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PERIODONTAL CLINICAL CHARACTERISTICS IN PATIENTS WITH IRON DEFICIENCY ANEMIA

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Abstract:

The main aim of this study was to evaluate the periodontal clinical characteristics in patients with iron deficiency anemia.

In a cross-sectional study, 280 consecutive patients suffered iron deficiency anemia and referred to Sina hospital in Hamadan, Iran between April and October 2012 were included into the study. Iron-deficiency anemia was defined as a hemoglobin concentration ≤ 12.5 g per deciliter for men (normal range, 13.5 to 17.5 [8.4 to 10.9]) and ≤ 10.6 g per deciliter for women (normal range, 11.6 to 15.8 [7.2 to 9.8]), accompanied by at least one of the following laboratory values consistent with iron deficiency: a serum iron concentration ≤ 45 µg per deciliter (normal range, 50 to 150 [9.0 to 27.0]) with a transferrin saturation no higher than 10 percent (normal range, 16 to 60 percent), a serum ferritin concentration ≤ 20 µg per liter for men (normal range, 20 to 450) and ≤ 10 µg per liter for women (normal range, 10 to 250), or the absence of iron stores in bone marrow-biopsy specimens [10]. None of the participants were smoker.

Several clinical and experimental studies have documented the mechanisms which predisposing oral alterations in patients with iron deficiency anemia [13]. Most of these mechanisms involve cell-mediated immune effectors pathways and cytokines. In fact, various cytokines, acute-phase proteins and radicals with regulatory effects on iron-homeostasis may be altered following periodontal inflammatory or infectious states resulting in anemia Several clinical and experimental studies have documented the mechanisms which predisposing oral alterations in patients with iron deficiency anemia. On the other hand, the release of these cytokines by periodontal tissues in response to bacterial infection can be the main fundament of periodontal disease-induced anemia.

Key words: *Gingiva, mouth mirrors, plaque control record (PCR) and buccal.*

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INTRODUCTION:

Periodontal diseases as multifactorial phenomena are potentially affected by a wide variety of factors including baseline characteristics, social and behavioral indicators, and even genetic predisposing factors [1]. These disease are also associated with several systemic disorders and thus systemic medical evaluation of the patients with periodontal disease is usually advisable. This approach not only makes access to dental health, but also prevents further dental losses [2,3]. Various former and recent studies evidenced relationship between iron deficiency anemia and periodontal disease [4,5]. In susceptible patients, it has been demonstrated that subgingival microbial colonization can induce infectious condition of the supporting tissues of the teeth that result in immune inflammatory response to bacteria and their products [6]. Therefore, the inflammatory biomarkers as cytokines are produced and secreted during periodontal inflammation that may depress erythropoietin production leading to the development of anemia. On the other hand, a lower number of erythrocytes and hemoglobin levels in those with periodontal disease are predictable compared to healthy controls [7]. Meanwhile, it is now hypothesized that the periodontal therapies may effectively improve the anemic status of these patients [8,9]. However, a few studies assessed clinical and periodontal evidences in anemic patients. The present study evaluated periodontal clinical characteristics in patients with iron deficiency anemia to more reveal the periodontal changes leading to the development and worsening anemia.

METHODS:

In a cross-sectional study, 280 consecutive patients suffered iron deficiency anemia and referred to Sina hospital in Hamadan, Iran between April and October 2012 were included into the study. Iron-deficiency anemia was defined as a hemoglobin concentration ≤ 12.5 g per deciliter for men (normal range, 13.5 to 17.5 [8.4 to 10.9]) and ≤ 10.6 g per deciliter for women (normal range, 11.6 to 15.8 [7.2 to 9.8]), accompanied by at least one of the following laboratory values consistent with iron deficiency: a serum iron concentration ≤ 45 μg per deciliter (normal range, 50 to 150 [9.0 to 27.0]) with a transferrin saturation no higher than 10 percent (normal range, 16 to 60 percent), a serum ferritin concentration ≤ 20 μg per liter for men (normal range, 20 to 450) and ≤ 10 μg per liter for women (normal range, 10 to 250), or the absence of iron stores in bone marrow-biopsy specimens [10]. None of the participants were smoker. Those with any systemic disorders that might affect the periodontal tissues were excluded. The study was reviewed and approved by the ethical committee of the faculty of dentistry, Hamadan University of Medical Sciences. Patients were advised of their role and asked to provide written informed consent. Baseline information including demographics, medical history, and duration of anemia was collected by interviewing and recorded in study questionnaire. Fool mouth examinations were conducted for all patients. The main study periodontal parameters included: plaque control record, bleeding on probing, probing depths, clinical attachment level, gingival color, gingival consistency, gingival contour, gingival size, as well as gingival texture. Gingival state was examined using an especial Williams periodontal probe disposable mouth mirrors and all gingival sites were evaluated. For assessment of plaque control record (PCR), following consumption of disclosing tablet and appearance of plaques, four dental surfaces of buccal, lingual, mesial, and distal were evaluated and PCR was calculated by the following formula:

