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Anthropological Characteristic of Some Odontometric Dimensions between Certain Balkan Ethnicities

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The aim of the present study is to evaluate the variations of dental dimensions between Bulgarians and other populations. The study included 169 Bulgarians aged 20-40 years. Buccolingual and mesiodistal dimensions of teeth were measured by Dentistry Sliding Vernier Caliper and analyzed with SPSS 23.0. We found significant differences in mesiodistal dimensions of maxillary canines, premolars and molars and mandibular incisors and premolars between Bulgarians and Serbians. Similar significant differences were found in vestibulolingual and mesiodistal dimensions of upper canines and molars, vestibulolingual dimensions of upper incisors and mesiodistal dimensions of upper premolars, mesiodistal dimensions of mandibular incisors, premolars and second molars and vestibulolingual dimensions of mandibular lateral incisors, canines, premolars and molars between Bulgarians and Greeks. Our results showed that odontometric dimensions vary in different population and therefore it is necessary to determine specific population values in order to make identification possible.

Key words: dental dimensions, population specific values, Bulgarians

Introduction

Dental profile consists of specific individual characteristics related to the teeth and their size. They can help in estimation of age, sex, race, socio-economic status, personal habits, oral and systemic health, occupation and dietary status of the person [12, 18]. Variability observed in the human dentition provides a theoretical basis for

the individualization of human dentition [11]. Different dental traits, such as crown dimensions, tooth shape, cusp number, groove and fissure patterns can provide evidence about the nature and extent of diversity between human populations [13]. Examples of ethnic differences and geographic variability in tooth size have been documented [4]. Numerous factors can contribute to variation in tooth size but probably the combination between genetic factors and environmental influences leads to the differences between populations [3].

A synthesis of data on dental dimensions from different population worldwide has indicated that Western Eurasian population tend to have the smallest teeth while Australians, sub-Saharan Africans and Native Americans tend to have the largest teeth. East and Southeast Asian population were found to be intermediate in tooth size between these groups. Hanihara observed that this was due to the impact of agriculture [10]. Masticator forces, non-chewing parafunctional activities, use of teeth as tools, nature of the diet can also contribute to variations in dental size between different populations [2]. A tough fibrous and abrasive food requires prolonged mastication so populations relying on plant food have larger teeth than those eating meat. Environmental influences can affect the dentition during prenatal and postnatal periods and depending on the time of the effect a variety of phenotypic variations may occur [16]. Environmental factors are local and systemic. Local factors usually produce localized defects [15] while systemic factors such as birth trauma, low birth weight, prematurity, drugs and chemicals, nutritional disorders, metabolic diseases lead to different changes in micromorphology of dental crowns as well as gross morphological changes such as tooth size [9]. In accordance with other researchers [5, 8] we think that variations in crown size between different populations are affected by interaction between genetic and environmental factors. Standards for skeletal identification vary among different populations and may not be applicable from one population to another. There are no odontometric standards for Bulgarian population.

The aim of this research is to assess the population specificity of some dental dimensions between Bulgarians and other Balkan populations.

Materials and Methods

The present study included 86 males and 83 females of Bulgarian origin living in South Bulgaria aged 20-40 (mean age $32,60 \pm 4,30$). Before starting the study, subjects were informed about the nature of the study and written informed consents were obtained. Patients were included based on the following criteria: presence of complete set of fully erupted and periodontally healthy teeth, presence of non-carious and non-worn teeth, no dental history of any crown restorations or bridges, normal occlusion. Patients with orthognathic surgery or trauma, history or clinical evidence of cleft palate, history or clinical features suggestive of endocranial disorders, metabolic disorders, developmental disorders and history of prolonged illness were excluded.

Buccolingual and mesiodistal dimensions of teeth were measured by Dentistry Sliding Vernier Caliper, Ridge Mapping Caliper Type A and Type B. We used the technique of Martin-Saller, 1957, modified by Yordanov et al. [19]. According to Yordanov et al. the mesiodistal dimension is the greatest mesiodistal distance between the contact points of teeth, usually it is in the upper or middle third of coronal height.

