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## Different type of periodontitis and gingivitis in patients with major thalassemia comparing to healthy people

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Iran is located on the thalassemia belt and has the highest prevalence rate of patients compared to the general population in the world. This investigation was performed to determine the prevalence of gingivitis and periodontitis in thalassemia patients in comparison to healthy people and evaluate the relationship between periodontal disease and age, gender, splenectomy and dosage of desferal.

**METHODS:** In this cross-sectional study, 133 thalassemia patients and 133 healthy people were examined. Clinical examination was performed by periodontal probe and age, gender, desferal dosage, smoking, occlusion, dental alignment were recorded. The results were analyzed using ANOVA, Chi-square, and t-test.

**RESULTS:** Prevalence of gingivitis and periodontitis in thalassemia patients was significantly higher than the control group ( $P = 0.049$ ). However, no difference was observed in the severity of periodontitis. Results showed that age, xerostomia and splenectomy are associated with periodontitis, and dental alignment was correlated with gingivitis. Calculus index (CI) was reported to be more in thalassemia patients, but results showed no significant difference in debris index (DI) however DI was significantly higher in anterior maxillary sextant.

**CONCLUSION:** Due to the higher prevalence of gingivitis and periodontitis in patients with thalassemia and susceptibility to infection, preventive and therapeutic treatment is essential in these patients.

**KEYWORDS:** Major Thalassemia, Gingivitis, Periodontitis, Splenectomy, Desferal

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**T**halassemia is a congenital disorder in which a defect in the synthesis of one or more of the globin chains can be seen. Oral and facial manifestations such as maxillary protrusion, a severe malocclusion, open bite, flattened bridge of the nose, upper lip protrusion, and glossitis have been observed in these patients.<sup>1,2</sup> Due to the reduced number of T-cells, B-cells activity are also impaired against infectious agents. Hence due to the reduced hemoglobin, lowered immune

reaction and increased susceptibility to infection, special considerations are important for dental patients, particularly in patients who have undergone splenectomy.<sup>3</sup>

In addition to the systemic effects of thalassemia on the body, it also affects local defense and B lymphocytes do not respond to gingival inflammation in patients with gingivitis and salivary immunoglobulins are unchanged in these patients. Other factors, which contribute to the deficient local immune response, are the lack of saliva and

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xerostomia, which reduce salivary immune function. Hence, these patients cannot benefit from the salivary local immune defense against gingivitis.<sup>4</sup>

Although the prevalence and severity of periodontal disease have been demonstrated in a number of systemic diseases, there is little information about the relationship between periodontal disease and thalassemia and the available researches show controversial results. Some researchers have approved this relationship and some haven't<sup>5-7</sup> such as Hattab reported gingivitis in 43% of patients with thalassemia<sup>5</sup> and Caliskan et al.<sup>6</sup> reported that gingivitis in 100% of 22 thalassemia patients on the other hand, Al-Wahadni et al.<sup>7</sup> reported no difference in gingival index, plaque index and pocket depth between thalassemia patients and healthy people and concluded that there is no relationship between gingivitis and periodontitis with thalassemia.

Iran is located on the thalassemia belt, and has the highest prevalence rate of patients compared with the general population in the world. Due to the high prevalence of bacterial infections in these patients, contradictory information in the study results and lack of studies considering periodontitis types, we decided to evaluate the prevalence of gingivitis and periodontitis in patients with major thalassemia in Kerman, Iran.<sup>8</sup>

## Methods

This is a cross-sectional study that was performed on 133 thalassemia patients in the range of 10-20 ages referred to Samen-al-Hojaj Hospital in Kerman and 133 healthy people in the same range age. All patients must have major thalassemia without any other systemic disease or medications that have an impact on periodontal tissues. People, who had a history of smoking, were excluded.

