Archeology) were conducted between 2007-2008. Beybağ settlement, which is located within the borders of Yatağan District of Muğla province today, is an area showing the characteristics of a small rural settlement. Among the graves unearthed in the field in 2008, 161 of the graves showing the characteristics of tile and plate boat type graves were dated to the Byzantine Period, and 79 graves, which were buried by Islamic methods, were dated to the Ottoman Period. In addition, the other two pithos tombs found in the area were dated to the Bronze Age according to the archaeological materials found and the hoker burial style. In general, the use of the area can be dated between the Xth and XIIIth centuries. The skeletons that make up our study material are those from Byzantine tombs. Concerning the cemetery area, the most archeological findings belong to XIIth century.[20]

During the Beybağ excavations, 161 graves which were unearthed in 2008 were dated to the Byzantine Period. The demographic distribution of the population of 171 individuals obtained from these graves is given in ***Table 1***. Ninety-seven (mandible and/or maxilla) jaw bone obtained from 171 individuals constitute our study material. It was determined that the jaw bones of these 97 individuals belonged to 39 males, 26 females and 32 infant-child.

Table 1. Demography of Byzantine Beybağ Population.[21]

Distribution of Individuals	N	%
Fetal period	6	3.5
Infant 0-3 age	28	16.3
Child 4-17 age	33	19.2
Woman ≥ 18 age	35	20.4
Man ≥ 18 age	60	35.0
Undefined (Adult) ≥ 18 age	9	5.2
Total	171	100

Hypodontia and supernumerary tooth formation are observed both in today's societies and in ancient societies. In this study, it was aimed to investigate the hypodontia and supernumerary tooth formation in the Byzantine society of Beybağ. In this context, mandible and maxilla of the skeletons were examined with macroscopic observations, and the lower and upper jaws of individuals which were thought to have hypodontia were visualized with Kavo 3D Exam Dental Tomography Device.

Results

The jaw bones (mandible and maxilla) of 97 skeletons, which were obtained from 161 graves dating to the Byzantine Period and belonging to 171 individuals were evaluated. In these 97 jaw bones that make up the study material; dislocated, antemortem, postmortem or buried teeth were excluded from the study. As a result of the evaluations, hypodontia in five individuals and supernumerary tooth samples in one individual was determined and the age and gender distributions of these individuals were presented in ***Table 2***.

Table 2. Examples of hypodontia (agenesis) and supernumerary teeth (hyperdontia) observed in the Beybağ population.

Grave Number	Inspected Region	Gender	Age	Observed Phenomenon Hypodontia/Hyperdontia)
08BBM14(1)	Mandible-Maxilla	**Man**	25-35	Mandible –right and left 3rd molar- (**Hypodontia**)
08BBM87	Mandible-Maxilla	**Man**	45-55	Mandible -right and left 3rd molar- (**Hypodontia**)
08BBM228(2)	Mandible-Maxilla	**Man**	20-25	Maxilla -right and left 3rd molar- (**Hypodontia**)
08BBM137	Mandible-Maxilla	**Woman**	30-35	Mandible-Maxilla -right and left 3rd molar- (**Hypodontia**)
08BBM220(1)	Mandible-Maxilla	**Woman**	30-35	Mandible-Maxilla - right and left 3rd molar- (**Hypodontia**)
08BBM125	Mandible-Maxilla	**Child**	12±2.5	Maxilla –right first central incisive region- (Supernumerary teeth **–Hyperdontia**)

With the images taken from Kavo 3D exam dental tomography device, hypodontia cases were detected in the teeth of five individuals. It was observed that three of these individuals were male and two were female. Two of those male individuals (25-35 and 45-55 years) had hypodontia in the mandible and one in the maxilla (20-25 years). Two other female individuals were at the age of 30-35 years, and on both of the lower and upper jaws (***Figures 1-3***) hypodontia was detected. In addition, it was observed that the case of hypodontia observed in five individuals was symmetrical (bilateral) in the third molar teeth.

However, it was determined that the skeleton that was unearthed from the grave number 08 BBM 125 belongs to a 12 years old (± 2.5 years) child. As a result of macroscopic analyzes performed on this skeleton, supernumerary tooth formation was observed in the right first central incisive region (mesiodens) in the maxilla. It was observed that the supernumerary tooth in question was not in normal tooth morphology but conical (***Figures 4,5***). It was observed that the incisive tooth did not come out in the area that had to be found in normal conditions, but that the supernumerary tooth was in place. Incisive tooth has emerged in an upper area in an inappropriate position in the anatomical position.

