

MESIODISTAL WIDTH AND HEIGHT OF PRIMARY ANTERIORS OF MAXILLA AMONG INDIAN POPULATION

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ABSTRACT

AIM:

The aim of this research is to evaluate the mean value of mesiodistal width and height of maxillary primary anterior crowns of children in order to document and provide a record of maxillary anterior deciduous crown sizes.

OBJECTIVE:

Evaluation of the mean value size of maxillary primary anterior crown of children is to document and provide a record of maxillary anterior deciduous crown sizes to ease the selection of crown size during clinical procedure for children who requires such treatments.

Materials and Methods:

The study was conducted on a sample size of 100 pedodontic patients visiting Saveetha Dental College aged less than 7 years old. The height and width of maxillary anterior primary teeth was taken intraorally using k-files and measured with endo block. And mean value was calculated from the recorded measurement of maxillary central incisors, maxillary lateral incisors, and maxillary canines.

RESULTS:

The maxillary incisors showed less variability in size than the maxillary canines. The greatest variability was seen in the mean height and width of the maxillary lateral incisors and maxillary canines. The maxillary lateral incisors showed the least variability of all the maxillary anterior teeth.

CONCLUSION:

This study highlighted mean value height and mesiodistal width of maxillary central incisors, maxillary lateral incisor, and maxillary canines in primary dentitions. This value is documented in order to ease the crown size selection during particular treatment procedure.

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I. INTRODUCTION

In paediatric dentistry it is the responsibility of a pedodontist to maintain the primary teeth to improve the masticatory efficiency, facial esthetics and alignment of the dental arches, which becomes frustrating in the presence of crown-size discrepancies.[1] It is essential for the clinician to know the size of individual tooth and groups of teeth, to make an adequate diagnosis and treatment plan.[2]

The Pedodontic examination may be incomplete without a careful analysis of the patterns of mesiodistal crown size relationships of an primary tooth, hence to improve the quality of available dental care, there is an urgent need for baseline data on the sizes of individual teeth.

Indications on mesiodistal dimensions are available on crown dimensions of the teeth of American Caucasians [3] and their ethnic groups. The determination of ratios, indicative of how large the maxillary teeth are, have been suggested to be in relation to their lower counterparts[4] or to ratios which presumably indicate the correct amount of over-jet or overbite.[5]

Richardson *et al.*[6] found teeth of males to be larger than those of females for each type of tooth in both the arches. Sanin and Savara[7] reported differences in crown size patterns even among good occlusion cases. Howe *et al.*[8] in their study found combined mesiodistal width for males to be more as compared to females. Smith *et al.*[9] in their study on incisor shapes and crowding found males to have slightly larger average teeth dimensions than females. Further Moorrees[10] in his study on 184 North American white children reported that males to have wider teeth mesiodistally than females.

The developing dentition should be monitored throughout eruption. This monitoring at regular clinical examinations should include, but not be limited to, diagnosis of missing, supernumerary, developmentally defective, and fused or geminated teeth; ectopic eruption; space and tooth loss secondary to caries and periodontal and pulpal health of the teeth. Radiographic examination should be done, when it is necessary and feasible. The diagnosis of anomalies in primary tooth developments and eruptions should be made to inform the parents about the treatment plan and recommends an appropriate intervention. This evaluation should be ongoing throughout the whole development of dentition, at all stages.[11]

The discrepancy of arch length includes tooth size discrepancy, insufficient arch lengths, crowding, excessive arch length and spacing. This is known as the Bolton discrepancy. These arch length discrepancies can be seen in conjunctions of complicating and other etiological factors including missing teeth, supernumerary teeth, and fused or geminated teeth.[12]

Various negative sequelae play a major role in resulting inadequate arch length with incisor size which commonly occurs in the primary dentition. Studies of crown length in today's children compared to their parents and grandparents of 50 years ago indicate less crown length, more frequently associated with incisor crowding, and unstable tooth sizes. This implies that the problem of incisor crowding and ultimate crown length discrepancies may be increased in numbers of patients and in amount of crown length shortage. Crown length

and especially crowding must be considered in the context of the esthetic, dental, skeletal, and soft tissue relationships. Mandibular incisors have a high relapse rate in rotations and crowding.

