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SEXUAL DIMORPHISM IN PERMANENT MAXILLARY CANINES

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ABSTRACT

The aim of this study was to evaluate the sexual dimorphism in permanent maxillary canines among Kosovo-Albanian population. The study was conducted on 204 dental students, selected from Dental School, Medical Faculty in Prishtina. The mesiodistal and buccolingual diameters of the permanent maxillary canines were measured in dental casts using electronic digital calliper Boss, Germany, which has an accuracy ± 0.01 mm. The descriptive statistics and t-test were calculated. The results showed that in Kosovo-Albanian population mesiodistal and buccolingual diameter of the permanent maxillary canines was larger in males than in females and the difference was statistically significant ($p<0.0001$). The buccolingual diameters of maxillary canines shoved greater percentage of sexual dimorphism (6.72%) than mesiodistal diameter (3.71%). The study showed that maxillary permanent canines exhibiting significant sexual dimorphism.

KEYWORDS:Mesiodistal diameter, Buccolingual diameter, Maxillary canines, Sexual dimorphism, Kosovo- Albanian population

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INTRODUCTION

Teeth are known to be unique organs made of the most enduring mineralized tissues in the human body [1]. As such, teeth are extraordinary resistance to putrefaction and the effect of external agents (physical, thermal, mechanical, chemical or biological) which makes them invaluable elements for anthropological, genetic, odontologic, evolutionary and forensic investigations [2, 3]. Sexual dimorphism refers to the systemic difference in form (either in shape or size) between individuals of different gender in the same species. Teeth of various species are known to exhibit sexual dimorphism [4]. Tooth size standards based on odontometrics investigation can be used in age and sex determination [5]. Mesiodistal (MD) and buccolingual (BL) diameters of the permanent tooth crown are the two most commonly used and researched features used in determining sex on the basis of dental measurements [6]. The mesidistal crown diameters of the teeth are reduced by interproximal wear, and the buccolingual measurements may prove more useful for sex identification [7]. Males possess larger tooth crowns than females in contemporary human population. This may be due to a longer period of amelogenesis for both deciduous and permanent dentitions in males [8]. The sexual dimorphism is more pronounced in permanent dentition than in deciduous teeth. The magnitude and pattern of sexual dimorphism in the size of permanent teeth also differ from one to another population [9]. Amongst all the teeth, the permanent mandibular canines are found to exhibit the greatest sexual dimorphism [10]. The study of permanent maxillary and mandibular canines teeth offers certain advantages in that they are the least extracted teeth, are less affected by periodontal diseases, are exposed to less plaque, calculus, abrasion from brushing, and are the last teeth to be extracted with respect to age [11]. The purpose of this study was to evaluate the existence of sexual dimorphism in mesiodistal and buccolingual diameters of maxillary permanent canines in a study population.

MATERIALS AND METHODS

The sample composed of 204 dental casts that belonged to 101 males and 103 females students selected from School of Dental Medicine, University of Prishtina. The research has been accepted and approved by the Institutional Ethic Committee (School of Dental Medicine, University of Prishtina) and a written consent was obtained from each subject. The subjects were selected based on inclusion criteria outlined in the beginning of this study. Inclusion Criteria: The subjects' age between 18-25 years having completed set fully erupted and morphological well formed, non carious, non attrited, intact and periodontally healthy teeth. Satisfactory aligned maxillary and mandibular teeth, with no history or evidence of cleft palate or orthodontic treatment and prosthetic restoration were included in this study. The objective of limiting the sample of young adults was to ensure that dentitions were relatively intact, free of pathology and wear, thereby maximize odontometric information. The sample was a composite of ethnic groups since the aim was to assess dental sexual dimorphism in Kosovo-Albanians as a whole. Measurements of the mesiodistal (MD) and buccolingual (BL) crown diameters of right and the left permanent maxillary canines (MC) were taken in a dental casts using electronic digital calliper Boss, Germany, which has an accuracy ± 0.01 mm. The mesiodistal crown diameter was defined as the greatest mesiodistal dimension, taken parallel to the occlusal and facial surface. The buccolingual crown diameter was defined as the greatest distance between the buccal (or labial) and lingual (or palatinal) surfaces, perpendicular to the mesiodistal diameter [12]. All the measurements were done by a single examiner to eliminate interobserver error. Each measurement was taken three times and the average of three values was obtained to minimize the intraobserver error. The descriptive statistics were calculated (mean, range and standard deviation), for maxillary

canines. Statistically significant sexual dimorphism in male and female odontometric features were tested by Students't-test. The level of statistical significance was set up at $p<0.05$. The percentage of sexual dimorphism where calculated using the formula given by Garn and Lewis [10], as follows: Sexual dimorphism = [Xm/Xf] – 1 x 100 where; Xm = mean value for males; Xf = mean values for females. All statistical analyses were performed using the SPSS 18 for Windows (SPSS Inc., Chicago, Illinoiss, USA) and MS Excel (Microsoft Office, Windows 2007, USA).

RESULTS

The study results are presented in table form (Table 1-3). There was a statistically significant difference between males and females in the mesiodistal diameter of tooth crown of the permanent maxillary canines (males 7.81 ± 0.43 mm, females 7.53 ± 0.34 mm, $p<0.0001$), (Table 1).