Figure 1. Radiographic image of a 30-35 years old female (08BBM137) case of hypodontia (Agenesis) in the maxilla

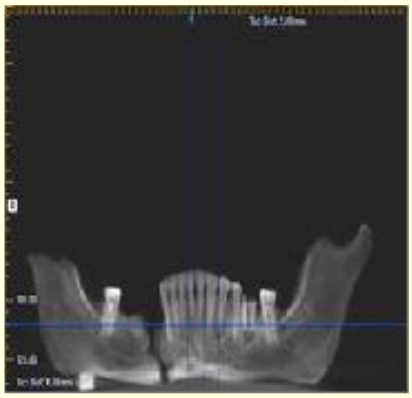

Figure 2. Radiographic image of a 30-35 years old female (08BBM137) case of hypodontia (Agenesis) mandible

Figure 3. A case of hypodontia (Agenesis) in the mandible and maxilla of a 30-35 years old female (08BBM137)

Figure 4. A case of supernumerary tooth (Hyperdontia) observed in the maxilla of an approximately 12 (± 2.5 years) child individual (08BBM125)

Figure 5. Anterior and posterior view of the supernumerary tooth

Discussion

There are many recent studies on congenital tooth deficiency (agenesis or hypodontia). Hypodontia were detected in 36 individuals (1.77%) over 2025 individuals within the range of 9-35 years of age in a study conducted in Istanbul.[22] However, in this study, it is stated that female individuals have more hypodontia than male individuals. Another study was carried out on a population from Kayseri province.[23] In this study, a total of 2,566 individuals, 1178 males and 1388 females aged 6-14, were examined, and hypodontia was found in 145 individuals (5.65%). In the study, it is stated that female individuals are more affected than men. One of these researches in this subject, covers 21,384 people belonging to an ethnic group.[24] The researchers found that the frequency of hypodontia was 4.60% in this study and stated that there was no significant difference between the genders. In another study conducted in Korea, 1,622 individuals were evaluated and hypodontia frequency was reported as 11.2%.[25] In another study conducted in Brazil, it is reported that 6.3% of 1,049 individuals had hypodontia and that there was no statistically significant difference between the genders.[26]

In a study performed in Iran, panoramic radiographies of 3374 patients between 10-20 years of age who applied to Tehran Dentistry Universities were obtained and evaluated for hypodontia.[27] Third molars were not included in the study. According to the results obtained, the prevalence of hypodontia was determined as 5.21% for 2012 female and 1362 for male patients. When this value is analyzed by sex, it is presented as 5.86% in women and 4.25% in men. For hypodontia no significant difference was found in terms of genders.

Congenital tooth deficiency (agenesis or hypodontia) can be seen in today's societies, as well as in societies that lived in the past. However, as mentioned above, the skeletons obtained from archaeological excavations can be scarce. Therefore, much less samples were evaluated compared to modern studies. In this context, studies on the absence of third molar teeth in different historical populations were compared in a study.[28] The absence of third molar teeth, which is the most common form of hypodontia, varies widely from society to society and is observed with a frequency of approximately 0.2% to 25%. As reported in this study, hypodontia was observed more frequently, especially after Neolithic according to examination of these skeletal materials.

While it is less common among individuals of African origin in today's societies, it is more common in African-Americans than individuals of African descent probably due to the result of pairing with individuals of white descent. In the aforementioned study, hypodontia data from many ancient societies such as Europe and North Africa Mesolithic period, Pre-Egypt dynasty period, Greece from Neolithic to Middle Ages, pre-and post-historic Texas natives and Mesopotamia 3000 B.C. were given.[28]

In a study on the third molar tooth deficiency in 3 different prehistoric periods of Canary Islands, 1,492 maxilla and 1718 mandible, 3210 jaw arcs in total were evaluated.[29] In Tenerife (I-XIV century BC), 342 (10.8%) over 1575 (lower/upper) of the jaw samples were detected without third molar teeth. In Gran Canaria (A.D.60-1220) 1555 samples of women and men were evaluated and 236 (7.6%) individuals were reported with a deficiency in third molar. In La Gomera, 80 individuals were evaluated and in 15 (9.4%) of them third molar teeth deficiency was detected. In this study, third molar tooth deficiency was explained as a genetic alteration.