It is also termed the dental width. The buccolingual (vestibulolingual) dimension, also termed as the dental thickness is the greatest dimension between buccal and lingual surfaces of crown, taken at right angle to the plane in which mesiodistal diameter is taken. We used collected data about the dental dimensions of Serbians and Greeks reported by other authors [7, 20].

The measurements were analyzed with SPSS 23.0 using Student's t-test. The level of statistical significance was set at $P < 0.05$. The degree of significance was considered weak ($P < 0,05$), moderate ($0,01 > P > 0,001$) or high ($P < 0,001$). Only measurements which show significant differences were reported in the tables.

Results

Comparison of Bulgarian and Serbian samples (report results included in Tables 1-4)

We found statistically significant differences between the mesiodistal dimensions of maxillary canines and first molars of the Bulgarian and Serbian men with high degree of significance ($P < 0,001$). The mean values in Bulgarians were higher than those in Serbians (**Table 1**).

Similar differences were found in the mesiodistal dimensions of mandibular incisors and premolars again with high degree of significance ($P < 0,001$). This time mean values in Serbians were higher than those in Bulgarians (**Table 2**).

Mesiodistal dimensions of the maxillary premolars in Bulgarian women showed significantly lower values than those of Serbian women. For the first premolar the degree of significance was high ($P < 0,001$) while for the second premolar the degree was weak ($P < 0,05$). Similar differences with high degree of significance were found in the mesiodistal dimensions of maxillary canines in favor of Bulgarian women (**Table 3**).

We found statistically significant differences between the mesiodistal dimensions of mandibular incisors and premolars with high degree of significance ($P < 0,001$). The mean values in Serbian women were higher than those in Bulgarian women (**Table 4**).

Comparison of Bulgarian and Greek samples (report results included in Tables 5-8)

Vestibulolingual dimensions of the maxillary incisors, canines and molars between Bulgarian and Greek men showed statistically significant differences in favor of Greeks. They were with high degree of significance in the molars. Similar statistically significant differences were found in the mesiodistal dimensions of the maxillary canines, premolars and molars. The degree of significance was high for the canines ($P < 0,001$). Mean values in Greeks were higher except for the canines and molars (**Table 5**).

We found statistically significant differences in the mesiodistal dimensions of the mandibular incisors, premolars and second molars between Bulgarian and Greek men. Vestibulolingual dimensions in mandibular lateral incisors, canines, premolars and first molars showed statistically significant differences as well. The degree of significance was high ($P < 0,001$) for the mesiodistal dimensions of the mandibular second premolars and second molars and for the vestibulolingual dimensions of the lateral incisors and premolars. Greeks showed higher mean values except for the vestibulolingual dimensions of premolars and first molars (**Table 6**).

Similar statistically significant differences were found in mesiodistal dimensions of the maxillary canines between Bulgarian and Greek women with high degree of

significance ($P < 0,001$). Vestibulolingual dimensions of the maxillary premolars in Bulgarians were also significantly higher than those in Greeks (**Table 7**).

Mesiodistal dimensions of the mandibular second premolars between Bulgarian and Greek women were significantly higher in Greeks with weak degree of significance ($P < 0,05$). Vestibulolingual dimensions in mandibular premolars and second molars showed statistically significant differences in favor of Bulgarian women. The degree of significance was high for the premolars ($P < 0,001$) (**Table 8**).

