



A STUDY TO COMPARE THE MESIO DISTAL WIDTHS OF ANTERIOR TEETH AMONG INDIAN POPULATION WITH THE STANDARD DIMENSIONS.

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ABSTRACT

Background: The dimensions of teeth have been studied in detail for ancestral and gender determination with considerable success. Variation in tooth size among populations is clearly established in many studies; however practitioners and students still follow the dimensions prescribed in Wheelers textbook of anatomy. This study was conducted to compare the standard measurements with the measurements of the sample population.

Materials and Methods: Measurements of 540 patients were taken as sample of this study were compared with the measurements given in wheelers textbook of dental anatomy. The results were statistically analyzed.

Results: The means of mesiodistal dimensions of all the teeth except for the maxillary left canine were significantly different from the standard measurement.

Conclusion: Our study proves that the tooth measurements of Indian population are different from the standard measurements and hence average dimensions for each region should be established and followed.

KEYWORDS :

INTRODUCTION:

Tooth measurement or more commonly referred called as morphometrics, have been extensively used in various branches of dentistry. The dimensions of teeth have been studied in detail for ancestral and gender determination with considerable success.¹⁻³ Numerous factors contribute to variation in tooth size and these may be described broadly as genetic, epigenetic and environmental influences and the variations in the dental crown size among various populations has been clearly established in numerous studies.^{4,5}

Knowledge of tooth morphology and dental anatomy and function is imperative for the practice of modern dentistry. Tooth morphology and its dimensions is one of the fundamental courses which is taught in the dental schools and is a component of the basic core sciences program in the faculties of dentistry around the world.⁶ Even though the variation in tooth size among populations is clearly established in many studies, students in most of the dental schools including India are asked to carve teeth according to the dimensions prescribed in Wheelers textbook of anatomy.⁷ These measurements are based on data collected in western countries and hence this study was conducted to check if the mean dimensions of teeth among Indian population coincided with the measurements given in wheelers textbook or is there a need to establish new ideal teeth dimensions based on the local data.

MATERIALS AND METHODS:

This was designed as a cross sectional study, the sample used in this investigation consisted of patients of Indian origin obtained from Jaipur dental college. Institutional ethical approval was obtained for the study and informed written consent was obtained from all the participants. The inclusion criteria was fully erupted anterior teeth with no fillings or extractions, no crowns, no crowding of teeth, no fractured teeth or orthodontic apparatuses and no developmental anomalies that could affect odontometric measurements. 600 patients visiting the outpatient department of our institute

Table -1: Universal sequence from Wheelers Textbook.

MXRC	MXRLI	MXRCI	MXLCI	MXLLI	MXLC	MD LC	MDLLI	MDLCI	MDRCI	MDRLI	MDRC
7.5	7	8.5	8.5	7	7.5	7	5.5	5	5	5.5	7

Legend –

MXRC – Maxillary right canine; MXRLI – Maxillary right lateral incisor; MXRCI - Maxillary right central incisor; MXLCI

were selected according to the inclusion criteria mentioned above. Impression was taken using alginate (Vival®, Ivoclar Vivadent) in perforated trays and casts were poured immediately with dental stone type IV (Fujirock® EP) to minimize dimensional changes. Out of the 600 casts that were prepared 540 casts were found to be free of air bubbles and procedural defects, hence the final sample size consisted of 540 patients. All the measurements were taken within 24hours of pouring the casts to minimize errors due to change in dimensions.

Each of the fabricated casts was given a serial number. For each cast, the serial number and the age and gender of the patient were recorded and stored in the project files. Procedures were performed in accordance with the manufacturer's instructions. A digital vernier caliper (Absolute Digimatic Caliper®, Mitutoyo), giving two decimal points was used for the measurements. Mesio-distal diameter (m-d) of each tooth was obtained by measuring the greatest distance between the proximal surfaces of the crown with the caliper held parallel to the occlusal and buccal surfaces according to methods outlined by Moorrees (1957) and Hillson (1996).^{8,9} To estimate intra-observer error, a second determination was made after 3 weeks by the same investigator. If the discrepancy between the two measurements was greater than ± 1.96 standard deviation, a new set of measurements were taken, and the nearest two measurements was averaged. The measurements were taken starting from right maxillary canine and progressed onto left maxillary canine, and then the measurement of mandibular teeth starting from left canine and ending with the right mandibular canine.

