Original Article

Orodental Complications in Patients with Major Beta-Thalassemia

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ABSTRACT

Background: The aim of this study was to determine whether beta-thalassemia major is associated with an increased risk of periodontal disease, dental caries and malocclusion.

Methods: In this cross-sectional study, 50 patients (21 males and 29 females) with thalassemia major, between two and 20 years of age, and 50 healthy matched control individuals, were included. Demographic, hematological and odontostomatological data (hematological picture, the face characteristics and odontostomatologic examination) were collected for each patient. Patients and control individuals were examined for plaque deposits, gingivitis, periodontitis and dental caries using Silness and Loe plaque index (Pl.I), Loe and Silness gingival index (GI), probing pocket depth (PPD) and decayed, missing and filled teeth (DMFT) respectively and also were evaluated for malocclusion. Data were analyzed by t-student and Mann-Whitney tests.

Results: Poor oral hygiene was generally observed. There were no significant differences in Pl.I, GI and PPD scores between the thalassemic patients and the healthy control individuals ($P > 0.05$). Dental caries were significantly higher in thalassemic patients ($P < 0.001$) in comparison with the healthy control group. Various and serious malocclusion stages (Angle's II class, deep bite and open bite) were seen especially in older patients.

Conclusion: Thalassemia is not associated with increased rates of gingivitis or periodontitis, but it is associated with higher rates of dental caries and malocclusion.

Keywords: Dental caries, malocclusion, periodontal diseases, thalassemia.

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Introduction

Thalassemia syndromes are characterized by various degrees of ineffective hematopoiesis and increased hemolysis. Beta thalassemia mutations are common in Mediterranean and Middle Eastern areas. Double heterozygous forms cause a major clinical syndrome with severe anemia and extramedullary hematopoiesis. As a result of chronic transfusion, which is necessary for these patients, excessive iron load and hemochromatosis develop, and many organ systems, especially cardiovascular and endocrine systems, will be affected. Extramedullary hematopoiesis also results in bony deformities. In the face, enlargement of jaw and its alveolar process produce various and serious malocclusion stages.[1,2] Prevalence and severity of periodontal diseases are increased in some chronic diseases. However, in patients with major beta thalassemia, this association has not been proven. Al-Wahadni et al. did not find higher rates of periodontal diseases in thalassemic patients but found a higher risk of dental caries.[3] On the other hand, Scutellari et al. found similar incidence of dental caries in beta thalassemic patients and normal controls.[4] Lower concentrations of immunoglobulin A (IgA) in saliva in thalassemic patients have been claimed to be related to higher rates of dental caries.[5] To find the orodental complications in major beta thalassemia, we evaluated malocclusion, periodontal disease and dental caries in these patients in comparison with normal individuals.

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Materials and Methods

In this cross-sectional study, 50 patients with major beta thalassemia two-20 years of age who were on regular blood transfusion every three-four weeks in Shahid Ashrafi-Isfahani thalassemia clinic affiliated with Shahid Beheshti University of Medical Sciences in Tehran were included. Fifty age- and sex-matched healthy individuals from the same area (in an attempt to have the same socioeconomic status) were selected as the control group. Individuals with chronic disease, malocclusion and those receiving antibiotic therapy within the last month were excluded from the control group. For each patient, a hematological and odontostomatologic questionnaire was completed to have their age, sex, mean pre-transfusion Hb level in the last three months, last ferritin level, fasting blood sugar, calcium and phosphate levels and thyroid function tests recorded. Laboratory test results were extracted from patients' files because they were routinely tested at least every six months. All patients and healthy individuals were examined by one examiner for malocclusion (Angel's class, open bite and deep bite) and dental plaque (by plaque index criteria of Silness and Loe[6]) on buccal and lingual surfaces of the first four molar teeth. Loe and Silness gingival index (GI) and probing pocket depth (PPD) were also examined on these four teeth. Dental caries were diagnosed by visual examination through the decayed, missing and filled teeth (DMFT) index, which uses the criteria of the World Health Organization.[7] Data were analyzed by SPSS software. Numerical data are presented as mean ± standard deviation. We considered t test and Mann-Whitney test (where distributions were not normal) to investigate different levels of associations. All statistical analyses were done with a 95% confidence interval when appropriate and $P < 0.05$ was considered significant.

Results

Patients' ages were between 2 and 20 years. Patients were divided into three age groups according to their dentition (deciduous, mixed and permanent). Demographic data are shown in Table 1. Case and control groups had similar age and sex distribution.

Table 1. Demographic data of patient group.

Group variables		Thalassemia patients
Sex	Female	29 (58%)
	Male	21 (42%)
Mean Age (years)		13.75 ± 5.82
Age groups:	2-5	5 (10%)
	6-12	11 (22%)
	13-20	34 (68%)
Underlying problems		
	Diabetes mellitus	4 (8%)
	Hypocalcemia	3 (6%)
	Hypoparathyroidism	1 (2%)
Ferritin level (ng/dl)		3230 ± 2125
Mean pre-transfusion Hb (g/dL)		8.24 ± 2.45

