Original Article

Comparison of the Frequency of Temporomandibular Disorders Between β -Thalassemia Major Patients and High School and Guidance School Students

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ABSTRACT

Background and Aim: Patients affected by thalassemia major show great skeletal changes in the head and neck area in addition to malocclusion. It seems that examination of malocclusion in these patients and evaluation of the frequency of temporomandibular disorders (TMD) can help identify people with a high risk of illness in the society. The current study aimed to compare the frequency of TMD between β-thalassemia major patients and high school and guidance school students.

Materials and Methods: In this descriptive-analytical study, 51 patients affected by thalassemia major (23 girls and 28 boys) and 78 normal (43 girls and 35 boys) guidance and high school students between 12 and 18 years old were evaluated. The presence of TMD and malocclusion and their relationship were determined. After examination and completion of the related questionnaire, data were analyzed by chi-square test and t-test using SPSS software.

Results: According to the data, there was no significant difference in spacing, occlusion, crowding, open bite, headache, bruxism, crepitation, clicking, TMD, subluxation, locking, cleaning, deviation, deep bite, and crossbite between the control and thalassemia students ($P>0.05$). However, significant differences were observed regarding overjet and pain ($P<0.05$).

Conclusion: These results suggest that TMD and occlusion type have no significant correlation with thalassemia.

Keywords: Thalassemia, Temporomandibular Joint Disorders, Malocclusion

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Introduction:

Thalassemia is a hereditary disease that occurs because of mutations in the synthesis of hemoglobin α- and β-chains, leading to chronic and severe anemia.[1] Thalassemia has two main forms: heterozygous, known as mild (minor), and homozygous or β-thalassemia (thalassemia major, also known as Cooley's anemia and Mediterranean anemia). The latter shows the most severe symptoms.[2] β-thalassemia causes severe anemia that begins after birth and leads to serious complications.[3] These patients show severe cardiac failure, chronic anemia, and hypoxia.[3] Thalassemia is a widespread disease distributed in Africa, the Middle East, the Mediterranean area, Southeast Asia, and the Pacific islands.[1]

The articular eminence is a part of the temporal bone that forms the joint. It is located on the anterior part of the articular cavity; the condyle slips on it during mandibular movement.[4] The morphologic changes and asymmetry observed in the temporomandibular joint (TMJ) are influenced by several factors including abrasion, premature contacts, avascular necrosis, unilateral crossbite, and dentoskeletal asymmetries.[5]

When the slope of the articular eminence is more than normal, the condyle is forced towards more lateral movements rather than anterior movements, which result in more vertical displacement of the condyle and the mandible during mandibular opening and may cause the loosening of the ligaments that connect the disc to the condyle.[6] Normal variations in condylar morphology occur with age, gender, face shape, occlusal force, functional load, and malocclusion between the left and right sides. The higher prevalence of morphological changes in the TMJ in older people is due to the onset of joint degeneration.[7]

These patients also show bone deformities, growth abnormalities, and hepatosplenomegaly.[8] Craniofacial manifestations are common features of β-thalassemia patients and include bony changes due to ineffective erythropoiesis.[9] These changes include vertical growth of the mandible, short mandibular body, prominent malar bone, depressed nasal bridge, partially obliterated maxillary sinus, delayed pneumatization of the maxillary sinuses, upper lip retraction, and altered ramus length, leading to Class II malocclusions.[10] These changes cause osteoporosis and marrow space expansion in long bones, the skull, and facial bones. Also, rodent face appearance is common in these patients.[11]

In the evaluation of the craniofacial morphology of Iranian children with β-thalassemia, Amini et al reported that anemia produces overgrowth of the maxilla, the condyle, and the ramus of the mandible, leading to Class II malocclusions and a soft-tissue profile for orthodontic or orthognathic management.[3]

The current study aimed to compare the frequency of TMD between β-thalassemia major patients and high and guidance school students.

Materials and Methods:

In this descriptive-analytical study, 51 patients affected by thalassemia major, referring to the 17th Shahrivar Hospital (Rasht, Iran) and 78 normal 12-18-year-old guidance and high school students in Rasht city (Iran) were evaluated. This study received approval from the Research Ethics Committee of Gilan University of Medical Sciences, Rasht, Iran.

After the exclusion of subjects who had a history of orthodontic therapy, surgery or trauma in the craniofacial area, the samples were allocated as 51 β-thalassemia major patients (23 girls and 28 boys) and 78 normal (43 girls and 35 boys) guidance and high school students between 12 and 18 years old. The presence of TMD and malocclusion and their relationship were determined. Clicking, crepitation, spacing, crowding, deviation and deflection, crossbite, open bite, overbite, overjet, bruxism, clenching, trauma, subluxation, locking, headache, pain, TMD, and malocclusion were evaluated, and occlusion types (I, II, III) were determined.