In ancient Anatolian populations, few studies have been carried out on this subject. In this context, the first study to address this situation in prehistoric Anatolian communities was carried out on Çayönü (Diyarbakır-Ergani) and Aşıklı Höyük (Aksaray) Neolithic period without Pottery (10,000 BC) and Neolithic Musular communities.[5] In all three societies, a total of 282 jaw bones were examined and 46 (16.3%) of third molar teeth agenesis were observed. Of these, 31 (15.4%) of the 201 jaw bones in the Çayönü community, and 15 (18.5%) of the 81 jaw bones of the Aşıklı Höyük community were observed with a third molar agenesis. While the congenital absence of the third Molar tooth detected in the mandible in Çayönü society is 18.3%, this rate is 11.1% in the maxilla. For Aşıklı society, this rate is 26.0% in the mandible and 6.5% in the maxilla. In general, the congenital absence of the third molar tooth in male individuals (24.2%) is higher than female individuals (13.3%).

Another study was conducted on the Kayalıpınar archaeological settlement area of Sivas province. In this study, hypodontia was observed in a total of four individuals (2.66%) out of 150 individuals, two women and two men.[39]

In the study we performed, hypodontia (agenesis) was detected in 7.21% of the seven jaw bones, four of which were the mandible and three of them were the maxilla. It was observed that three of these individuals were male and two were female. It was observed that the results we obtained in both the frequency of supernumerary teeth and the frequency of hypodontia (agenesis) in the study yielded similar results with both recent studies and previous studies.

Supernumerary teeth are available in several recent studies conducted in Turkey as well as world. One of the recent studies conducted in Turkey evaluated the supernumerary teeth in Çukurova Region and it was carried out on 12,735 individuals and a total of 156 (0.88%) supernumerary teeth were detected in 112 individuals.[30] Location of 69.2% of these supernumerary teeth were observed in the maxilla and 30.8% in

the mandible. In this study, no significant difference was observed between the genders in the frequency of supernumerary teeth. Buried supernumerary teeth were found as statistically more common in women.

Another recent study on supernumerary teeth carried out in Turkey, involved individuals aged 6-14 years' old who came to the Department of Oral, Dental and Maxillar Radiology (Kayseri) at Erciyes University.[23] This study was carried out on 2,566 individuals in total. Of these individuals, 1178 are men and 1388 are women. Supernumerary teeth were detected in 17 individuals (0.66%). Another study was conducted on patients who came to Atatürk University Faculty of Dentistry in Erzurum between 1999-2008.[31] In this study, 3491 (2146 female/1345 male) patients aged between 12-25 were evaluated. Supernumerary tooth cases were detected in 42 (1.2%) individuals, of which 27 were detected in male patients and 15 in female patients.

While the eruption areas of the supernumerary tooth were seen in the most mesiodens with a rate of 31.3%, then they were observed in the areas of premolar (25.0%), lateral (22.9%), distamolar (14.5%), premolar (4.2%) and canine (2.1%) areas respectively. One of the most comprehensive studies done in Turkey on supernumerary molar teeth was conducted in seven different cities in Turkey (Sivas, Gaziantep, Kayseri, Bolu, Tokat, Samsun, Konya) and in ten different clinics.[32] Radiographic evaluations was made on 104902 patients between the ages of 14-43 and radiographic images were obtained. Among these patients, a total of 351 (0.33%) supernumerary teeth were detected in 288 individuals. While 153 (43.6%) of these 351 supernumerary teeth belong to male individuals, 198 (56.4%) belong to female individuals. Among these teeth, the most morphologically frequent are conical shaped teeth.

