European Journal of Dental and Oral Health
Vol 5 | Issue 3 | June 2024
ISSN 2684-4443

RESEARCH ARTICLE

Comparative Study of Mesiodistal Crown Dimensions and Tooth Size Discrepancies of Thalassemia and Control Iraqi Patients

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ABSTRACT

Aims: **To find differences in mesiodistal tooth width in Iraqi B thalassemia compared with normal individuals. Setting and design: 44 subjects, 22 thalassemia (11 males, 11 females) (12.5–22) years, and 22 control (11 males, 11 females) 14–23 years.**

Methods and Material: **Registrations of MD for maxillary and mandibular teeth from the first molar on one side to analogous tooth on the other side were done. Statistical analysis: Mean, standard deviation and 2-sampled t-test were used.**

Results: **In both groups, males' crown size was greater than females. In the study group largest gender variances appear in the maxillary molars, mandibular molar, maxillary central and maxillary canine respectively. In control, the greatest sexual difference is present in the maxillary first premolar followed by the mandibular second premolar. The means of mesiodistal in both sexes in thalassemia were smaller than in control except in male maxillary central and lateral and female maxillary lateral incisor. In the maxilla, a significant decrease in mesiodistal thalassemia is present in canine and second premolar in both sexes. In the mandible, a significant decrease in thalassemia was present in all comparisons in both genders in comparison with the control. The greatest mesiodistal difference in the mandibular male is present in the first molar, first premolar, second premolar, canine, lateral and central incisor respectively. In female mandibular teeth, the greatest difference is present in the first molar followed by the first premolar, second premolar, canine, lateral incisor and central incisor.**

Conclusions: **Means mesiodistal dimensions in thalassemia show a significant reduction in mandibular teeth and maxillary canine and second premolar in both genders.**

Keywords: Iraqi, mesiodistal, thalassemia, tooth size.

Submitted: May 24, 2023

Published: June 24, 2024

10.24018/ejdent.2024.5.3.277

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1. Introduction

Tooth size analysis is the most important diagnostic step for the treatment planning of orthodontic patients [1]. In normal occlusion, maxillary and mandibular tooth size should be proportional to each other, otherwise, malocclusion will occur [2].

Space problems represent one of the most frequent malocclusions (up to 95% of the population) [3]. Variation in mesiodistal crown size is an impact factor for crowding and spacing development [4].

Tooth crown size discrepancy can vary depending on heredity, ethnicity and gender [5]. Furthermore, gastrointestinal disorders such as hypothyroidism, hypertension and diabetes in addition to malnutrition can influence tooth size variation [6].

Thalassemia is a genetic blood disorder caused by the absence or reduction of the production of either α- or β-globulin protein chains which leads to failure of normal hemoglobin synthesis. Additionally, an ineffective erythropoiesis results in excess of α- or β- globulin which leads to red cell membrane damage, cell lysis and severe anemia [7], [8].

Thalassemia is considered one of the common genetic blood diseases with a prevalence of 3% of the world's population [9]. Mostly it affects individuals from Italy, Asia, Africa, the Middle East and Greece [10].

The most common clinical manifestation of the disease includes severe anemia due to ineffective erythropoiesis and the destruction of circulating red blood cells (hemolysis,) [11], [12] bone marrow expansion, extramedullary haematopoiesis, hepatosplenomegaly, [13] skeletal deformities, frontal and cheekbone posing [14], maxillary overgrowth, underweight [15], short stature, delay in dental development and reduction in dental arch dimensions [16].

The aim of this study: catch any difference in mesiodistal (MD) tooth crown width in Iraqi B thalassemia patients as compared with the corresponding normal individuals.

2. Subjects and Methods

The sample comprised 22 thalassemia patients, 11 males and 11 females aged (12.5–22) years, with a mean age (18.2 ± 2.8 standard deviation) of years. The control unaffected group was composed of 22 subjects 11 males and 11 females aged (14–23) years, with the mean age (19.6 ± 2.5) years tested. Patients were selected from a larger group of patients who attended to thalassemia center in Al-Karama Hospital as they fulfilled the criteria of clinical sample selection that included:

1-They are patients with β-thalassemia major proven by laboratory and medical examination

2-Iraqi in origin

3-No present history of orthodontic treatment and maxillofacial surgery

4-The patient should have a full eruption of permanent teeth from the first molar of one side to the first molar of the other side

5- Teeth not affected by caries or attrition

6-teeth have no restoration

7-no abnormal crown morphology

Ethical approval was achieved by the research committee of Mustansiriyah University/College of Dentistry for this study. Consent was obtained from the parents of all participant members.

Impressions were obtained in perforated trays of suitable size and Alginate for the maxillary and mandibular dental arches of each patient, and then cast in by dental stone. Registrations of MD for each maxillary and mandibular permanent tooth from the first molar on one side to the analogous tooth on the other side. The MD of a tooth was gained by measuring the supreme distance between the mesial to distal contact points of the tooth on a line parallel to the occlusal plane distance by using "a Boley gauge" with a Vernier scale and accuracy reading to close to 0.1 mm. The sharp tips of the callipers assisted the accuracy. An investigator measured each arch twice, from the right first molar to the left first molar. If the second measurement was different by more than (0.2 mm) from the first measurement, the tooth was re-measured again.