The clinical examination began by directly palpating over the joint while the subject opened and closed the mandible, and the extent of the condylar movement was assessed. The joint was auscultated during the mandibular motion to examine crepitus, grinding, and clicking or popping sounds. The degree of mandibular opening was measured using the distance between the incisal edges of the upper and lower incisors; the opening of less than 35 mm was considered abnormal. Mandibular deviation was also assessed.

After examination and completion of the related questionnaire, data were analyzed by chi-square test and t-test using SPSS software (SPSS Inc., Chicago, IL, USA). P-values lower than 0.05 were considered statistically significant.

Results

As seen in Table 1, 51 participants had thalassemia and 78 participants were normal.

Table 1: Distribution of the participants

Groups	N (%)
Thalassemia	51 (39.5)
Control	78 (60.5)
Total	129 (100)

There was no significant difference between the two groups regarding gender (P=0.265; Table 2).

Table 2. Distribution of the participants according to gender

Group	Thalassemia	Control	Total
Gender	N (%)	N (%)	N (%)
Female	23 (45.1)	43 (55.1)	66 (51.2)
Male	28 (54.9)	35 (44.9)	63 (48.8)
Total	51 (100)	78 (100)	129 (100)

The frequency of TMD in the participants is presented in Tables 3 and 4. According to the data, there was no significant difference in spacing, occlusion, crowding, crossbite, open bite, headache, bruxism, and deviation between the control and thalassemia groups (P>0.05). However, significant differences were observed regarding overjet and pain (P<0.05).

Also, no significant differences were observed regarding crepitation, clicking, TMD, subluxation, locking, and cleaning between the control and thalassemia groups (P>0.05).

The results of the comparison of TMD frequency among the participants is presented in Table 5. As seen, there was no significant difference in deep bite, overjet, crowding, open bite, spacing, and occlusion classes between the control and thalassemia groups (P>0.05). However, significant differences were observed regarding crossbite between the control and thalassemia groups (P<0.05).

Table 3:Frequency of temporomandibular disorders (TMD) among the participants

Disorder		Thalassemia; n (%)	Control; n (%)	P-value
Spacing	Yes	33 (64.7)	68 (87.2)	
	No	18 (35.3)	10 (12.8)	
Occlusion type I		24 (47)	37 (47.5)	
Occlusion type II		25 (49.1)	20 (25.6)	
Occlusion type III		2 (3.9)	21 (26.9)	
Overjet >4mm	Yes	40 (78.4)	74 (94.9)	
	No	11 (21.6)	4 (5.1)	
Deep bite	Yes	48 (94.1)	62 (79.5)	
	No	3 (5.9)	16 (20.5)	
Crowding	Yes	28 (54.9)	46 (59)	
	No	23 (45.1)	32 (41)	
Crossbite	Yes	2 (4)	4 (5.2)	
	No	49 (96)	74 (94.8)	
Open bite	Yes	3 (5.9)	9 (11.6)	
	No	48 (94.1)	69 (88.4)	
Pain	Yes	10 (19.6)	4 (5.1)	
	No	41 (80.4)	74 (94.9)	
Headache	Yes	20 (29.2)	28 (35.9)	
	No	31 (60.8)	50 (64.1)	
Bruxism	Yes	8 (15.7)	9 (11.5)	
	No	43 (84.3)	69 (88.5)	
Deviation	Yes	9 (17.7)	23 (29.5)	
	No	42 (82.3)	55 (70.5)	

Table 4:Frequency of temporomandibular disorders (TMD) among the participants

Disorder		Thalassemia; n (%)	Control; n (%)	P-value
Crepitation	Yes	2 (3.9)	2 (2.6)	
	No	49 (96.1)	76 (97.7)	0.66
Clicking	Yes	2 (3.9)	7 (8.9)	
	No	49 (96.1)	71 (91.1)	0.27
Subluxation	Yes	0	1 (1.3)	
	No	51 (100)	77 (98.7)	0.41
Locking	Yes	0	1 (1.3)	
	No	51 (100)	77 (98.7)	0.41
Clenching	Yes	20 (39.2)	29 (37.2)	
	No	31 (60.8)	49 (62.8)	0.81

Table 5. Correlation of temporomandibular disorders (TMD) with other disorders among the participants

