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Original Article

Dentistry Section

Crown Dimensions of Deciduous Teeth: The Tool for Predicting the Physical Height of the Child: A Pilot Study

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ABSTRACT

Introduction: Dental profiling is one of the well known methods in forensic sciences that help in identification of disaster victim. In forensic sciences there are many techniques used for personal identification which give definite results. As adult height estimation can be done by measuring the dimensions of the long bones of hand, foot and vertebral column, similarly stature of the child can be estimated using tooth dimension.

Aim: To evaluate the relationship between height of the child and the clinical crown length of deciduous teeth.

Materials and Methods: The sample size used in the present study was 30, comprising of 15 boys and 15 girls which ranged in the age group of 3-6 years. The clinical crown length of tooth numbers-51, 52, 53, 54, 55 were measured with the help of Vernier calliper and standard measuring tape was used to measure the height of the child. Ratios of the crown length and height were calculated. Student's unpaired t-test and Pearson's correlation coefficient was used to evaluate the relationship between the tooth crown length and height of the child.

Results: Significant values were obtained in tooth numbers-52 in combined samples, 51 and 52 in male samples and 53 in female samples. Mean height of the crown in male patients with respect to tooth number 51, 52, 53, 54 and 55 were found to be 5.89, 4.77, 5.94, 4.55, and 4.18 respectively. However, the mean height of the individuals was found to be 942.84 mm. The mean height of crown in females was 5.02, 4.53, 5.31, 4.76 and 4.68 respectively while their mean height was found to be 1001.77 mm.

Conclusion: As per the present study, clinical crown length of anterior teeth (51, 52) in males can be used for predicting the physical height of the child and clinical crown length of canines (53) in female can be used for predicting the physical height of the child with caution. For more significant results, further studies should be done with a larger sample size.

Keywords: Forensic sciences, Morphometrics, Stature, Vertical crown length

INTRODUCTION

Forensic sciences involve a variety of rules and regulations that are used independently or combined together and can be utilised in the investigation of various crime scenes [1]. Human tissues, especially bones and teeth are considered to be highly resistant and indestructible as these combat bacterial mortification while other tissues are easily putrefied [2]. Teeth thus play an important role in individual recognition or finding unknown identity from skeletal remains in various disasters [1,3].

Dental morphometrics is quantitative study which includes both shape and size of teeth, which has been an appealing subject in forensic sciences [4]. Physical height of a person is one of the foremost tools that can be used in forensic odontology. A number of studies have been performed in the past in assessing the physical height of an individual from various crown dimensions [2,4]. The dimensions which were included in these studies are tooth length, clinical crown length, mesiodistal width of the crown and the tooth labiolingual width [4]. However, there is a positive literature on such correlation being carried out in child population; hence we decided to evaluate the relationship between physical heights in children against the tooth coronal height in age group of 3 to 6 years.

The present study aims at finding a correlation between the clinical crown length and physical height of the child and furthermore its use in forensic odontology.

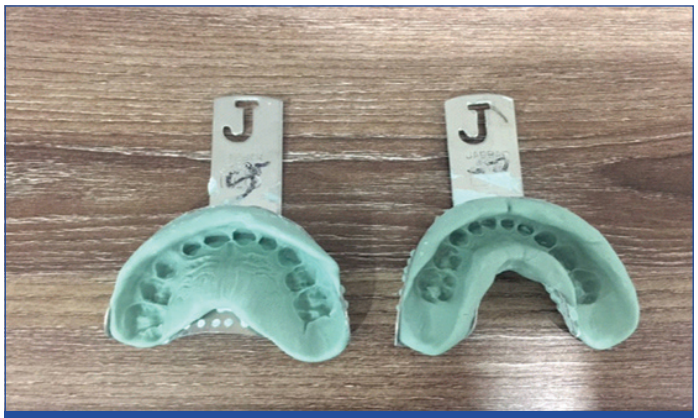
MATERIALS AND METHODS

This dental morphometric study was conducted in DY Patil Dental College and Hospital, Department of Oral Pathology and Microbiology in January 2017 over three months of time. Convenient sampling was used to select the sample which encompassed a total 30 subjects of which 15 were boys and 15 were girls. The age of these 30 subjects ranged between 3-6 years keeping in mind the fact that all the deciduous teeth would have erupted. Only the first quadrant (51, 52, 53, 54 and 55) was selected [4]. As this was a pilot study we had selected 30 patients to co-relate present findings. These patients were randomly selected from the Out Patient Department (OPD) and the crown length and height of the patients were measured on a metric scale.