Growth of the aging skeleton causes further crowding and incisor rotations. Functional contacts are diminished with rotations of incisors, canines, and bicuspid exist. Occlusal harmonies and temporomandibular joint health has less negative impact on functional contacts. In starting of primary dentition assessments, when mandibular incisors begin to erupt the evaluation of available space has to be considered for making space for permanent incisors to erupt. Initially radiographic utilization is done to ascertain the presence of permanent successors.

Comprehensively, diagnostic analysis is reported to be evaluated maxillary and mandibular skeletal relationships, direction and pattern of growth, facial profile, facial width, muscle balance, and dental and occlusal findings including tooth positions, crown length analysis. Derotation of teeth just after emergence in the mouth implies correction before the transseptal fiber arrangement has been established. It has been shown that the transseptal fibers do not develop until the cementoenamel junction of erupting teeth pass the bony border of the alveolar process.⁸¹ Long-term stability of aligned incisors may be increased.[13]

The aim of this study was to establish normative data of the mesiodistal crown dimensions of primary teeth among Indian populations in India. Evaluating the mean value size of maxillary primary anterior crown of children in order to document and provide a record of maxillary anterior deciduous crown sizes to ease the selection of crown size during clinical procedure for children who requires such treatments.

II. MATERIALS AND METHODS

The study was conducted on a sample size of 100 paediatrics patients visiting pedodontic department of Saveetha Dental College. Paediatric patients aged less than 7 years old was chosen according to the including and excluding criteria which is mentioned below. Then, with the consent and permission from the parents of the chosen patients the height and width of anterior primary teeth was taken intraorally using k-files and measured with endo block. Later, mean value was calculated from the recorded measurement of central incisors, lateral incisors, and canines. To avoid bias, 50 male participants and 50 female participants was included in this research.

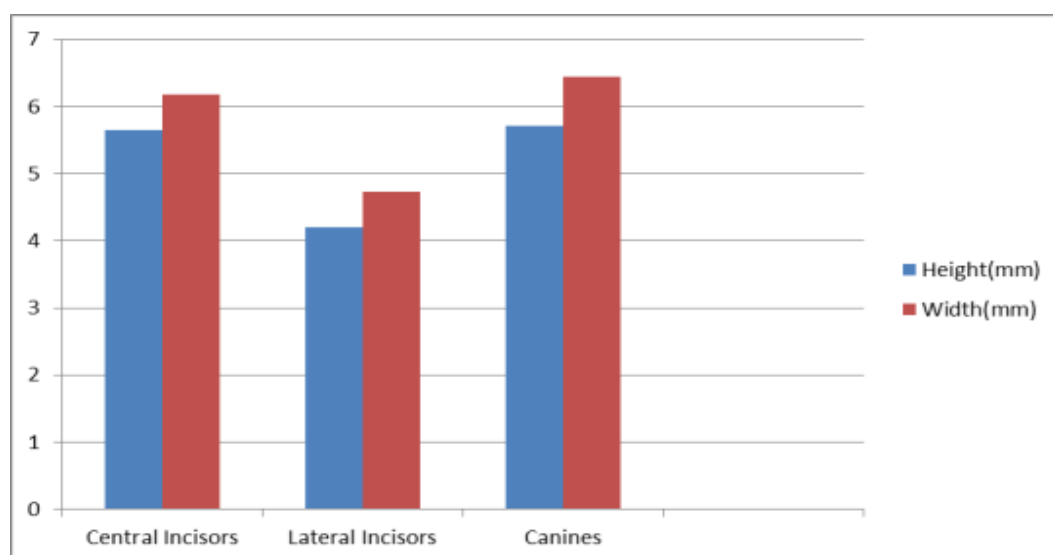
Including criteria:

- Patient aged less than 7 years old
- Fully erupted primary anterior tooth
- Patient without any oral habits
- Tooth without any dental treatment
- Non-syndromic patient
- Non-shedding tooth
- Non-traumatic maxillary anterior primary tooth
- Cooperative patient

Excluding criteria:

- Permanent maxillary anterior tooth
- Patient aged more than 7 years old
- Incomplete eruption of primary anterior tooth
- Patients with improper (crowding) teeth alignment
- Patients with supernumery teeth
- Patients with oral habits
- Decayed tooth
- Pathological tooth
- Syndromic patients
- Shedding of maxillary anterior primary tooth
- Traumatic maxillary anterior primary tooth
- Dentally treated tooth