Discussion

We found statistically significant differences in 6 odontometric dimensions between Bulgarian and Serbian men. Mesiodistal dimensions of maxillary canines and first molars were higher in Bulgarians than those in Serbians while mesiodistal dimensions in mandibular incisors and premolars in Serbians were higher than those in Bulgarians. We found statistically significant differences in 7 dimensions between Bulgarian and Serbian women and these were mesiodistal dimensions of upper canines, lower incisors and both upper and lower premolars. Similar results were reported by Filipopovic who measured dental size in Serbian population and found that Serbians were more similar to European than Asian populations [6, 7]. Although we found statistically significant differences between the two populations, a certain degree of similarity was present, and this can be explained by the fact that they have common elements in nutrition. Other authors such as Ates et al. also thought that environmental factors such as eating habits can influence the size of teeth [1]. Deepak et al. found that abrasive food required more continuous mastication hence dental size in these populations was smaller while populations relying more on plant food than meat had larger teeth [4]. Hanihara and Ishida proposed that the smaller tooth dimensions in Western Eurasians populations were related to the lower impact of natural selection on tooth size over the last few millennia, associated with cultural changes in food preparation practices following the adoption of agriculture [11]. On the other hand, the resemblance between the two populations can be explained with the geographical proximity of their countries. Both nations belong to the South – Slavic ethnic group and have common origin with other Balkan populations (Macedonians, Romanians).

Other authors suggested strong genetic contribution in tooth size as well [14, 17]. They have pointed the importance of the role of genetic influences on dental traits and dimensions [3]. This can also explain the fact that the statistically significant differences between Bulgarian and Serbian population were less than those we found between Bulgarians and Greeks [20].

Our results showed that there were 10 significant differences in the dimensions of the maxillary teeth between Bulgarian and Greek men - mesiodistal dimensions of canines, premolars and molars and vestibulolingual dimensions of incisors, canines and molars. Greeks have higher values than Bulgarians except for the mesiodistal sizes of canines and molars. Ten significant differences were found in the dimensions of the mandibular teeth as well between the two populations: mesiodistal dimensions of the incisors, premolars and second molars and vestibulolingual dimensions of lateral incisors, canines, premolars and first molars. The mean values in Greek men were significantly higher than in Bulgarian men except for the vestibulolingual dimensions

of premolars and first molars where Bulgarians showed higher values. Bulgarian and Greek women though showed statistically significant differences in considerably less odontometric dimensions. They were 3 for the maxillary teeth: mesiodistal dimensions of canines and vestibulolingual dimensions of premolars and 4 for the mandibular teeth: mesiodistal dimensions of second premolars and vestibulolingual dimensions of premolars and second molars. The more differences between Bulgarians and Greeks probably were due to the different origin between the two populations (ancient Greeks are Indo-European nation coming from Africa), so it can be concluded that genetic influence has an important role in the dental dimensions.

The fact that there were less differences between women than between men and that most of them were in the vestibulolingual dimensions for the women shows that not only odontometric dimensions are population-specific but the degree of sexual dimorphism as well shows variation among different nations.

Conclusion

The present study revealed that odontometric dimensions were population-specific. They can be used for establishing the phylogenetical and biological relationships between populations, for explaining historical, cultural and biological macro and micro-evolutionary processes and thus for understanding the origin, formation, contacts, migration pathways of the different populations leading to ethnic variation of humanity.

Table 1. Comparison of mesiodistal dimensions of maxillary teeth between Bulgarian and Serbian men with statistically significant differences

Tooth	Bulgarian - males			Serbian - males			P
	N	Mean	SD	N	Mean	SD	
C13MD	86	8,72	0,63	101	7,90	0,39	<0,0001
M16MD	86	10,70	0,67	101	10,11	0,66	<0,0001

Table 2. Comparison of mesiodistal dimensions of mandibular teeth between Bulgarian and Serbian men with statistically significant differences

Tooth	Bulgarian - males			Serbian - males			P
	N	Mean	SD	N	Mean	SD	
I41MD	86	5,16	0,43	101	5,50	0,31	<0,0001
I42MD	86	5,47	0,55	101	6,06	0,37	<0,0001
P44MD	86	6,47	0,74	101	6,94	0,41	<0,0001
P45MD	86	6,37	0,82	101	7,02	0,41	<0,0001

Table 3. Comparison of mesiodistal dimensions of maxillary teeth between Bulgarian and Serbian women with statistically significant differences