PCR = [number of colored surfaces / (number of all teeth × 4)] ×100%

Probing technique was also applied to assess correct depth of pocket. Using the William periodontal probe and mouth mirrors, the medial, mesial, and distal sites of the buccal and lingual surfaces were examined and depth of dental plaque was recorded. Gingival bleeding was also assessed using the gingival bleeding index (GBI) using the following formula:

GBI = [number of bleeding sites/ (number of all teeth × 4)] ×100%

Moreover, for assessing clinical attachment level, the selected reference was CEJ that the distance between pocket depth and CEJ was determined in six medial, mesial, and distal sites of buccal and lingual surfaces using the William periodontal probe. As noted, all measurement was performed using the same William probe graded from 1 to 10 mm.

RESULTS:

With regard to demographics characteristics, the average age of the participants was 30.4 ± 15.4 years that most of them (77.1% were female). More than half of the patients experienced iron deficiency anemia more than one year, while only 34.2% of subjects suffered from anemia less than one year (Table 1). The majority of patients had oral habits such as lip biting, cheek biting, and finger nail biting. Method of brushing in 92% of the participants was reported as rolling and only 4% of them regularly used the bass method.

As shown in Table 2 and with respect to gingival color, the most frequent detected color in the studied sites including right posterior, left posterior, and

anterior sites was red (ranged between 57.1% and 66.4%), followed by pale pink color that was detected in 32.8% to 42.9% of the cases. Regarding gingival consistency, the most common form of consistency in left and right posterior regions was spongy form and in anterior region was firm form. In this regard, fibrotic form was rarely observed. Scalloped contour was commonly seen in anterior region, while non-scalloped contour was more detected in posterior regions. In addition, stippled texture was reported in 61.0% in anterior region, whereas only 26.9% in right posterior and 27.3% in left posterior regions. Normal gingival size was detected in 66.3% in anterior region, while about two-third of left and right posterior regions had recessed gingival and gingival enlargement was not found in any of the studied gingival regions. Also, with regard to atrophy of gingival papillae, this phenomenon was found 8.2% in anterior region and 56.3% in posterior regions.

Regarding common tongue clinical features, the most prevalent feature was burning tongue (30.0%), followed by lip fissure without burning (Figure 1). The mean plaque control record in anemic subjects was 62.5 ± 19.1 (ranged 41 to 179) and the mean bleeding probe index was 50.8 ± 11.6 (ranged 26 to 100).

In maxilla, the average ranges of CAL index in superior buccal was between 0.36 mm and 2.87 mm, and in superior palatal was between 0.33 mm and 2.72 mm (Table 3). Also, the mean maxillary PD index in superior buccal and superior palatal was ranged 0.38 to 2.68 mm and 0.38 to 2.44 mm, respectively. The same examination in mandible showed that the mean mandibular CAL index ranged 0.99 to 2.88 for superior buccal and 0.97 to 2.87 for superior palatal site. Also, mandibular BD index ranged between 1.47 and 2.73 mm for superior buccal and between 0.87 and 2.68 mm for superior palatal region.

Table 1: Baseline characteristics of study population (N = 280)

Gender	
Men	65 (22.9)
Women	214 (77.1)
Age	30.4 /15.47
Oral habits	214 (76.5)
Method of brushing	
Rolling method	258 (92.1)
Bass method	11 (3.8)
Other methods	11 (3.8)
Duration of anemia	
Less than 1 year	96 (34.2)
1 to 3 years	152 (54.4)
3 to 5 years	29 (10.3)
More than 5 years	3 (1.1)

Table 2: Baseline gingival pattern of study population (N = 280)