Before the study, the aim and method of the examination were described to the patients and patient's information was

documented in a pre questionnaire considering age, gender, splenectomy, dosage of deferral. Bleeding on probing and loss of attachment was recorded by use of periodontal probing. The severity of periodontitis was classified into mild, moderate and severe periodontitis in patients with 1-2 mm, 3-4 mm and 5 mm and more clinical loss of attachment, respectively.

Oral hygiene index (OHI) that contained debris index (DI) and the calculus index (CI) was measured and documented. Debris is the soft substance consisting of bacterial plaque and food remnants. no debris is documented as Score 0, when the stain or debris cover less than one-third of the tooth surface is classified as Score 1, one-third to two-thirds of the tooth surface is classified as Score 2 and more than two-thirds of the tooth surface is classified as Score 3. CI Score 0 is when no calculus is detected. When the supragingival calculus cover less than one third of the tooth surface is classified as Score 1, one-third to two-thirds of the tooth surface or dispersed subgingival calculus is classified as Score 2. In Score 3 subgingival calculus has covered more than two-thirds of the tooth surface or a band of heavy and attached subgingival calculus is observed (Table 1).

The documentation of CI and DI is similar, only CI contains subgingival calculus as well. In this system, the teeth are divided into six sextants, and only the buccal or lingual surface containing the most calculus and debris is documented. Six numbers from the whole mouth were added and divided to the number of sextants to obtain the mean. Other oral parameters such as mouth breathing, open bite, xerostomia and occlusal relationship were recorded. Tongue blade was utilized to assess xerostomia, and hence that it was placed on buccal mucosa and xerostomia was diagnosed in cases that the mucosa stuck to the tongue blade. The results were analyzed by ANOVA, Chi-square, and t-test, and  $P < 0.05$  was considered as significant. After clinical examination,

patients that had gingival inflammation or periodontitis referred for treatment.

### Results

In this study 133 patients (61 male, 72 female) with thalassemia major in the range of 10-20 years old, were examined and compared with 133 healthy people as a control group.

#### *Relationship between thalassemia and periodontal disease*

Normal periodontium was seen in 75.2% control group and 49.2% thalassemia patients. Gingivitis and periodontitis were reported in 21.8 and 3.0% in the control group and 32.6 and 18.2% in thalassemia patients respectively. Among periodontal involved thalassemia patients, 66.7% were diagnosed as mild periodontitis and 33.3% had moderate periodontitis. On the other hand, 100% control group had mild

periodontitis. The results showed that the prevalence of gingivitis and periodontitis was significantly higher in thalassemia patients ( $P < 0.001$ ), but there was no significant difference in different type of periodontitis ( $P = 0.295$ ).

#### *Relationship between thalassemia and dentition*

In clinical examination, there was no relationship between thalassemia and xerostomia and mouth breathing. About dental alignment, spacing was higher in thalassemia patients (14.4 vs. 8.3%) and crowding was reported more in control group (47.4 vs. 39.4%) although there was no significant difference between two groups. Evaluation of occlusion revealed anterior open bite was more common in thalassemia (7.6 vs. 0.8%), but in the other hands there was no difference in different Angel classification (Table 2).

**Table 1.** Debris and calculus index

Scores	Classification
DI	
0	No debris
1	Debris or stain up to 1/3 of the tooth surface
2	Debris or stain cover 1/3 to 2/3 of the tooth surface
3	Debris or stain cover more than 2/3 of the tooth surface
CI	
0	No calculus
1	Supra gingival calculus up to 1/3 of the tooth surface
2	Supra gingival calculus 1/3-2/3 of the tooth surface or dispersed subgingival calculus
3	Supra gingival calculus more than 2/3 of the tooth surface or a band of heavy and attached subgingival calculus