Table 1
Basic descriptive statistic of mesiodistal diameter of Maxillary Canines

Gender	N	Mean ± SD (mm)	Range	95%CI	CV%	p-value
Male	101	7.81 ± 0.43	6.74 - 8.88	7.73 - 7.89	5.45	t=5.16 p<0.0001
Female	103	7.53 ± 0.34	6.68 - 8.52	7.46 - 7.60	4.57	
Total	204	7.67 ± 0.41	6.68 - 8.88	7.59 - 7.75	5.35	

There was a statistically significant difference between males and females in the buccolingual diameter of the crown of the permanent maxillary canines (males 8.57 ± 0.58 mm, females 8.03 ± 0.54 mm, $p<0.0001$), (Table 2).

Table 2
Basic descriptive statistic of buccolingual diameter of Maxillary Canines

Gender	N	Mean ± SD (mm)	Range	95%CI	CV%	p-value
Male	101	8.57 ± 0.58	7.16 - 10.01	8.46 - 8.68	6.80	t=6.88 p<0.0001
Female	103	8.03 ± 0.54	6.71 - 9.26	7.93 - 8.14	6.77	
Total	204	8.30 ± 0.62	6.71 - 10.01	8.18 - 8.42	7.51	

The buccolingual diameter of permanent maxillary canines was found to exhibit greater sexual dimorphism 6.72 % than mesiodistal diameter of the same tooth, 3.71 % (Table 3).

Table 3
Sexual dimorphism in mesiodistal and buccolingual diameter of Maxillary Canines

Maxillary canine	Males	Females	% Dimorphism
MD* diameter	7.81	7.53	3.71%
BL* diameter	8.57	8.03	6.72%

DISCUSSIONS

Several odontometric studies performed in human dental arches attest the fact that there are differences in teeth size patterns between sexes and that those differences vary among populations. Canines have demonstrated a higher degree of sexual dimorphism among the populations [6, 13] and are considerate as one the most resistant teeth in the dentition, remaining intact in several post mortem scenarios [14]. In the present study there was no significant difference between measurements of the permanent maxillary canines in right and left sides (asymmetry) for both sexes. A non significant difference of the measurements of permanent teeth between right and left sides was reported in a study of samples of three populations from Egypt, Mexico and United States [15], in Saudi Arabian[16, 17] and in Brazilian population[18]. Due to our findings it could be concluded that in Kosovo-Albanian population the measurement of one side could be representative when the measurement of the other side was inaccessible. Even though, there is a study with contradictory finding where the authors concluded there were statistically significant differences between right and left sides of the maxillary canines [19]. This difference can be attributed to several factors namely, environmental, ethnic and nutritional factors.

In our study, the significant statistically differences were found in MD and BL permanent maxillary canines between males and females. Those results were in accordance with other studies in which it was observed that the males have larger teeth than females [5, 16, 17, 18, 20, 21, 22]. The present study establishes the survival of the definitive statistically significant sexual dimorphism in maxillary permanent canines. Sexual dimorphism in canine size is influenced markedly by genetic factors. Both X and Y chromosomal involvements have been found by various workers. The Y chromosome in now known most in size of the teeth by controlling the thickness of dentine, whereas the X chromosome seems to be responsible for modulating thickness of enamel. The sexual dimorphism in tooth is attributable to the presence of relatively more dentine in the crowns of male teeth [23]. The cervical diameters are not affected by wear until the most of the crown has been lost; nevertheless they have also a big advantage for archeological purpose. Furthermore the dental neck diameter proved to be more useful than crown diameters [24]. This advantage is less important for BL diameters, but is essential for MD diameters, mainly in anterior teeth [25].

The BL diameter of permanent maxillary canines showed a larger percentage of sexual dimorphism (6.72%) than the MD diameter of maxillary canines (3.71%). Canines usually showed the highest degree of sexual dimorphism. They generally performed as the most dimorphic teeth in various study [26, 27, 28]. Entitlement of sexual dimorphism was smaller in the MD diameters than in the BL in Modern Greek population, Taiwan Chinese, Egyptian population and Caucasians [28, 29, 30, 31]. The percentage of sexual dimorphism in maxillary canines in Kosovo Albanian population was relatively high. It was found that the difference between males and females in the percentage of dental sexual dimorphism ranged from 3-9% [32]. There can be a complex interaction between a variety of genetic and environmental factors that is responsible for the variation in the magnitude of dimorphism. Different human populations may show different expressions of sexual dimorphism. In some populations, this dimorphism may be greater developed than in others. Sexual dimorphisms in tooth size are population specific [6] and varied among different ethnic groups [9].

CONCLUSION

From the present study, it can be concluded that mesiodistal and buccolingual diameter of the permanent maxillary canine was greater in males than in females and the difference was statistically significant ($P<0.0001$). In the

Kosovo - Albanian population the mesiodistal diameter of maxillary canine exhibits a sexual dimorphism of 3.71%, while the buccolingual diameter 6.72%. This study indicates that permanent maxillary canines show significant sexual dimorphism and can be used in forensic investigations as an adjunct along with other accepted procedures for sex determination.

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