In another study conducted in Finland on 1,141 children (three – four ages), the prevalence of supernumerary teeth was found to be 0.4%[33]. In the study, it has been reported that supernumerary teeth are seen in the region where incisors are located in the maxilla. It was also reported that there was no significant difference between the genders in the frequency of supernumerary teeth. In South India, in a clinical and radiographic study, supernumerary teeth were found in 45 (1.1%) of 3,936 people.[34] It was found that these teeth were seen more in the maxilla and observed three times more in males (75.6%) than females (24.4%). While 35 of the 45 supernumerary teeth detected consisted of a single excess tooth, two supernumerary teeth were found in nine individuals and three in one individual. In the study, which also evaluated deciduous and permanent teeth, 8 of 45 individuals had extra tooth formation in their deciduous teeth, 29 individuals in mixed (deciduous/permanent) teeth and eight individuals in their permanent teeth. However, in a study on children aged three-six -, supernumerary teeth were detected in four individuals (0.05%) in maxilla of 8,122 (4102 boys/4020 girls) individuals.[35] In another study carried out in Yazd dental faculty in Iran[36] the presence of supernumerary teeth was observed in 17 (3.5%) out of 480 individuals. In this study, 220 male patients and 260 female patients were evaluated. The rate of supernumerary teeth was found as 5% in male patients (220/11) and 2.3% in female patients (260/6).

Supernumerary tooth (hyperdontia) can be seen in today's societies as well as in societies that lived in previous periods. There are difficulties in evaluating skeletal material from ancient societies. Skeletons obtained from the excavations have a fragile structure and can be affected by natural conditions. Finding such rare specimens becomes more difficult in ancient populations. The earliest example belongs to a fossil specimen. In an adult *Australopithecus robustus* fossil dating back about 1.7 million years ago, found in Swaartkrans, the maxilla had a hyperdontia between first and second right incisive.[37]

A rare number of samples were obtained for Anatolian populations. One of these few examples was reported as a supernumerary premolar tooth in the mandible of a young male individual in the Perge society from the Roman Imperial Period in the Pamphylia Region.[38] Another example was obtained in Patara, one of the important ancient cities of the Lycian Region. Supernumerary premolar tooth formation

in the mandible of an adult person was detected in an anthropological study conducted on 155 skeletons from Lykia Region.[15] The presence of supernumerary teeth in only one of 155 individuals reveals that the incidence in the community is 0.64%.

In another study, supernumerary teeth were found in the upper left central incisive region of a 12-year-old child in one of the 150 individuals (0.66% in the population) obtained from the Kayalıpınar archaeological settlement. [39]

In this context, our study constitutes one of the rare examples. In the anthropological evaluation we performed on 97 jaw bones dated to the Byzantine Period in Beybağ Region, supernumerary tooth was observed only in one child aged 12 years (± 2.5), which indicates that the frequency of supernumerary teeth was 1.03% for this Byzantine society.

In the literature review conducted, it was found that the incidence of supernumerary teeth was 0.1% - 3.9% and that it was observed more in men than in women. The frequency of supernumerary teeth observed in permanent teeth is consistent with the literature information both for the Perge and Patara communities as well as Byzantine Period society we conducted for Beybağ. In addition, although studies have been conducted on a small number of samples, the fact that individuals with supernumerary teeth in the Perge and Patara samples are male, is in parallel with the literature records.

In our study, individual bearing a supernumerary tooth was a child, and therefore gender determination could not be made. Whether our study (in the context of gender) is in accordance with the literature could not be evaluated for this reason. However, it has been reported that the formation of supernumerary teeth is most common in the maxilla. Lateral maxillar incisors are the most susceptible to this formation. In our study, the observation of the supernumerary tooth in the maxilla and in the region of the lateral incisors is in accordance with the literature.

Conclusion

Finding more or less teeth number than expected is an important research topic in anthropological studies. Ancient populations also experienced similar problems at different levels, but since the end of the Pleistocene period, jaw and tooth reduction has been observed in almost all populations. However, researchers do not explain agenesis only with reduction in tooth and jaw size, and it is also associated with natural selection, genetic and environmental factors, growth patterns of populations and eruption chronology of teeth.[5] A similar situation applies to supernumerary teeth. It is suggested that familial inheritance is effective since it is more observed in consanguineous groups.[12]

Since anthropology tries to analyze the changes that occur in human populations and the factors that cause these changes, it is very important to reveal what kind of dynamics are/can be effective in both supernumerary tooth formation and agenesis formation. From this point of view, both hypodontia and hyperdontia samples were detected in our Byzantine period research population. Our findings reveal that, the incidence of supernumerary teeth in the Byzantine community of Beybağ was found to be 1.03% and the frequency of agenesis was 7.21%. However, only one case of a supernumerary tooth was observed in the maxilla. Frequency of supernumerary teeth and the frequency of hypodontia (agenesis) in this study was in accordance with relevant literature. With further studies, our knowledge in this field will expand including Anatolian populations.