DI: Debris index; CI: Calculus index

**Table 2.** Relationship between thalassemia and relevant factors

Variation	Control group [n (%)]	Thalassemia [n (%)]	All cases	Results
Mouth breathing	35 (26.3)	29 (22.0)	64 (24.2)	$P = 0.400, \chi^2 = 0.68, df = 1$
Xerostomia	26 (19.5)	20 (15.2)	46 (17.4)	$P = 0.340, \chi^2 = 0.89, df = 1$
Open bite	1 (0.8)	10 (7.6)	11 (4.2)	$P = 0.005, \chi^2 = 7.75, df = 1$
Occlusion				
Class I	75 (56.4)	73 (55.3)	148 (55.8)	$P = 0.150, \chi^2 = 3.79, df = 2$
Class II	25 (18.8)	36 (27.3)	62 (23.0)	
Class III	33 (24.8)	23 (17.4)	56 (21.1)	
Alignment				
Normal	59 (44.4)	61 (46.2)	120 (45.3)	$P = 0.200, \chi^2 = 3.21, df = 2$
Spacing	11 (8.3)	19 (14.4)	30 (11.3)	
Crowding	63 (47.4)	52 (39.4)	115 (43.4)	

df: Degree of freedom

### *Relationship between thalassemia and OHI*

CI was reported to be more in thalassemia patients, but results showed no significant difference in DI however DI was significantly higher in anterior maxillary sextant.

### *Associated factors with periodontal disease in thalassemia patients*

Results showed that age, xerostomia and splenectomy are associated with periodontitis but no correlation was found with open bite, type of occlusion, smoking and desferal dosage. Among the various factors such as age, sex, dry mouth, splenectomy and smoking dosage and type of occlusion, the only dental crowding was associated with gingivitis.

## Discussion

Although the prevalence and severity of periodontal disease has been demonstrated in a number of systemic diseases, there is little information about the relationship between periodontal disease and thalassemia and the available researches show controversial results. Some researchers have approved this relationship, and some haven't.

In our study, gingivitis and periodontitis was seen in 32.6 and 18.2% of thalassemia patients, respectively. Similar to this study Hattab reported gingivitis in 43.0% of patients with thalassemia.<sup>5</sup> The prevalence of periodontitis was not measured in study of Hattab,<sup>5</sup> While Caliskan et al. reported that gingivitis was observed in 100% of 22 thalassemia patients.<sup>6</sup> The small number of the patients in Caliskan et al. study may be the reason of the difference in the results of these studies.<sup>6</sup> Al-Wahadni et al. reported no difference in gingival index, plaque index and pocket depth between the case (61 patients) and control (healthy) group and concluded that there is no relationship between gingivitis and periodontitis with thalassemia.<sup>7</sup> Siamopoulou-Mavridou et al. evaluated gingivitis and caries in 22 thalassemia patients and suggested that the lower level of the salivary antibodies set the higher prevalence of gingivitis and caries in

patients with thalassemia. The percentage of gingivitis prevalence was not reported in this study. Periodontitis was not assessed in this study either.<sup>4</sup>

Ajami et al. studied oral and dental health in thalassemia patients and reported healthy periodontium, gingivitis and periodontitis in 64.8, 33.0 and 1.8 percent of the patients, respectively.<sup>9</sup> Our study showed these clinical statuses in 49.2, 32.6 and 18.2 percent of the patients. The prevalence of gingivitis in study of Ajami et al.<sup>9</sup> is very similar to our study (33.0 and 32.6%), but there is a significant difference between the studies in periodontitis (1.8 vs. 18.2%) and normal periodontium (64.8 vs. 49.2%). As discussed before, other studies only evaluated gingivitis and even the studies that considered periodontitis, had not assessed the severity of periodontitis in patients.

In this study, 66.7% of the thalassemia patients with periodontitis showed moderate, and 33.3% showed severe periodontitis. Prevalence of gingivitis and periodontitis in thalassemia patients was significantly higher than the control group; however, no difference was observed in the severity of periodontitis. In this study, CI was significantly higher in patients with thalassemia compared to the control group that conflicts with study of Al-Rubayee et al.<sup>10</sup> that showed similar CI in both groups.