The inclusion criteria for the study included teeth and periodontium in healthy state, presence of fully erupted deciduous teeth (51, 52, 53, 54, 55), normal overjet and overbite and normal molar-canine relationship while patients with interdental spacing/crowding, mobility and incompletely erupted deciduous teeth, any feature altering gingiva, dentition or contour of the face like apparent loss of tooth structure due to fracture/caries/attrition/restoration were excluded.

Approval for the study was obtained from Institutional Ethics Research Committee. Informed consent from parents of children was obtained. Two body parameters were obtained i.e., the age and the height of the child respectively. Standard measuring tape was used to measure the height of the child. This value was first recorded in feet and then converted into millimeters, which was then entered into a Microsoft Excel sheet. In order to evaluate the clinical crown length of the deciduous teeth, first the children cast models were prepared using C-silicone impression material (putty) and dental stone [Table/Fig-1,2]. Later the clinical crown length was measured from the mid point of the incisal edge to the highest point of the gingival margin with the help of electronic digital Vernier caliper (0-150 mm by AEROSPACE). This value was recorded in millimeters

and entered into Microsoft Excel sheet. Knowing the height of the child and the length of the crown, ratio of clinical crown length/height was obtained.



[Table/Fig-1]: Shows maxillary and mandibular impressions prepared with the help of C-silicone impression material (putty).

[Table/Fig-2]: Shows maxillary and mandibular casts.

STATISTICAL ANALYSIS

Descriptive and inferential statistical analysis was carried out in the present study. Results on continuous measurements were presented on Mean±SD. Level of significance was fixed at p=0.05 and any value less than or equal to 0.05 was considered to be statistically significant.

Student's t-tests (two tailed, unpaired) was used to find the significance of study parameters on continuous scale between two groups. Pearson's Correlation coefficient was computed to measure correlation between clinical crown length and height.

The statistical software IBM SPSS statistics 20.0 (IBM Corporation, Armonk, NY, USA) was used for the analysis of the data and Microsoft word and Excel were used to generate graphs, tables etc.

RESULTS

The comparison of height, clinical crown length and crown length/height ratios among males and females using unpaired t-test are shown in [Table/Fig-3]. There was a significant difference between males and females clinical crown length for tooth number 51 (<0.001), 53 (0.010) and 55 (0.021). Also, there was a significant difference between males and females crown length/height ratios for tooth number 51 (<0.001), 52 (0.023) and 53 (0.007).

With the respective values, a correlation was found between the clinical crown length and height of the child in combined samples (males+females), male samples and female samples.

In combined samples, tooth number 52 shows low positive correlation between the clinical crown length and the height of the child [Table/Fig-4].

In male samples, tooth number 51 shows moderate positive correlation and tooth number 52 shows high positive correlation between the clinical crown length and height of the child [Table/Fig-5].

In female samples, tooth number 53 shows moderate positive correlation of clinical crown length and height of the child [Table/Fig-6].

Variables	Gender	n	Mean	Std. Deviation	t-value	p-value
CD 51	Male	15	5.89	0.589	3.799	<0.001**
	Female	15	5.02	0.659		
CD 52	Male	15	4.77	0.549	1.032	0.311
	Female	15	4.53	0.732		
CD 53	Male	15	5.94	0.679	2.784	0.010*
	Female	15	5.31	0.570		
CD 54	Male	15	4.55	0.432	1.455	0.157
	Female	15	4.76	0.339		
CD 55	Male	15	4.18	0.480	2.448	0.021*
	Female	15	4.68	0.641		
Height (mm)	Male	15	942.84	170.278	1.203	0.239
	Female	15	1001.77	83.76390		
51 CL/H	Male	15	0.00640	0.001010	4.534	<0.001*
	Female	15	0.00502	0.000603		
52 CL/H	Male	15	0.00516	0.000705	2.401	0.023*
	Female	15	0.00453	0.000732		
53 CL/H	Male	15	0.00654	0.001601	2.898	0.007*
	Female	15	0.00530	0.000406		
54 CL/H	Male	15	0.00502	0.001285	0.655	0.518
	Female	15	0.00478	0.000550		
55 CL/H	Male	15	0.00466	0.001446	0.097	0.923
	Female	15	0.00470	0.000663		