Descriptive statistics include mean, standard deviation (SD) and. A 2-sampled test was used to test for statistical differences between means. $P < 0.05$ is considered significant.

3. Results

Student's t-test was used for comparison between the first and second measurements. No significant differences were found between the two measurements ($p = 0.001$).

There were no significant differences between (males and females) in the MD of teeth regarding the right and left sides of the dental arch ($p = 0.004$).

The mean of MD for each single tooth in males and females among the study group and the control group, in cooperation, the mean of crown size in males was greater than the mean in females. In the study group, the largest gender variances were established in the maxillary molars (mean = 0.40 mm), followed by mandibular molar (mean = 0.26 mm), then maxillary central incisor (mean = 0.19) and finally maxillary canine (mean = 0.14) [Table I].

In the control group, the greatest sexual difference was found in the maxillary first premolar (mean = 0.32) followed by the mandibular second premolar (mean = 0.18); however, only 2 of these 24 comparisons showed a significant increase [Table II].

On another hand; the means of MD in the thalassemia group in both males and females were smaller than in those of the control group except in male maxillary central and lateral and female maxillary lateral incisor (See Fig. 1 Table I).

In the maxillary arch; there was a significant decrease in MD in the thalassemia group in canine and second premolar in both males (mean differences canine 0.52, second premolar 0.43) and females (mean difference canine 0.60, second premolar 0.38) (See Fig. 1 and Tables III and IV).

While in the mandibular arch (See Fig. 2), there was a significant decrease in the thalassemia group in all comparisons in both males and females as compared with those in the control group. The greatest mesiodistal difference in mandibular males is present in the first molar, first premolar and second premolar (mean difference = 0.63, 0.63 and 0.59, respectively); then followed by canine and lateral (mean difference = 0.37 for both) while the central incisor shows less difference (mean = 0.25) [Table III].

Whereas, in mandibular teeth in females also the first molar shows the greatest mean difference (0.74) followed by the first premolar (0.64), second premolar (0.47), canine (0.45), lateral incisor (0.41) and finally central incisor which shows a least mean difference (0.29) as presented in Table IV.

4. Discussion

Teeth size variations can be caused by multiple factors such as heredity, gender and environment. Some of the environmental factors include diseases and malnutrition which have a valuable influence on tooth crown size; [17] like cleft lip, cleft palate, Down's syndrome, and oligodontia that cause a reduction in tooth dimension [18].

Patients with Beta thalassemia may suffer from skeletal and craniofacial deformities. Common manifestations of thalassemia patients are frontal and cheekbone prominence, maxillary overgrowth, widening of the anterior maxillary teeth and malocclusion, [19] Decreased dimensions of dental arches, [20] interruption in the development of teeth, and under stature and weight [6].

TABLE I: Crown Mesio-Distal Diameters (in mm) of the Permanent Teeth in the Study and Control Group

	Thalassema				Control			
	Male		Female		Male		Female	
Maxilla	Mean	SD	Mean	SD	Mean	SD	Mean	SD
U1	8.25	4.9	8.05	0.25	8.17	0.48	8.07	0.43
U2	6.21	10.3	6.11	0.83	6.11	0.19	6.04	0.25
U3	7.34	5.8	7.2	0.71	7.86	0.28	7.8	0.30
U4	6.3	7.6	6.26	0.47	6.63	0.68	6.31	0.59
U5	6.11	6.8	6.09	0.45	6.54	0.44	6.47	0.45
U6	10.25	4.8	9.85	0.30	10.31	0.51	10.17	0.67
Mandible	Mean	SD	Mean	SD	Mean	SD	Mean	SD
L1	5.15	0.22	5.05	0.16	5.4	0.32	5.35	0.32
L2	5.55	0.29	5.44	0.38	5.93	0.21	5.86	0.23
L3	6.62	0.41	6.53	0.39	7.0	0.29	6.99	0.34
L4	6.46	0.48	6.4	0.46	7.1	0.17	7.04	0.24
L5	6.64	0.39	6.58	0.41	7.23	0.26	7.05	0.12
L6	10.47	0.49	10.21	0.062	11.11	0.24	10.96	0.26

Note: *SD = standard deviation. **U = upper, L = lower.