Tooth	Bulgarian - females			Serbian - females			P
	N	Mean	SD	N	Mean	SD	
C13MD	83	7,95	0,65	101	7,60	0,51	<0,0001
P14MD	83	6,49	0,67	101	6,85	0,53	<0,0001
P15MD	83	6,40	0,66	101	6,65	0,48	<0,05

Table 4. Comparison of mesiodistal dimensions of mandibular teeth between Bulgarian and Serbian women with statistically significant differences

Tooth	Bulgarian - females			Serbian - females			P
	N	Mean	SD	N	Mean	SD	
I41MD	83	5,14	0,35	101	5,47	0,31	<0,0001
I42MD	83	5,58	0,50	101	6,00	0,35	<0,0001
P44MD	83	6,47	0,63	101	6,84	0,46	<0,0001
P45MD	83	6,37	0,73	101	6,93	0,43	<0,0001

Table 5. Comparison of mesiodistal and vestibulolingual dimensions of maxillary teeth between Bulgarian and Greek men with statistically significant differences

Tooth	Bulgarian - males			Greek - males			P
	N	Mean	SD	N	Mean	SD	
I11VL	86	6.74	1.18	15	7,42	0,36	<0,05
I12VL	86	5.98	0.71	22	6.48	0,51	<0,01
C13MD	86	8.72	0,63	32	7.73	0,51	<0,0001
C13VL	86	8,02	0,89	32	8,55	0,63	<0,01
P14MD	86	6.72	0,59	32	7.03	0,67	<0,05
P15MD	86	6,40	0,62	32	6.73	0,43	<0,01
M16MD	86	10.70	0,67	32	10.38	0,63	<0,05
M16VL	86	10,84	0,53	31	11,34	0,52	<0,0001
M17MD	86	10.00	0.53	32	9.64	0.92	0.010
M17VL	86	10,47	0,55	33	11,44	0,71	<0,0001

Table 6. Comparison of mesiodistal and vestibulolingual dimensions of mandibular teeth between Bulgarian and Greek men with statistically significant differences

Tooth	Bulgarian - males			Greek - males			P
	N	Mean	SD	N	Mean	SD	
I41MD	86	5,16	0,43	32	5,35	0,41	<0,05
I42MD	86	5,47	0,55	32	5,92	0,56	0,0002
I42VL	86	5,63	0,69	30	6,24	0,46	<0,0001
C43VL	86	7,33	1,02	32	7,94	0,63	<0,01
P44MD	86	6,47	0,74	32	6,97	0,50	<0,01
P44VL	86	8,70	0,96	36	7,80	0,59	<0,0001
P45MD	86	6,37	0,82	32	7,06	0,56	<0,0001
P45VL	86	8,83	0,78	34	8,13	0,67	<0,0001
M46VL	86	10,65	0,72	29	10,35	0,38	<0,05
M47MD	86	10.05	0.62	32	10,75	0.65	<0,0001

Table 7. Comparison of mesiodistal and vestibulolingual dimensions of maxillary teeth between Bulgarian and Greek women with statistically significant differences

Tooth	Bulgarian - females			Greek - females			P
	N	Mean	SD	N	Mean	SD	
C13MD	83	7,95	0,65	15	7,26	0,42	<0,0001
P14VL	83	9,23	0.57	17	8,43	0,69	<0,0001
P15VL	83	9,28	0,50	20	8,73	0,63	<0,0001

Table 8. Comparison of mesiodistal and vestibulolingual dimensions of mandibular teeth between Bulgarian and Greek women with statistically significant differences

Tooth	Bulgarian - females			Greek - females			P
	N	Mean	SD	N	Mean	SD	
P45MD	83	6,47	0,74	22	6,88	0,52	<0,05
P44VL	83	8,51	0,74	24	7,20	0,71	<0,0001
P45VL	83	8,58	0,70	25	7,81	0,57	<0,0001
M47VL	83	9,98	0,46	28	9,59	0,54	0,0003

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