In our study, DI was higher in maxillary anterior but no difference was observed in the DI between the groups; however, Banihashemrad and Banihashem showed higher DI in the thalassemia group and similar CI in groups. Since anterior open bite is more prevalent in thalassemia group than the control, it explains the increased DI in the anterior maxilla due to lack of labial seal and dental self-cleansing.<sup>11</sup>

Class I and Class II occlusal relationship were observed in 52.0 and 48.0% of the patients in study of Elangovan et al.<sup>12</sup> and 59.7 and 23.6% in study of Scutellari et al.<sup>13</sup> Class III relationship was seen in neither of



these studies that conflicts with our study. Class II malocclusion is more common than class I and III in studies of Elangovan et al.<sup>12</sup> and Scutellari et al.<sup>13</sup> This is due to increased bone formation, resulting in protrusion of the upper jaw in thalassemia patients.

Considering thalassemia patients' dental alignment in incisor area, some studies have reported dental crowding while other studies reported increased tooth spacing. In our study, 14.4% of thalassemia cases showed teeth spacing and 39.4% showed teeth crowding. These results were similar to the crowding results reported by Thomson and Dick.<sup>14</sup> (38.0%) and different from Banihashemrad and Banihashem.<sup>11</sup> results (9.0%). Furthermore, spacing was more prevalent in the case and crowding in the control group. Although there was no significant difference between thalassemia patients and control group, the discrepancy between the case and control groups in our study may be due to the increased of facial bone growth in thalassemia patients and increased space for teeth in dental arch.<sup>13,14</sup>

In this study, the relationship between periodontal disease predisposing factors and age, gender, xerostomia, smoking, splenectomy and dosage of desferal with gingivitis and periodontitis was evaluated. Results showed that age, xerostomia and splenectomy were associated with periodontitis, and dental alignment was correlated with gingivitis. The spleen plays an important role in the immune system; Therefore in the thalassemia patients who have undergone surgical splenectomy, the immune system response is reduced. As a result of the impaired gingival local response, the plaque accumulation pattern may alter. De et al. research showed higher occurrence of gingivitis in patients with beta thalassemia major who had the history of splenectomy than the patients who were not splenectomized.<sup>2</sup> In a similar study Banihashemrad and Banihashem reported more gingival inflammation in patients who had previously undergone splenectomy;<sup>11</sup> however, in our

study was not found an association between gingivitis and splenectomy but a higher prevalence of periodontitis was seen in splenectomized patients.

Repeated blood transfusions in thalassemia patients results in excessive accumulation of iron in the body and desferal (deferrioxamine) is an iron chelator that reduces the body's iron overload. As iron is a vitamin C oxidizer, these patients usually suffer from vitamin C deficiency and oral symptoms such as gingival bleeding, redness or swelling and tooth mobility and displacement is expected. In our study, no association was found between periodontitis or gingivitis with the deferrioxamine dose that is in consistence with the results of Loebstein et al.'s study.<sup>15</sup> It showed that this drug does not change the immune response in patients with thalassemia; however, lymphocyte function abnormalities were observed in study of Li et al.<sup>16</sup> on 50 thalassemia patients with frequent bleeding disorders. In study of Li et al. the number of transfusions, treatment with deferrioxamine and iron overload were reported as the factors involved in this immune deficiency.<sup>16</sup>

In this study, prevalence of gingivitis and periodontitis was higher than the normal population that it may be because of reduced number of T-cells, impaired B-cell activity, lack of saliva and unresponsiveness of salivary immunoglobulin.

### Conclusion

Our study showed that the prevalence of gingivitis and periodontitis in thalassemia patients was significantly higher than the control group. Also, age, xerostomia and splenectomy were associated with periodontitis and dental alignment was correlated with gingivitis. Due to the higher prevalence of gingivitis and periodontitis in patients with thalassemia and susceptibility to infection, preventive and therapeutic treatment is essential in these patients.

### Conflict of Interests

Authors have no conflict of interest.

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