## CLINICAL CROWN LENGTH, WIDTH AND THE WIDTH/LENGTH RATIO IN THE MAXILLARY ANTERIOR REGION IN A SAMPLE OF MARDAN POPULATION

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#### ABSTRACT

The objective of this study was to determine clinical crowns length, width and width/length ratios of the maxillary anterior teeth and to determine standard of ideal tooth dimensions.

Crown length, width and width/length ratio was measured of 100 casts of patients. All of the 6 maxillary anterior teeth present, anatomically whole, without restorations that altered their dimensions, from which good diagnostic casts could be obtained, and where the anatomic elements were well defined were included in the study. The data were analyzed by using SPSS 20.0 version. Mean and standard deviation were calculated for numerical variables like age, tooth width, length and width/length ratio. Pearson correlation test was applied for symmetry of teeth sizes between left and right of arch.

The sample composed of 50% males and 50% females with gender ratio 1:1. The mean age was  $23\pm2.3$  years. The mean crown length was 10.22 mm for right central incisor, 7.96 mm for right lateral incisor and 8.88 mm right canine. The left side teeth crown width was close to right side. The mean crown width was 7.99 mm for right central incisor, 7.96 mm for right lateral incisor and 8.28 mm right canine. The left side teeth crown length was nearly equal to right side crown width. The mean crown width/length ratio was 0.91 for right central incisor, 0.72 for right lateral incisor and 0.71 right canines. The left side teeth crown width/length was nearly equal to right side crown width. Interclass correlation was almost perfect and statistically significant.

The tooth dimension showed less variation (low standard deviation value) for crown length, width, and width/length ratio; so it will help the clinician in restorative procedures.

Key Words: Crown length, crown width, ideal tooth dimensions, maxillary anterior teeth.

#### **INTRODUCTION**

For many years, the establishment of health and function was the primary objective of dental professionals. However, the goal of modern dentistry includes not only health and function, but also a final esthetic result corresponding to the shape, size, color, texture, and harmony of natural healthy teeth and their surrounding tissues. Additional factors that might influence the ideal smile are ethnicity, personality, size, and position

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of teeth and clinical crowns, or simply the perception of what is "ideal" by a specific group or population.  $^{1}\,$ 

Attitudes toward the importance of our general appearance have shown rapid changes over the past decades. Differences have been found not only over time but also with respect to age, gender, and various groups of individuals.<sup>2,3</sup> Whether the situation is similar regarding dental appearance does not seem to have been studied, even though interest in dental esthetics has increased rapidly during the last few decades among both patients and dentists. To create a natural facial and dental appearance has become an important task in prosthodontics and in restorative dentistry. New materials and clinical methods have given dentists a potential for improving the dental appearance of their patients.<sup>4</sup> However, the patient's perception of dentofacial esthetics does not necessarily match the dentist's perception, which highlights the importance of establishing an esthetic diagnosis prior to treatment.<sup>5,6</sup>

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The relative dimensions of teeth seem to be among the most objective dental criteria within the esthetic checklist because they can be easily and physically controlled. The definition of ideal tooth dimensions, however, remains a difficult task due to individual variations and proximal/incisal tooth wear. To provide "magic numbers" for the clinician, mathematic theorems such as the "golden proportion" and the "golden percentage" have been proposed, taking into account classic elements of art and architecture. These rules were applied to the apparent size, as viewed directly from the anterior.<sup>7</sup>

Lombardi<sup>8</sup> was the first to suggest applying the golden proportion to dentistry; he also described the use of a "repeated ratio" in the maxillary anterior teeth. Levin<sup>9</sup> agreed that the golden proportion (62%) was the most harmonious recurrent tooth-to-tooth ratio from a frontal view. Ward<sup>10</sup> recommended using other tooth-to-tooth ratios, such 70% for normal length teeth, 62% for very long teeth, and 80% for very short teeth. He had asked several North American dentists about their esthetic preferences when looking at pictures of smiles with different proportions.

The objective was to determine clinical crowns length, width and width/length ratios of the maxillary anterior teeth and to determine standard of ideal tooth dimensions.