Acknowledgement

The authors report no conflicts of interest.

Authors are grateful to Prof. Dr. Ahmet Adil TIRPAN, Prof. Dr. Bilal SOGUT and Muğla Museum officials who allowed us to work on the skeletons of the Byzantine Beybağ population we used as material. In addition, we would like to thank to Dr. Ersen BILGILI for his help in x-ray imaging of the skeletons. We also would like to thank to Assoc.Prof.Dr. Okan Arıhan for his contribution to English text and Instr. Leyla Adıgüzel for her English language control.

Author contributions

Seda Karaöz Arıhan: Idea/Concept, design, control/supervision, data collection, analysis and/or interpretation, literature review, writing the article, critical review, references and fundings, materials.
Ramazan Türkekul: Control/supervision, data collection, analysis and/or interpretation, literature review, writing the article.

References

1. Hillson S. Dental Anthropology. Cambridge University Press; 1998; New York.
2. Irish JD, Scott GR. A Companion to Dental Anthropology. 1st ed. John Wiley & Sons, West Sussex UK; 2016; England.
3. Arte S. Phenotypic and Genotypic Features of Familial Hypodontia. Academic Dissertation. Helsinki: Helsinki University; 2001; Helsinki.
4. Kotecha S. 2011. The Impact of Hypodontia on the Oral Health-Related Quality of Life in Children. Master of Philosophy, Birmingham University; 2011; Birmingham, Britain.
5. Özbek M, Erdal YS. Neolitik Çağ Anadolu İnsanlarında 20 Yaş Dişinin Sürme Durumu. J Hacettepe Fac Dent 2003;27:10-22.
6. Ruschel HC, Diamonte M, Kramer PF. Hypo-Hyperdontia: A Case Report. Rev Gauch Odontologia Odontologia 2015;63:331-36.
7. Kashyap RR, et al. Prevelance of Hyperdontia in Nonsyndromic South Indian Population: An Institutional Analysis. Ind J Dent 2015;6:135-38.
8. Byahatti SM. Hyperdontia: 3 Cases Reported. J Clin Diagn Res 2011;5:665-68.
9. Ferrazzano GF, et al. An Impacted Central Incisor Due to Supernumerary Teeth: A Multidisciplinary Approach. Eur J Pediat Dent Clinical Supplement to 2014; 15: 187-90.
10. Scheiner MA, Sampson WJ. Supernumerary Teeth: A Review of the Literature and Four Case Reports. Austral Dent J 1997;42:160-65.
11. Dural S, Özbek M, Avcu N. Mandibular Premolar Bölgede Bilateral Gömük Süpernümerer Dişler (İki Olgu Nedeniyle). Atatürk Üni Diş Hek Fak D 1996;6:68-71 (in Turkish).
12. Karayilmaz H, Kirmizioğlu Z, Saritekin A. Characteristics of Nonsyndromic Supernumerary Teeth in Children and Adolescents. Turk J Med Sci 2013;43:1013-18.
13. Erdem MA, et al. Artı Dişler (Süpernümerer Dişler) Supernumerary Teeth. Olgu Sunumu. İstanbul Üni Diş Hek Fak D 2011;45: 15-8 (in Turkish).
14. Amını F, Rakhshan V, Jamazzadeh S. Prevalence and Pattern of Accessory Teeth (Hyperdontia) in Permanent Dentition of Iranian Orthodontic Patients. Iran J Publ Health 2013;42:1259-65.
15. Sevim Erol A, Yavuz AY, Aytek Aİ. Patara İnsanlarında Bir Diş Varyasyonu: Supernumerary Premolar Diş ve Antropolojik Önemi. MASROP 2018;12:45-57.
16. Inchingolo F, et. al. Non-Syndromic Multiple Supernumerary Teeth in a Family Unit With a Normal Karyotype: Case Report. Int J Med Sci 2010;7: 378-84.
17. Srinivasan K, Chitra S. Mystery Behind Hyperdontia: Report of Two Cases. Int J App Dent Sci 2015;1:5-9.
18. Alt KW, Rosing FW, Teschler-Nicola M. Dental Anthropology, Fundamentals, Limits and Prospects. Springer Wien; 1998.
19. Tatli U. et al. Çukurova Bölgesinin Süpernümerer Diş Karakteristikleri: Çok Merkezli Retrospektif Bir Çalışma. Acta Odontol Turc 2014;31:82-8.
20. Tirpan A, Söğüt B, Büyüközer A. Lagina, Börükçü, Belentepe ve Mengefe 2008 Yılı Çalışmalar. 31. Kazı Toplantısı 3.cilt; 2009; Mayıs 25-29; Denizli, Turkey; 2009.
21. Karaöz Arihan S. Beybağ Mevkii (Muğla) Bizans Dönemi Toplumunda Beslenmeye Bağlı Gelişen Paleopatolojik Rahatsızlıklar. T.C. Ankara Üniversitesi Sosyal Bilimler Enstitüsü Antropoloji (Paleoantropoloji) Anabilim Dalı, Yayımlanmamış Doktora Tezi, Ankara 2013, pp 63.
22. Aren G, et al. The Prevalence of Dental Anomalies in a Turkish Population. J İstanbul Univ Fac Dent 2015;49:23-8.

