

Inter-Incise Index in Bulgarians and its Application in Dentistry

Indice Interincisivo en Búlgaros y su Aplicación en Odontología

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SUMMARY: In recent years, aesthetic dentistry has become a major focus for the public. Facial attractiveness plays a key role on modern society and the creation of harmonious smile is an aim for every dentist. The objective of this study was to define certain values of the inter-incisive index in Bulgarians, the sexual dimorphism and bilateral asymmetry and to verify differences of this index between Bulgarians and other Balkan populations. The present study included 121 males and 111 females of Bulgarian origin aged 20-40 years. Mesiodistal dimensions of maxillary central and lateral incisors were measured by Dentistry Sliding Vernier Caliper. We used the technique of direct anthropometry, modified by Prof. Y. Yordanov. We calculated the inter-incisive index as ratio of the mesiodistal dimension of maxillary lateral incisor to the mesiodistal dimension of the maxillary central incisor. The measurements were analyzed with SPSS 23. The level of statistical significance was set at $P < 0.05$. The inter-incisive index showed no statistically significant differences between left and right side of the dental arch in both sexes. We did not find statistically significant differences between males and females as well. On the other hand, we found statistically significant differences in MD values of incisors between Bulgarians and other Balkan nations. Inter-incisive index shows no sexual dimorphism and bilateral asymmetry in Bulgarians. This can be helpful in aesthetic dentistry, in prosthodontics and in orthodontic treatment planning.

KEY WORDS: Incisors; Proportions; Hypodontia; Prosthetics; Orthodontics.

INTRODUCTION

Facial attractiveness plays a key role on modern society and it can influence not only self-esteem but also social opportunities, professional performance and employment prospects. In face-to-face situation a person's eyes primarily observe the other person's eyes and the area of the mouth. This means that smile aesthetics is becoming a dominant concern for patients, in particular when a dental treatment is required (Rotundo *et al.*, 2015).

In recent years, aesthetic dentistry has become a major focus for the public. This trend was initiated by prosthodontists and, recently, by orthodontists. It can be said that the smile is the sum of features which comprise the lips, soft tissue (gingiva) and hard tissue (teeth). Numerous factors are related to dental aesthetics, such as the color, the shape, the size, the proportions of the teeth and the shape of the dental arch. They are influenced by individual

preferences, cultural factors, and sociodemographic factors. The selection of teeth for an edentulous patient can be difficult especially when no pre-extraction records are available. The size, form and color of the teeth must be in harmony with surrounding oral and facial structures (Frush & Fisher, 1956). One of the primary concerns in denture aesthetics is the selection of suitable sized maxillary anterior artificial teeth.

Maxillary central incisors are considered to be the key teeth in smile since they are the most visible teeth during facial activity. Their size, shape, and arrangement are the most influential factor for harmonious appearance. On the other hand, the mesiodistal dimensions of lateral incisors also play an important role in facial appearance. One of the essential elements in the aesthetic complex is exactly the contrast between the width of the central incisor and the

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smaller lateral incisor. Dental anomalies in number, size and shape affect upper lateral incisors very often (Kotsomitis & Freer, 1997). Some studies prove that these deformities are even interconnected. They can be observed in cases with asymmetric hypodontia, microdontia or peg-shaped tooth crown of the opposing lateral incisor (Bot & Salmon, 1977; Alvesalo & Portin, 1969). This impedes not only the aesthetics but also occlusal relationship. Success of the treatment option connected with an orthodontic open missing tooth space and subsequent prosthetic or implant restoration depends on proper determination of medio-distal diameter of the missing and mis-shaped incisor. The inter-incisive index is the mathematical expression of this ratio between both incisors. Geometrical or mathematical relationship between teeth is an important determinant to achieve an aesthetic restorative result (Tarvade & Agrawal, 2015), therefore this index can be very helpful in aesthetic dentistry, prosthodontics and orthodontics.

The aim of this study was to define certain values of the inter-incisive index in Bulgarians, to assess its degree of sexual dimorphism and bilateral asymmetry and to verify statistically significant differences in this index between Bulgarians and other Balkan populations.

MATERIAL AND METHOD

The present study included 121 males and 111 females of Bulgarian origin in the age group 20-40 years. 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:

1. Presence of complete set of fully erupted and periodontally healthy maxillary teeth.
2. No periodontal disease.
3. No spacing and crowding in anterior maxillary teeth.
4. No history of orthodontic treatments.
5. No intruded, extruded or rotated teeth in the anterior region.