## METHODOLOGY

This prospective cross-sectional was conducted at Prosthodontics department, Bacha Khan Medical College, Mardan from May 2015 to August 2015. Approval of the hospital ethical committee was taken. The purpose, procedures, risk and benefits of the study were explained to patients. An informed consent and their willingness and participation in the study were ensured. They were assured of maintaining confidentiality of their personal and other data collected from them.

Using correlation calculator (http://www.sample-size.net/correlation-sample-size), the crown length/ width ratio for right lateral incisor correlation coefficient of 0.7811, power of test is 95% and probability of type 1 error is 5% was put in calculator, the calculated sample size is was 15. However due to normality assumption we have taken sample size of 100.

### • Inclusion criteria

All of the 6 maxillary anterior teeth present, anatomically whole, without restorations that altered their dimensions, from which good diagnostic casts could be obtained, and where the anatomic elements were well defined.

#### • Exclusion criteria

Children (younger than 18 years); those with signs of gingival alteration, hyperplasia, inflammation, altered passive eruption, or gingival recession; history of periodontal surgery or clinical evidence or history of alteration of the incisal or proximal surfaces of the tooth; and those with restorations, traumatisms, attrition, occlusal adjustment, dental malformation, malposition or diastema, or previous orthodontic treatment.

Maxillary impression was taken in alginate material from all patients and were poured in dental stones. An extra-fine end digital caliper was used to obtain the measurements, with a precision of 0.01 mm. The measurements were all recorded in millimeters by a trained examiner. The maximum mesiodistal width (perpendicular to the longitudinal axis of the tooth) and the maximum crown-root length, (parallel to the longitudinal axis of the tooth and between the most apical point of the gingival margin and the most incisal point of the anatomic crown) of the maxillary central incisors, lateral incisors, and canines was recorded for each tooth. These scores arranged in a table. The age and sex of each participant was also recorded.

## STATISTICAL ANALYSIS

The data were analyzed by using SPSS 20.0 version. Mean and standard deviation were calculated numerical variables like age, tooth width, length and width/ length ratio. Pearson correlation test was applied for symmetry of teeth sizes between left and right of arch. The level of significant was kept at p<0.05.

## RESULTS

The sample composed of 50% males and 50% females with gender ratio 1:1. The mean age was 23±2.3 years. The mean crown length was 10.22 mm for right central incisor, 7.96 mm for right lateral incisor and 8.88 mm right canine. The left side teeth crown length was close to right side. The standard deviation in each tooth size was very less. The details are given in Table 1.

The mean crown width was 7.99 mm for right central incisor, 7.96 mm for right lateral incisor and 8.28 mm right canine. The left side teeth crown length was nearly equal to right side crown width. The standard deviation in each tooth size was very less. The details are given in Table 2.

The mean crown width/length ratio was 0.91 for right central incisor, 0.72 for right lateral incisor and 0.71 right canines. The left side teeth crown width/ length was nearly equal to right side crown width. The degree of dispersion in each tooth ratio was very less. The details are given in Table 3. Interclass correlation was almost perfect and statistically significant. (Table 4)

TABLE 1: MEAN (MM), RANGE (MINIMUM AND MAXIMUM), AND STANDARD
DEVIATIONS (SD) CROWN LENGTH

Dimension	Left canine	Left lateral	Left central	<b>Right canine</b>	<b>Right lateral</b>	Right central
Minimum	8.51	6.13	8.69	8.96	6.77	9.12
Maximum	13.23	10.81	12.56	12.93	10.10	13.11
Mean	9.23	8.31	10.77	8.88	7.96	10.22
SD	0.982	0.865	0.799	0.911	0.910	0.754

# TABLE 2: MEAN (MM), RANGE (MINIMUM AND MAXIMUM), AND STANDARD DEVIATIONS (SD) OF CROWN WIDTH

Dimension	Left canine	Left lateral	Left central	Right canine	<b>Right</b> lateral	<b>Right central</b>
Minimum	7.67	6.42	7.79	7.86	7.38	8.12
Maximum	11.53	10.11	10.56	11.93	10.10	10.06
Mean	9.57	7.51	8.57	8.28	7.96	7.99
SD	0.492	0.665	0.563	0.511	0.610	0.954