23. Yilmaz S, et. al. Kayseri İli Popülasyonunda Diş Anomalileri ve Konjenital Diş Eksiklikleri Prevalansı. Selcuk Dent. J. ODMFR; 2019 Kongre Kitapçığı Özel Sayısı, Konya, Turkey; 2019.
24. Eidelman E, Chosack A, Rosenzweig KA. Hypodontia: Prevalence Amongst Jewish Populations Of Different Origin. Amer J Phys Anthrop 1973;39:129-33.
25. Chung CJ, Han JH, Kim KH. Hypodontic Pattern and Prevalence In Koreans. Oral Dis 2008;14:620-25.
26. Gomes RR, et al. Prevalence of Hypodontics in Orthodontic Patients in Brasilia, Brazil. Eur J Ortodon 2010;32:302-6.
27. Amını F, Rakhshan V, Babael P. Prevalence and pattern of hypodontia in the permanent dentition of 3374 Iranian orthodontic patient. Dental Res J 2012;9:245-50.
28. Brothwell DR, Carbonell VM, Goose DH. Symposia of The Society for The Study of Human Biology Vol.5 Dental Anthropology ''Congenital Absence of Teeth in Human Populations''. Symposium Publication Division Pergamon Press ed. Brothwell D.R. 1963; 179-190.
29. Bermudez de Castro JM. Third Molar Agenesis in Human Prehistoric Populations of the Canary Islands. Am J Phys Anthropol 1989;79:207-15.
30. Tatlı U. et al. Çukurova bölgesinin süpernümerer diş karakteristikleri: çok merkezli retrospektif bir çalışma. Acta Odont Turc 2014;31:84-8.
31. Celikoğlu M, Kamak H, Oktay H. Prevalence and characteristics of supernumerary teeth in a non-syndrome Turkish population: Associated pathologies and proposed treatment. Med Oral Patol Oral Cir Bucal 2010;15:575-578.
32. Kara Mİ, Aktan AM, Ay S. Characteristics of 351 supernumerary molar Teeth in Turkish Population. Med Oral Patol Oral Cir Bucal. 2012;17:395-400.
33. Jarvinen S, Lehtinen L. Supernumerary and Congenital Missing Main Teeth in Finnish Children. ACTA Odontol Scand 1981;39:83-6.
34. Syriac G. et al. Prevalence, Characteristics, and Complications of Supernumerary Teeth in Nonsyndromic Pediatric Population of South India: A Clinical and Radiographic Study. J Pharm BioAl Sci 2017;5:231-36.
35. Miyoshi S. et al. An Epidemiological Study of Supernumerary Primary Teeth In Japanese Children: Review Of Racial Differences In Prevalence. Oral Dis 2000;6:99-102.
36. Ardakani FE, Sheikhha MH, Ahmadi H. Prevalence of Dental Developmental Anomalies: A Radiographic Study. Comm Dent Health 2007;24:1-5.
37. Ripamonti U, Petit JC, Thackeray JF. A supernumerary tooth in a 1.7 million-year-old *Australopithecus robustus* from Swartkrans, South Africa. Eur J Oral Sci. 1999;107:317-21.
38. Erdal YS. Et al. A Supernumerary Premolar Tooth From A Roman Site Perge in Anatolia. Int J Dent Anthropol 2006;9:20-3.
39. Sarı İ, Açıkkol Yıldırım A. Dental Anomalies in Ancient Societies: Kayalıpınar Example. Anthropology 2021;41:99-107.