III. RESULTS



Graph1: shows the mean value of height and width of anterior deciduous teeth of maxilla

	Mean Height (in mm)	Mean Width (in mm)
Maxillary Central Incisors	5.64	6.71
Maxillary Lateral Incisors	4.21	4.73
Maxillary Canines	5.71	6.44

Table: shows tabulated mean value height and width of anteriors of primary dentition

The mesiodistal crown dimension of maxillary primary anterior teeth for both boys and girls in maxillary arch is given in [Table - 1]. The mean mesiodistal crown dimension of the primary dentition in the maxillary arch, the mean width of the crowns of the central incisors (6.71mm) was larger than the mean width of the crowns of the lateral incisors (4.73mm). The mean height of the mesiodistal dimension of maxillary canine was larger (5.71mm) than that of the central incisors (5.64mm) and the mean width and height maxillary lateral incisor has the least dimension (4.21 mm mean height and 4.73 mm mean width). There were no variants or differences found in between the mean dimension for male and female participants.

IV. DISCUSSION

As compared to other ethnic groups, no measurements of tooth sizes have been made on the primary dentition of an Indian population [14]. This study was conducted to provide normative data on the mesiodistal height and width measurements. The results of this study agree with those of a smaller sample reported by Richardson and Malhotra [15] that the central incisors were larger than the lateral incisors maxillary arch in primary dentitions.

The mesiodistal diameter of primary maxillary central incisor has been observed from past literature that varies, where it is larger from different ethnic groups of Caucasian, American, American Negroes, Saudi, and Jordanians [16]. In the present study the mean mesiodistal width is 6.71 mm and height is 5.64mm which is smaller to width and height recorded by Joycelyn et al. [16] Not much has been mentioned about right and left side, literature states that there is definitive difference between both the sides. In the present study right Central incisor is bigger than left with a difference of 0.04 mm. Taji et al. [17] had stated that the mean values of teeth on either side of midline are within ± 0.3 mm. Teeth on the left side exceed the teeth on right side, confirming that bilateral symmetry is not consistent on individual or group basis, the crown size is free from systematic sidedness, when asymmetry is found in most hard—tissue structures. Wazzna [18] stated that a difference of up to 1 mm between right and left maxillary central incisor is considered normal in appearance. Marvroskoufis and Ritchie [19] stated that population differences in mesiodistal width and height of crown size of far less than 0.1 mm may be statistically significant even though they fall well within the limits of measuring error and undetectable enamel loss in apparently unworn young dentitions. The relevant in his study are closely similar to present study. Female child provided a greater index for identical incisors and a decrease in dissimilar teeth. The mean mesiodistal width of maxillary central incisor of maxilla in subjects varies in the range of 6.86 mm to 6.99mm varying for different racial groups. In the present study the mesiodistal width is 6.71 mm, which is smaller than other ethnic. Right side Central incisor is bigger than left side with a difference of 0.08 mm in the present study.[20]

The mesiodistal diameter of lateral incisor according to various authors varies between 5.61 and 5.67 mm in subjects. And the height of the crown is recorded ranging between 4.86mm to 4.96mm by Joycelyn et al. The mesiodistal width of maxillary right lateral incisor in subjects is 4.73 mm with a height of 4.21mm in the present study. It varies between for different racial groups. The mesiodistal width in the present study is 4.73 mm and as mentioned by different investigators vary between 4.53 mm and 4.91 ± 0.3 mm. The difference

in right and left side is 0.1 mm in the present study in contrast of literatures varying in the range -0.02 to 0.02 mm.[21] Various authors have mentioned the range in female subjects varying between 4.45 and 4.95 mm and the mesiodistal width of maxillary right lateral incisor varying between 4.61 and 4.32 ± 0.30 mm. The reading in the present study is 4.73 mm with mean height of 4.21 mm. The mean mesiodistal width of crown is 4.86 mm recorded by Joycelyn et al is closest to 4.73 mm, the mesiodistal width in present study, yet it is smaller compare to other racial.[22]