TABLE 3: MEAN (MM), RANGE (MINIMUM AND MAXIMUM), AND STANDARD DEVIATIONS (SD) OF CROWN WIDTH/LENGTH RATIO

Dimension	Left canine	Left lateral	Left central	Right canine	<b>Right lateral</b>	<b>Right central</b>
Minimum	0.68	0.45	0.71	0.58	0.46	0.69
Maximum	0.914	0.99	1.06	0.922	0.92	1.05
Mean	0.78	0.722	0.87	0.71	0.72	0.91
SD	0.022	0.065	0.043	0.042	0.057	0.053

#### TABLE 4: INTERCLASS CORRELATION COEFFICIENT OF LENGTH AND WIDTH FOR RIGHT AND LEFT SIDE TOOTH

Tooth	Length**	Width**
Central incisor	0.92	0.90
Lateral incisor	0.86	0.87
Canine	0.96	0.93

\* Interclass correlation coefficient, Pearson correlation co-efficient

\*\*P-value = Sigificant

### DISCUSSION

This study was undertaken using measurement on dental cast of patients which is easy to measure and give more accurate results. A pointed beak digital vernier caliper with least count of 0.001 was used to records the measurement precisely. Similar methodologies were used by other authors.<sup>11</sup>

Anterior teeth are essential for esthetics in Orthodontics, Prosthodontics and other restorative patients. To know the mean values of crown length and width in each population will help the clinician to adequately restored these teeth. The present study showed less variation in sizes of teeth (small range and standard deviation), this is more helpful in restoration if the inclusion and exclusion criteria are strictly followed. Clinicians can use contralateral tooth in arch for space analysis and restoration in orthodontics and prosthodontics treatment; as same gene is responsible for bilateral structure formation in craniofacial region.<sup>12</sup> In the current study there was very less difference in right and left side teeth dimension. Perfect and statistically significant correlation was observed in the current study.

The data obtained from other articles established the following ranking for maxillary crown width and length for the population studied: centrals > canines > laterals. The most noticeable differences in the mean values of length were found in studies that measured extracted teeth,<sup>13,14</sup> that is, from the incisal edge to the cementoenamel junction rather than the gingival margin, leading to greater length values and therefore smaller ratios (width/ length ratio of 78% for central incisors). This is mentioned by Magne et al<sup>13</sup> and Marcushamer et al<sup>14</sup> who noticed that their measurements were approximately one mm longer than those of other studies measuring clinical crowns and not anatomic crowns. This may account for why, when this ratio is applied clinically, the resulting teeth appear excessively long. However, these data may be useful in patients

where crown-lengthening techniques are applied and the cementoenamel junction is exposed. In the current study the canine were more lengthier than central incisors.

The highest symmetry was observed in canine teeth in the present study in width (r=0.93 P=0.00) and length (r=0.96 P=0.00). Similar results were observed by Orozco-Varo et al.<sup>11</sup> But the sample of that study was larger than the current study.

The width/length ratio for each tooth has clinical relevance; knowing it allows a calculation of the lost length from the existing width, which usually remains stable. The results show an average ratio of 87% for maxillary central incisors and 72% for laterals and 71% canines. These results are in complete agreemen with Orozco-Varo et al.<sup>11</sup> These findings are in agreement with the results of other studies<sup>7,14</sup> but disagree with other reports that suggest ideal tooth dimension guide-lines based on the preferences and esthetic perception of dentists; these seem to prefer central incisors that were closer to the 75% to 78% width/length ratios.

#### CONCLUSION

The tooth dimension showed less variation (low standard deviation) for crown length, width, and length/ width ratio; it will helps the clinician in restorative procedures.

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#### **CONTRIBUTION BY AUTHORS**

1 Munir Khan:	Paper writing, Topic selection.
2 Muhammad Afzal Khan:	Data collection.
3 Umar Hussain:	Statistical and data analysis, literature.