The measurements were tabulated and difference between the sample measurements and the universal sequence from wheelers was established by comparing the mean value each tooth and the test value by using one sample't test.

RESULTS:

The measurements given in wheelers textbook of anatomy were considered as universal sequence [Table -1].

- Maxillary left central incisor; MXLLI - Maxillary left lateral incisor; MXLC - Maxillary left canine; MDLC - Mandibular left canine; MDLLI – Mandibular Left lateral incisor; MDLCI –

Mandibular Left central incisor; MDRCI – Mandibular right central incisor; MDRLI – Mandibular right lateral incisor; MDRC - Mandibular right canine

The mean of measurements obtained from the samples was compared to the universal sequence using sample 't' test [table -2]

Table -2

One-Sample Test - N= 540								
	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
MXRC	7.5483	0.47581	0.02048	2.360518	0.01860457	0.048333	0.008111	0.088555
MXRLI	6.8844	0.60818	0.02617	-4.415	0	-0.11556	-0.167	-0.0641
MXRCI	8.4506	0.43166	0.01858	-2.662	0.008	-0.04944	-0.0859	-0.013
MXLCI	8.3926	0.45214	0.01946	-5.52019	0.00	-0.10741	-0.14563	-0.06919
MXLLI	6.827	0.52324	0.02252	-7.68161	0.00	-0.17296	-0.21719	-0.12873
MXLC	7.5037	0.44782	0.01927	0.192189	0.85	0.003704	-0.03415	0.041559
MDLC	6.5869	0.53507	0.02303	-17.943	0.00	-0.41315	-0.4584	-0.3679
MDLLI	5.8057	0.38519	0.01658	18.445	0.00	0.30574	0.2732	0.3383
MDLCI	5.2396	0.34456	0.01483	16.161	0.00	0.23963	0.2105	0.2688
MDRCI	5.235	0.38441	0.01654	14.206	0.00	0.235	0.2025	0.2675
MDRLI	5.7437	0.35828	0.01542	15.807	0.00	0.2437	0.2134	0.274
MDRC	6.4981	0.54602	0.0235	-21.358	0.00	-0.50185	-0.54801	-0.45569

The means of mesiodistal dimensions of all the teeth except for the maxillary left canine were significantly different from the standard measurement given in Wheelers. This indicates that the mesio distal width of all teeth except the left maxillary canine in this population were different from the values given in wheelers.

DISCUSSION:

Our study proves the fact that the mesiodistal width of anterior teeth in the given population of indian origin is significantly different from the standard measurements used in dental schools across the world and also India. This finding supports various other studies which suggest that there is an ethnic variation of tooth dimensions.^{10,11} A synthesis of data on dental dimensions from different populations worldwide has indicated that western Eurasian populations tend to have the smallest teeth, with indigenous Australians, Melanesians, Micronesians, sub-Saharan Africans and native Americans tending to have large teeth. East and Southeast Asian populations were found to be intermediate in tooth size between these groups.¹² The data obtained in this study is concerned to indian population and hence is different from the standard measurements given in wheelers. Several studies have offered explanation for the variations seen in the morphology of human dentition, studies at a population level have reinforced the view that the morphological variation of teeth is under relatively strong genetic control, but they have also shown that various environmental factors, if of sufficient severity, can upset the process of dental development, leading to alterations in the number, size, shape or structure of teeth. More than 300 genes have been identified as being involved in odontogenesis, with many of them playing a role in cellular communication. Some of the genetic signaling pathways involved in this communication include Fgf, Bmp, Shh, Wnt and Tnf. The reciprocal interactions between the ectodermal and ecto-mesenchymal tissues regulate key stages in the process of odontogenesis, including initiation, morphogenesis and differentiation.^{13,14}

Tooth morphometrics are very important not just in ancestral and gender identification but also play an important role in selection of artificial teeth for dentures and in bite mark analysis during forensic investigations. Hence it is very important to know the average dimensions of any given area and also use these measurements in training the dental students. We recommend more such studies involving a larger sample and other ethnically different groups in India to establish the average mesiodistal widths of the population.

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