Mean ferritin level was 3230 ± 2125 ng/dl. Only 28% of patients had ferritin level < 1500 ng/dl. Fasting blood sugar level > 126 mg/dl, hypocalcemia (calcium < 8.5 mg/dl) and hypothyroidism were found in 8%, 6% and 2% of thalassemic patients, respectively. A patient was both diabetic and hypocalcemic. Periodontal status of thalassemia and control groups is shown in Table 2. The mean plaque scores, which show oral hygiene in three age groups was similar in the case and control groups, increased by age increment without any significant statistical differences among different age groups: 1.32 ± 0.52 versus 1.21 ± 0.51, respectively, in the two-five-years-old group, 1.51 ± 0.62 versus 1.49 ± 0.65, respectively, in the six-12-years-old group, and 1.64 ± 0.65 versus 1.61 ± 0.6, respectively, in the 13-20-year-old group. The gingival index and PPD also increased with age increment in the thalassemia group (21% moderate to severe gingivitis) but the difference between case and control groups was not significant (Table 2). DMFT indices of case and control groups are shown in Table 3. The indices were higher in thalassemic patients in all age groups. Its difference was not statistically significant in the2-5-years-old age group, but in the other two age groups, the DMFT scores of thalassemic patients were significantly higher ($P < 0.001$). In seven patients with endocrine abnormalities, gingival index and PPD were analyzed separately. Mean

Table 2. Periodontal status of patient and control groups measured by GI and PPD.

Age group (years)	Thalassemia patients		Control groups	
	GI	PPD	GI	PPD
2-5	1.22 ± 0.59	2.1 ± 0.75	1.20 ± 0.41	2.2 ± 0.83
6-12	1.36 ± 0.58	2.5 ± 1.1	1.28 ± 0.54	2.4 ± 0.97
13-20	1.55 ± 0.61	2.8 ± 1.1	1.49 ± 0.58	2.5 ± 0.99

$P > 0.05$

Table 3. DMFT index in patient and control groups.

Age group (years)	Thalassemia patients				Control groups			
	D	M	F	DMFT	D	M	F	DMFT
2-5	4.2	0.06	1.0	5.26 ± 4.22	3.82	0.07	0.78	4.67 ± 3.2
6-12	5.76	0.75	3.2	9.7 ± 6.52	3.24	0.32	1.2	4.73 ± 2.5
13-20	7.22	0.82	3.8	11.84 ± 6.43	4.43	0.38	1.57	6.43 ± 2.8

gingival index and PPD of these patients were 1.61 ± 057 and 3.1 ± 0.99, respectively, versus 1.47 ± 0.38 and 2.6 ± 1.1 in other thalassemic patients, respectively, which were higher, but the differences were not statistically significant. Different degrees of malocclusion (Angell's II class, deep bite and open bite) were seen in thalassemic patients. Thirty-one patients (90%) in the 13-20-year-old age group had malocclusion, which was prominent in 25 patients. The prevalence of malocclusion was seven (63%) and one (20%) in the six-12- and the 0-5-years-old groups, respectively. Individuals with malocclusion were excluded from the control group in advance.

Discussion

We found that in thalassemic patients, oral hygiene condition evaluated by plaque index was not good, although its status was similar to that of the control group. Prevalence of gingivitis in this group of patients (21% moderate to severe) was not also significantly different from that in the control group. Shallow periodontal probing depth in thalassemic patients indicated that destructive periodontal disease does not exist in our patients. DMFT index was generally high in our patients, especially in the two older age groups of patients who had significantly more frequent dental caries. Malocclusion was generally seen in the patients, especially in the older individuals. High rates of malocclusion were reported in thalassemic subjects,[8,9] but by early hypertransfusion treatment policy, it has been controlled in younger patients. In recent studies, Al-Wahadni showed a higher rate of dental caries in thalassemic patients[3] and De Mattia found a mean DMFT index of 5.12 ± 4.76 in thalassemic patients, which was correlated with age and splenectomy.[8] These results are compatible with our results. Leonardi et al. also found caries in 90% of thalassemic males and 60% of thalassemic females.[10] However, in a Scutellari et al. study, the rate of dental caries was not higher in thalassemic patients compared with controls.[4] We know that chronic anemia and extramedullary hematopoiesis in major beta thalassemia result in overgrowth of maxilla and failure of pneumatization of maxillary sinuses. These changes lead to maxillary overbite, prominence of upper incisors, and separation of the orbits; changes that contribute to the classic thalassemic face.[2] Some endocrine disorders such as diabetes mellitus and hypocalcaemia, which are due to hemochromatosis, develop in thalassemic patients mostly in the second decade of their lives. These disorders can also affect on orodental status. Although malocclusion and some endocrine disorders existed in our patients, the paucity of severe periodontal diseases in patients versus a control group may be related to the younger age of our patients, especially in the 2-5-years-old group of patients. The number of patients who had endocrinopathy was limited in our study. However, the DMFT index in a patient who was both diabetic and hypocalcemic was 29 (this could be related to his endocrinopathies). DMFT indices were significantly higher in thalassemia group, especially in older patients. This could be due to poor oral hygiene, poor motivation, malocclusion, endocrine problems such as diabetes mellitus and hypocalcaemia and finally, subclinical immune deficiency, which has been claimed in iron overload status and splenectomized patients. A low IgA level in saliva has also been shown in thalassemic subjects, which may contribute to an increased rate of caries.[5]

In summary, prevention of dental caries is essential in major beta thalassemic patients because different probable causes increase the risk of dental diseases in this group of patients. Periodontal disease was not significantly more common in our patients, but it should be evaluated in a larger population of older patients, especially those who suffer from endocrinopathies.

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