Disorder		Thalassemia; n (%)	Control; n (%)	P-value
		TMD (Yes)	TMD (No)	
Deep bite	Yes	2 (66.7)	34 (70.8)	0.87
	No	1 (33.3)	14 (29.2)	
Overjet >4mm	Yes	6 (54.5)	30 (75)	0.178
	No	5 (45.5)	10 (25)	
Crowding	Yes	16 (69.6)	20 (71.4)	0.88
	No	7 (30.4)	8 (28.6)	
Crossbite	Yes	36 (73.5)	0	0.02
	No	13 (26.5)	2 (100)	
Open bite	Yes	33 (68.7)	3 (100)	0.24
	No	15 (31.3)	0	
Spacing	Yes	25 (75.7)	11 (61.1)	0.27
	No	8 (24.3)	7 (38.9)	
	Class I	**Class II**	**Class III**	
Occlusion (Yes)	17 (70.8)	18 (72)	1 (50)	0.80
Occlusion (No)	7 (29.2)	7 (28)	1 (50)	

Discussion:

Patients affected by thalassemia major show great skeletal changes in the craniofacial area in addition to malocclusion. It seems that examination of malocclusion in these patients and evaluation of the frequency of TMD can help identify people with a high risk of illness in the society. In this study, we determined the frequency of TMD in β-thalassemia major patients and normal high and guidance school students. There are no reports on the craniofacial characteristics of the Iranians suffering from thalassemia.

According to the data, there was no significant difference in spacing, occlusion, crowding, crossbite, open bite, headache, bruxism, crepitation, clicking, TMD, subluxation, locking, cleaning, deviation, deep bite, and occlusion classes between the control and thalassemia groups. However, significant differences were observed regarding overjet and pain.

TMD is a generic term describing any clinical problem in the TMJ associated with orofacial pain and mandibular dysfunction.[12] In patients with TMD, the deterioration of articular cartilage, bone remodeling, and inflammatory changes occur in the TMJ. Although the diagnosis of TMD is usually based on the clinical symptoms and signs, a variety of imaging techniques, including skeletal radiography, computed tomography (CT), magnetic resonance imaging (MRI), and bone scintigraphy, provide valuable information for TMD diagnosis in clinical practice. Various physical, radiographic, and nuclear medicine examinations are used to diagnose TMD.[13]

Erosion, condylar hyperplasia, concavity, bifid condyle, condylar hypoplasia, and sclerosis are the most common manifestations, respectively. However, researchers have reported no significant differences in the prevalence of abnormal findings with the patient's gender, dental status, and occlusion.[14] Nonetheless, they reported that the prevalence of abnormal radiographic findings increases in older patients.[14] In the current study, a significant correlation was observed between locking-right and limitation-right, crepitus-left and crepitus-right, locking-left and limitation-right, subluxation-right and click-right and subluxation-right, and subluxation-left and subluxation-right. Perhaps, the age of the case group was low, which may have affected our results; further research on older patients is recommended.

Brooks et al reported flattening in 35% of the participants.[15] Katzberg et al reported flattening in 52% of patients between the ages of 20 and 69 years.[16] It has been reported that flattening is the most frequent finding in the condyles of young people under orthodontic treatments.[14] Also, Katzberg et al reported that sclerosis, concavity, osteophyte, erosion, and cysts were respectively the most common mandibular disorders after flattening. Additionally, flattening, osteophyte, sclerosis, concavity, erosion, and cysts are the most common complications.[17] Other joint disorders such as erosion, condylar hyperplasia, concavity, bifid condyle, condylar hypoplasia, sclerosis, osteophyte, and subcortical cysts have also been reported.[14]

The retarding effect of thalassemia on general skeletal growth has been reported.[18] In thalassemia patients, premature fusion of the epiphysis of long bones leads to shortening of the proximal humerus.[19] β-thalassemia patients have reduced craniofacial dimensions.[20] In β-thalassemia patients, the main craniofacial manifestation is Class II skeletal malocclusion associated with a strong vertical growth pattern.[19] The vertical growth of the mandible in these patients was in agreement with the findings reported in Qatar and Syria.[20-22] The bones become thinner, and pathological fractures may occur.[8] Overexpansion of the bone marrow leads to changes in typical facial and cranial bones.[8] The subperiosteal growth of the ramus and the mandibular cartilage leads to subsequent complications including severe chronic anemia, endocrine dysfunction, and growth hormone insensitivity.[1] In agreement with previous reports, the facial appearance of thalassemia patients follows their substantial skeletal discrepancy.[1] Prominent lips accompany a small chin.[3] Thalassemia patients exhibit severe facial disfigurements with reduced posterior facial height and increased anterior facial proportions.[20]

β-thalassemia is a transfusion-dependent disease.[8] Treatment of β-thalassemia includes regular blood transfusions to prevent anemia-induced heart failure.[8] Regular red blood cell transfusion is the recommended treatment for β-thalassemia, which is usually administered every 2-5 weeks

to maintain the pre-transfusion hemoglobin level (9-10.5 g/dl).[23] A blood transfusion regimen induces normal growth and inhibits excess bone marrow activity.[24]

Conclusion:

In conclusion, these results suggest that TMD and occlusion type have no significant correlation with thalassemia.

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