Mesiodistal dimensions of maxillary central and lateral incisors were measured by Dentistry Sliding Vernier Caliper. We used the technique of direct anthropometry, modified by Yordanov *et al.* (2012). According to Yordanov the mesiodistal dimension is the greatest distance between the most convex approximal points on the mesial and distal sides of the crowns, usually it is in the upper or middle third of coronal height. It is also termed the dental width. We calculated the inter-incisive index as ratio of the mesiodistal dimensions of maxillary lateral incisor to the mesiodistal dimensions of the maxillary central incisor. [(MD12/MD11) x100].

An ethical approval was taken for this study by the Ethics committee in Medical University-Plovdiv. Informed consents were obtained from all patients involved in the study. All methods were performed in accordance with the relevant guidelines and regulations.

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). Z-test was used to compare the proportions.

An ethical approval was taken for this study by the Ethics committee in Medical University-Plovdiv.

RESULTS

1. We did not find statistically significant differences in the inter-incisive index between left and right sides in Bulgarian men and women (Table I).
2. There were no statistically significant differences in the inter-incisive index between Bulgarian males and females (Table II).
3. Our study did not show statistically significant differences in the inter-incisive index between Bulgarian and Serbian populations. There were statistically significant differences in mesiodistal dimension of the maxillary central incisors in favor of Serbians (Table III).

Table I. Comparison of inter-incisive index in Bulgarians between left and right side.

Males- right				Males- left				
Tooth	N	Mean	SE	Tooth	N	Mean	SE	P
I11MD	121	8.47	0.11	I21MD	121	8.49	0.11	P>0.05
I12MD	121	6.74	0.11	I22MD	121	6.67	0.12	P>0.05
III		79.57 %		III		78.56 %		P>0.05
Females- right				Female s- left				
I11MD	111	8.42	0.09	I21MD	111	8.44	0.09	P>0.05
I12MD	111	6.79	0.11	I22MD	111	6.79	0.12	P>0.05
III*		80.64 %				79.62 %		P>0.05

* Inter Incisive Index.

Table II. Comparison of inter-incisive index between Bulgarian men and women.

Tooth	BG Males			Tooth	BG Females			P
	N	Mean	SE		N	Mean	SE	
I11MD	121	8.48	0.11	I11MD	111	8.43	0.09	<i>P>0.05</i>
I12MD	121	6.71	0.12	I12MD	111	6.79	0.12	<i>P>0.05</i>
III*	79.05 %			III	80.13 %			<i>P>0.05</i>

* Inter Incisive Index.

Table III. Comparison of inter-incisive index between Bulgarians and Serbians.

Tooth	Bulgarians			Tooth	Serbians			P
	N	Mean	SD		N	Mean	SD	
I11MD	232	8.46	0.67	I11MD	201	8.62	0.56	<i>P = 0.01</i>
I12MD	232	6.75	0.72	I12MD	201	6.71	0.48	<i>P>0.05</i>
III*	80.44 %			III	77.84 %			<i>P>0.05</i>

* Inter Incisive Index.

4. We did not find statistically significant differences in the inter-incisive index between Bulgarian and Greek populations. Mesiodistal dimension of the maxillary lateral

incisors showed statistically significant differences in favor of Bulgarians (Table IV).

Table IV. Comparison of inter-incisive index between Bulgarians and Greeks.

Tooth	Bulgarians			Tooth	Greeks			P
	N	Mean	SD		N	Mean	SD	
I11MD	232	8.46	0.67	I11MD	112	8.36	0.73	<i>P>0.05</i>
I12MD	232	6.73	0.72	I12MD	112	6.49	0.59	<i>P<0.001</i>
III*	80.44 %			III	77.63 %			<i>P>0.05</i>

* Inter Incisive Index.

DISCUSSION

Our results showed no statistically significant differences in the inter-incisive index between right and left sides of both sexes. This means that the ratio of the width of the lateral incisor towards the width of the central incisor is similar in both sides of the dental arch. Insignificant bilateral asymmetries in the antimeric teeth were reported by others as well (Lysell & Myrberg, 1982; Axelsson & Kirveskari, 1983; Buschang *et al.*, 1988). Lack of significant asymmetries was reported by Keith *et al.* who assessed the differences in the odontometric dimensions between left and right members of antimeric teeth in South Chinese, Yuen *et al.* (1997). This justifies the use of average values for the dimensions of left and right maxillary central and lateral incisors. We did not find statistically significant differences in the inter-incisive index between Bulgarian males and females which indicated no sexual dimorphism. These results were in accordance with Seipel (1946) and Jensen *et al.* (1957) who reported that the most dimorphic teeth were the canines, while the maxillary incisors were the least. Similar

results were observed by Garn *et al.* (1964) who claimed that the most dimorphic teeth were the molars, while the upper incisors were the least dimorphic.