[Table/Fig-3]: Shows comparison of height, clinical crown length and ration of crown length/height among males and females using unpaired t-test.
*Significant; **Highly significant
CD: Crown dimension; CL: Crown length; H: Height

Clinical crown length	Combined group	
	R (correlation coefficient)	p-value
51	0.267	0.154
52	0.476	0.008*
53	0.166	0.380
54	0.040	0.832
55	-0.059	0.757

[Table/Fig-4]: Shows correlation between clinical crown length and height by using Pearson's correlation co-efficient in combined samples (males+females).
*Significant

Clinical crown length	Male group	
	R (correlation coefficient)	p-value
51	0.607	0.016*
52	0.805	<0.001**
53	0.189	0.500
54	0.060	0.833
55	-0.430	0.110

[Table/Fig-5]: Shows correlation between the clinical crown length and height using Pearson's correlation co-efficient in males.
*Significant; **Highly significant

Clinical crown length	Female group	
	R (correlation coefficient)	p-value
51	0.417	0.122
52	0.307	0.267
53	0.643	0.010*
54	-0.226	0.419
55	0.168	0.548

[Table/Fig-6]: Shows correlation between the clinical crown length and the height using Pearson's correlation co-efficient in females.
*Significant

DISCUSSION

Genetic factors have a great impact on the growth of an individual including the height. Stature refers to height of an individual. All aspects of tooth like its size are greatly affected by the environmental factors, race and ethinicity. A tooth as a whole plays an important role in forensic odontology. The height of an individual and the crown length are two parameters that are gaining great attention in forensic odontology [4]. In forensic examination, stature evaluation is an integral step which aids in identification process [5]. Estimation of physical profile from various crown dimension would thus be a great help for the forensic odontologists in the investigation process of the deceased individuals in various mass disasters and also investigation of the living [2,4].

In the past, comparison of permanent maxillary central incisor crown length with facial height and body height showed no correlation between these parameters [6]. A study in Sinhalese subjects to evaluate a correlation between the length of permanent maxillary central and lateral incisor with that of the height of the individual found no significance [7]. An evaluation of correlation between parameters like width, length and its ratio to that of the stature of an individual in Caucasians gave no significant results [8]. A significant result to prove a correlation was found in a study comparing body height and multiple dimensions of the maxillary central incisor tooth [9]. In a study, both deciduous as well as permanent dentitions were used to analyse the correlation which showed that some of the tooth can be used for predicting the physical height of an individual [10].

Very few studies have been conducted using deciduous dentition for predicting the physical height [10]. The present study shows significant values regarding the correlation between the clinical crown length and height of the child for tooth numbers-52 in combined samples (0.008*), 51 and 52 in male samples (0.016* and <0.001**) and 53 in female samples (0.010*). While some of the tooth numbers didn't show significant values which were: 51, 53, 54, 55 in combined samples, 53, 54, 55 in male samples and lastly 51, 52, 54, 55 in female samples. The main reason behind this could be environmental factors, ethnic group, gender etc. Though the present study is a pilot study we have got significant results with respect to few tooth numbers which can indeed help the forensic odontologist to estimate the height of the child for identification purpose but in order to find more significant results with other tooth numbers more studies should be done of the same.

Apart from clinical crown dimensions, we can also make use of head dimensions. Various studies have been performed which makes use of head dimensions to estimate the stature of an individual [11-14]. The clinical crown length of tooth can also be used in assessing the height in anthropology. In some studies, correlation of tooth crown length and physical length has also been studied in animal population [15,16].

LIMITATION

The limitations of the present study are: due to small sample size, clinical significance was evident in fewer teeth. Deriving a mathematical equation and further applying it to the sample will help us validate the study.

CONCLUSION

A positive correlation was obtained between the clinical crown length and the height of the child with tooth numbers-52 showing significant results in combined group, 51 and 52 showing significant and highly significant values in males and 53 showing significant results in females.

In conclusion, correlating tooth size with height of the patient can be considered as an aid in forensic evaluation. However, the present study should be done on a larger population to further substantiate its association.

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