TABLE II: Difference between Means (M/d) in mm and Degree of Significance between Male and Female in Thalassemia and Control Group

	Thalassema		Control	
Maxilla	M/d between male & female	p-value	M/d between male & female	p-value
U1	0.19	0.03	0.10	0.32
U2	0.16	0.86	0.58	0.21
U3	0.09	0.02	0.06	0.06
U4	0.73	0.89	0.44	0.69
U5	0.14	0.4	0.11	0.13
U6	0.53	0.02	0.55	0.56
Maxilla	M/d between male & female	p-value	M/d between male & female	p-value
L1	0.09	0.06	0.05	0.05
L2	0.25	0.73	0.67	0.52
L3	0.11	0.05	0.06	0.18
L4	0.39	0.71	0.44	0.03
L5	0.09	0.26	0.01	0.15
L6	0.55	0.24	0.09	0.13

TABLE III: Difference between Means in mm (M/d) and Degree of Significance of Permanent Teeth in the Study Group (in Males) Compared with their Corresponding of the Control Group

Maxilla	M/D	p-value	Mandible	M/d	p-value
U1	0.08	0.64	L1	0.25	0.02
U2	0.09	0.59	L2	0.37	0.001
U3	0.52	0.001	L3	0.37	0.01
U4	0.33	0.15	L4	0.63	0.000
U5	0.43	0.01	L5	0.59	0.000
U6	0.05	0.79	L6	0.63	0.000

TABLE IV: Degree of Significance and the Difference between Means (M/d) in mm of Permanent Teeth in the Study Group (in Females) Compare with their Corresponding of the Control Group

Maxilla	M/D	p-value	Mandible	M/d	p-value
U1	0.01	0.89	L1	0.29	0.01
U2	0.07	0.77	L2	0.41	0.003
U3	0.60	0.01	L3	0.45	0.005
U4	0.04	0.82	L4	0.64	0.000
U5	0.38	0.04	L5	0.47	0.002
U6	0.32	0.13	L6	0.74	0.001

The findings of the study showed that the means mesiodistal crown sizes in the thalassemia group were smaller than in the control group. However, the difference in means was significant only in the mandible this may be related to the general reduction in mandibular size of the thalassemia patients [21].

A previous study stated that the mesiodistal dimension of teeth in thalassemia was significantly smaller in all maxillary teeth in males and females [2]. This somewhat differs from the findings of the present study which showed that in the maxilla just canine and second premolar showed a significant difference in both males and females.

Males showed larger mesiodistal tooth dimensions than females in both thalassemia and control groups and this is in agreement with the findings of the previous study [2].

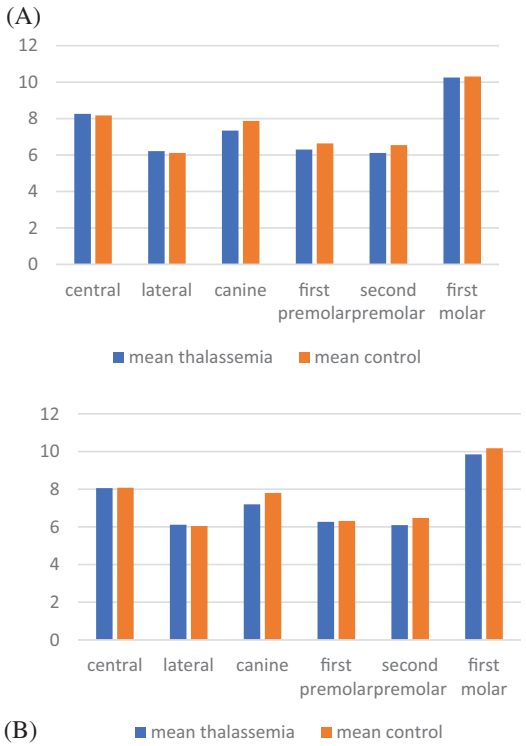

Fig. 1. A) Mean of mesiodistal measurement of (A) maxillary male and (B) maxillary female in both control and thalassemia groups.

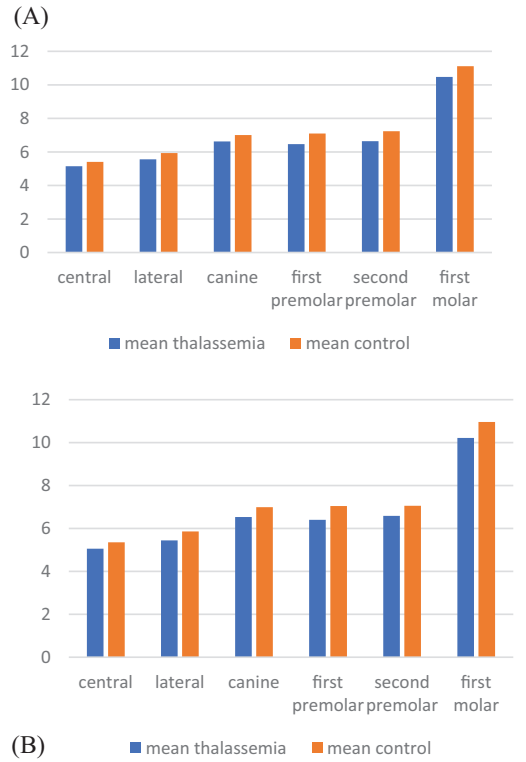

Fig. 2. Mean of mesiodistal measurement of (A) mandibular male and (B) mandibular female in both control and thalassemia groups.

5. Conclusion

With the limitations of the study, there are differences in mesiodistal dimensions of thalassemia patients in comparison with the control group. Therefore, careful analysis of tooth size in both maxilla and mandible should be done during treatment planning of thalassemia patients in order to achieve optimal occlusal relationships.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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