We believe that our findings can be useful for the prosthodontists because in treating patients with missing maxillary anterior teeth, they must determine tooth size and shape to achieve an optimal aesthetic result. If the size and shape of a replaced tooth are not in harmony with patients' face and other teeth, psychological and social problems might arise (Parnia *et al.*, 2010). Using average values for left and right inter-incisive index and for males and females would considerably facilitates dentists in esthetic treatment with facets and manufactures of artificial teeth for prosthesis.

Inter-incisive index values can be used by the orthodontists for treating hypodontia of the upper lateral incisor when a decision should be taken for how much space is needed to be opened for an implant. In all cases with

microdontia of upper incisors or deep bite correction by stripping of the crowns of maxillary incisor, mean values for the size of the crowns or inter-incisive index can be applied.

In our study we did not find statistically significant differences in the inter-incisive index neither between Bulgarians and Serbians nor between Bulgarians and Greeks. Mesiodistal dimensions of central incisors between Bulgarians and Serbians were significantly different though. Similar significant difference we found in the mesiodistal dimensions of lateral incisors between Bulgarians and Greeks.

Yordanov *et al.* (2012) reported that values of the inter-incisive index are between 75- 78 % in Europeans, while in Mongoloids they are between 82- 84 %. He observed that the index in women is lower. This is in contrast with the results of our study according to which women show higher values (80.13 %) than men (79.05 %). Our results showed that values of inter-incisive index were closer to those of the Europeans (79.05 %). This is in contrast with the results from Abadzhiev (2017) who observed closer values of the index in North- Eastern Bulgarians to those of the Mongoloids. Examples of ethnic differences and geographic variability in tooth size have been documented and they could be related to the degree of ethnic mixing, Brook *et al.* (2014). The fact that there were no significant differences in the inter- incisive index between Bulgarians and the two Balkan nations can be explained by geographical proximity of the countries, a decrease in racial differences due to increase of racial mixture and the common origin. Both Bulgarians and Serbians belong to the South – Slavic ethnic group.

CONCLUSION

Inter-incisive index can be very useful in esthetic dentistry in the treatment with facets, in prosthodontics in the treatment of edentulous patients with prosthesis and in orthodontic treatment planning. The fact that it showed no sexual dimorphism and bilateral asymmetry facilitates the dentists with use of averaged size between mesiodistal dimensions of both the incisors. Since it did not show population- specificity the index might be applicable for Serbians and Greeks as well.

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RESUMEN: En los últimos años, la odontología estética se ha convertido en un foco importante para el público. El atractivo facial juega un papel clave en la sociedad moderna y la creación de una sonrisa armoniosa es importante para todos los dentistas. El objetivo de este estudio fue definir ciertos valores del índice interincisivo en búlgaros, el dimorfismo sexual y la asimetría bilateral y verificar diferencias de este índice entre búlgaros y otras poblaciones balcánicas. El presente estudio incluyó a 121 hombres y 111 mujeres de origen búlgaro entre 20 y 40 años de edad. Las dimensiones mesiodistales de los incisivos superiores centrales y laterales se midieron con un calibrador Vernier deslizante de odontología. Utilizamos la técnica de antropometría directa, modificada por el Prof. Y. Yordanov y se calculó el índice interincisivo como la relación entre la dimensión mesiodistal del incisivo lateral superior y la dimensión mesiodistal del incisivo central superior. Las medidas se analizaron con SPSS 23. El nivel de significancia estadística se fijó en $P < 0,05$. El índice interincisivo no mostró diferencias estadísticamente significativas entre los lados izquierdo y derecho de la arcada dentaria en ambos sexos. Tampoco encontramos diferencias estadísticamente significativas entre hombres y mujeres. Por otro lado, encontramos diferencias estadísticamente significativas en los valores de DM de los incisivos entre búlgaros y otras naciones balcánicas. El índice interincisivo no muestra dimorfismo sexual ni asimetría bilateral en los búlgaros. Esto puede ser útil en odontología estética, en prostodoncia y en la planificación de tratamientos de ortodoncia.

PALABRAS CLAVE: Incisivos; Dimensiones; Hipodoncia; Prótesis; Ortodoncia.

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