The mesiodistal width of maxillary canine according to foreign authors is 6.80 mm and 6.73 mm for mesiodistal width and 5.45 mm and 5.51 mm for height of crown. The mesiodistal width of right and left maxillary canine of subjects in present study is 6.44 and 5.71 mm, respectively. The height of maxillary canine is closer to present study which is mentioned by Joycelyn et al and on the mesiodistal width it is smaller compare to other studies.[23] In various literatures varies in the range 5.45 ± 0.20 to 6.73 mm in both sides of subjects. In previous studies varies in the range of 6.53 – 5.32 mm. The difference in right and left side in the present study is 0.04 mm and in the range of 0.0 – 0.02 mm in previous studies. Whereas in subjects the mesiodistal width and height of right and left maxillary canine in present study is 6.44 mm and 5.71 mm, respectively.[24] In female subjects from various literatures varies in the range 5.50 ± 0.53 and 5.67 mm on right side and 5.44 ± 0.55 and 5.64 mm on left side. It varies in the range 5.00 and 6.81 mm in previous studies. The difference in right and left side in the present study is 0.068 mm and from previous studies as 0.06 – 0.03 mm approximately.[25]

The maxillary incisors showed less variability in size than the maxillary canines. The greatest variability was seen in the mean height and width of the maxillary lateral incisors and maxillary canines. The maxillary lateral incisors showed the least variability of all the maxillary anterior teeth as is evident in Table-1

It is imperative to emphasize the mean width of the maxillary canine and incisor teeth to the mean height of the maxillary canine and incisor teeth pedodontic therapy for spacing limitations and maintaining the alignment of purpose makes this relationship a matter of prime concern if one is to avoid malocclusion during eruptions of permanent maxillary teeth[26]

The importance of tooth measurement and its application in diagnosis and clinical dentistry has been well emphasized in the past. Some of the more common types of malocclusion are basically due to discrepancy between inadequate spacing and size of the dental arches. This discrepancy may be reflected clinically as impaction or crowding of the teeth, if a combination of inadequate spacing for permanent tooth to erupt and a short dental arch length exists [27]. On the other hand, it may result in spacing and diastema between the teeth if the arch length is more and spacing is less. In either case, it is the space problem, which is of great interest to the general dentist, as well as to the pedodontist and orthodontist in diagnosis and treatment planning[28]. The tooth size ratio also contributes a great deal to balanced occlusion, facial harmony and aesthetics even though in paediatric patients [29].

V. CONCLUSION

This study highlighted mean value of height and mesiodistal width of maxillary central incisors, maxillary lateral incisor, and maxillary canines in primary dentitions. This value is documented in order to ease the crown size selection during particular treatment procedure.

Guidance of eruption and development of the primary, mixed, and permanent dentitions is an integral component of comprehensive oral health care for all pediatric dental patients. This component should contribute to the developments of a permanent dentition which should be in a stable, functional, and esthetically acceptable occlusion and normal subsequent dentofacial development. In early diagnosis, the success of treatment of developing malocclusions can have both short-term and long term benefits while achieving the goals of occlusal harmony and function and dentofacial esthetics.

Dentists have the responsibility in recognizing, diagnosing, and managing abnormalities in the developing dentition. Many factors affecting the managements in development of dental arches and reduces the success of any treatment. A thorough clinical examination, appropriate pre-treatment records, differential diagnosis, sequential treatment plan, and progress records are necessary to manage any condition affecting the developing dentition. This study can prove helpful in replacement of artificial crown of prosthesis in Indian population in a better way. This study should further followed up with more number of participants. Statistically, a report should be prepared to improved the dimensions of primary tooth prosthetic crowns which are commercially available nowadays.

REFERENCES

1. Seipal CM. Variation of tooth position. Svensk Tandlak T. 1946.
2. Lundstrom A. Intermaxillary tooth width ratio and tooth alignment and occlusion. Acta Odont Scand 1954;12:265-92.
3. Neff CW. The size relationship between maxillary and mandibular segments of the arch. Angle Orthodont 1957;27:138-47.
4. Jeevanandan G, Subramanian E, Muthu M S. Single-rooted primary first molars. Indian J Dent Res 2012;23:104-6
5. Saemundsson SR, Roberts MW. Oral self-injurious behavior in the developmentally disabled: Review and a case. ASDC J Dent Child 1997;64(3):205-9.
6. Richardson ER, Malhotra SK. Mesiodistal Crown diameters of the secondary dentition of Black Americans. J Dent Res (Abst) 1973;52:214.
7. Hunter WS, Priest WR. Errors and discrepancies in measurement. J Dent Res 1960;39:405-14.
[PUBMED]

8. Riedel RA. Retention. In: Graber TM, editor. Current orthodontic concepts and techniques. WB Saunders Company: Philadelphia; Chapter 9, 1969.
9. Jensen E, Kai-Jen Yen P, Moorrees CF, Thomsen SO. Mesiodistal Crown diameter of the deciduous and permanent teeth in individuals. *J Dent Res* 1957;36:39-47. [PUBMED]
10. Moorrees CF. The dentition of the growing child. A longitudinal study of dental development between 3 and 18 years of age. Harvard University Press: Boston; 1959.
11. Lunt DA. The dentition of early Scottish race, MDS thesis. University of Glasgow: Glasgow, Scotland; 1961.
12. Aishwarya AS, Gurunathan D. Stress level in dental students performing pedodontic procedure. *J Adv Pharm Edu Res* 2017;7(1):34-38
13. Smith RJ, Davidson WM, Gipe DP. Incisor shape and incisor crowding: A re-evaluation of the peck and peck ratio. *Am J Orthod* 1982;82:231-5.
14. Bolton WA. The clinical application of a tooth size analysis. *Am J Orthod* 1962;48:504-29.
15. Richardson ER, Malhotra SK. Mesiodistal Crown diameters of the secondary dentition of Black Americans. *J Dent Res (Abst)* 1973;52:214.
16. Joycelyn Eigbobo, Elizabeth Sote, Folakemi Oredugba. Tooth Crown Dimensions of Primary Dentition in the Nigerian Population. *Int J Oral Sc Dent Med.* 2010;44(4):269-277
17. Taji S, Seow WK. A literature review of dental erosion in children. *Aust Dent J* 2010;55(4):358-67.
18. Wazzna RK, Kapoor DN, Pradhan AC, Roy RK. Study of tooth size (permanent) in twins. *JIDA* 1980;52:311-3.
19. Marvroskoufis ML, Ritchie, Chase PS, Flower RI Jr. Comparative odontometry of the permanent post canine dentition of American whites and Negroes. *Am J Phys Anthropol* 1967;27:125-42.
20. Ballard ML, Wylie WL. Mixed dentition case analysis - estimating size of unerupted permanent teeth. *Am J Orthod Oral Surg* 1947;33:754-9.
21. Nance HN. Limitations of orthodontic treatment. 1. Mixed dentition diagnosis and treatment. *Am J Orthod Oral Surg* 1947;33:177-233.
22. Millwood J, Fiske J. Lip biting in patients with profound neurodisability. *Dent Update* 2001;28(2):105-8.
23. Restrepo CC, Alvarez E, Jaramillo C, Velez C, Valencia I. Effects of psychological techniques on bruxism in children with primary teeth. *J Oral Rehabil* 2001;28(9):354-60.
24. Nissani M. A bibliographical survey of bruxism with special emphasis on nontraditional treatment modalities. *J Oral Sci* 2001;43(2):73-83.

25. Carey CW. Linear arch dimension and tooth size: An evaluation of the bone and dental structures in cases involving the possible reduction of dental units in treatment. *Am J Orthod* 1949;35:762-75.
26. Christensen J, Fields HW Jr, Adair S. Oral habits. In: Casamassimo PS, McTigue DJ, Fields HW Jr, Nowak AJ, eds. *Pediatric Dentistry: Infancy Through Adolescence*. 5th ed. St. Louis, Mo: Elsevier Saunders; 2013:385-97.
27. Savara BS, Sanin CA. A new data acquisition method for measuring dentitions and tests of accuracy. *Am J Phys Anthropol* 1969;30:315-8.
28. Moorrees CF. *The aleut dentition*. Harvard University Press: Cambridge; 1957.
29. Kieser JA, Groeneveld HT. Relationship between juvenile bruxing and craniomandibular dysfunction. *J Oral Rehabil* 1998;25(9):662-5.