Gingival pattern	Right posterior (up and down)	Anterior (up and down)	Left posterior (up and down)
Gingival color			
Pale pink	88 (32.8)	115 (42.9)	88 (32.8)
Dark pink	2 (0.8)	0 (0.0)	2 (0.8)
Red	178 (66.4)	153 (57.1)	178 (66.4)
Bluish	0 (0.0)	0 (0.0)	0 (0.0)
Gingival consistency			
Firm	120 (44.9)	196 (73.4)	122 (45.7)
Spongy	146 (54.7)	71 (26.6)	145 (54.3)
Fibrotic	1 (0.4)	0 (0.0)	0 (0.0)
Gingival contour			
Scalloped	81 (30.3)	197 (73.8)	83 (31.1)
Non-scalloped	183 (68.5)	70 (26.2)	181 (67.7)
Knife edge	0 (0.0)	0 (0.0)	0 (0.0)
Round edge	3 (1.2)	0 (0.0)	3 (1.2)
Gingival texture			
Stippled	72 (26.9)	163 (61.0)	73 (27.3)
Non-stippled	195 (73.1)	104 (39.0)	194 (72.7)
Gingival size			
Normal	93 (34.9)	177 (66.3)	96 (36.0)
Recessed	174 (65.1)	90 (33.7)	171 (64.0)
Enlarged	0 (0.0)	0 (0.0)	0 (0.0)
Atrophy of gingival papillae	143 (56.3)	21 (8.2)	143 (56.3)

Table 3: CAL and PD indices in study population (N = 280)

Number of tooth	CAL (superior buccal) Mean/SD	PD (superior buccal) Mean/SD	CAL (superior palatal) Mean/SD	PD (superior palatal) Mean/SD
Maxilla				
28	0.36/1.80	0.38/0.89	0.33/1.05	0.38/0.92
27	2.43/1.81	1.88/1.49	2.35/1.85	1.88/1.49
26	2.63/1.06	1.87/1.46	2.03/1.75	1.78/1.48
25	2.78/0.94	2.61/0.73	2.67/0.85	2.36/0.67
24	2.74/1.02	2.58/0.73	2.57/0.86	2.30/0.73
23	2.44/0.97	2.53/0.54	2.72/0.79	2.38/0.56
22	2.63/1.07	2.47/0.89	2.45/0.99	2.30/0.84
21	2.75/1.17	2.56/1.01	2.44/1.09	2.33/0.99
11	2.87/1.05	2.68/0.87	2.56/1.01	2.44/0.89
12	2.62/1.06	2.50/0.84	2.45/1.00	2.23/0.85
13	2.55/0.99	2.46/0.55	2.69/0.79	2.34/0.55
14	2.68/1.06	2.45/0.78	2.53/0.97	2.33/0.77
15	2.80/0.96	2.59/0.69	2.70/0.88	2.39/0.67
16	1.95/1.73	1.73/1.52	1.89/1.74	1.64/1.49
17	2.70/1.78	2.11/1.45	2.53/1.77	1.99/1.40
18	0.38/1.14	0.33/0.96	0.38/1.10	0.26/0.85
Mandible				
38	0.99/1.67	1.47/0.78	0.97/1.68	0.87/1.49
37	2.43/1.82	2.02/1.55	2.42/1.77	2.02/1.56
36	1.13/1.57	1.08/1.47	1.12/1.53	1.11/1.50
35	2.87/0.92	2.68/0.63	2.79/0.98	2.66/0.72
34	2.57/1.11	2.44/0.93	2.54/1.13	2.44/0.96
33	2.41/1.01	2.59/0.55	2.87/0.82	2.68/0.59
32	2.87/0.92	2.70/0.63	2.81/0.87	2.62/0.67
31	2.88/1.00	2.72/0.74	2.80/0.97	2.55/0.79
41	2.86/0.97	2.73/0.73	2.84/0.96	2.60/0.71
42	2.88/0.89	2.70/0.65	2.84/0.88	2.64/0.68
43	2.44/1.09	2.54/0.55	2.90/0.81	2.68/0.59
44	2.73/1.12	2.48/0.85	2.68/1.00	2.53/0.87
45	2.87/1.01	2.59/0.77	2.81/0.98	2.61/0.83
46	1.55/1.78	1.38/1.54	1.55/1.67	1.43/1.59
47	2.48/1.81	2.08/1.51	2.50/2.43	2.10/1.57
48	0.91/1.66	0.74/0.36	0.87/1.60	0.79/1.43

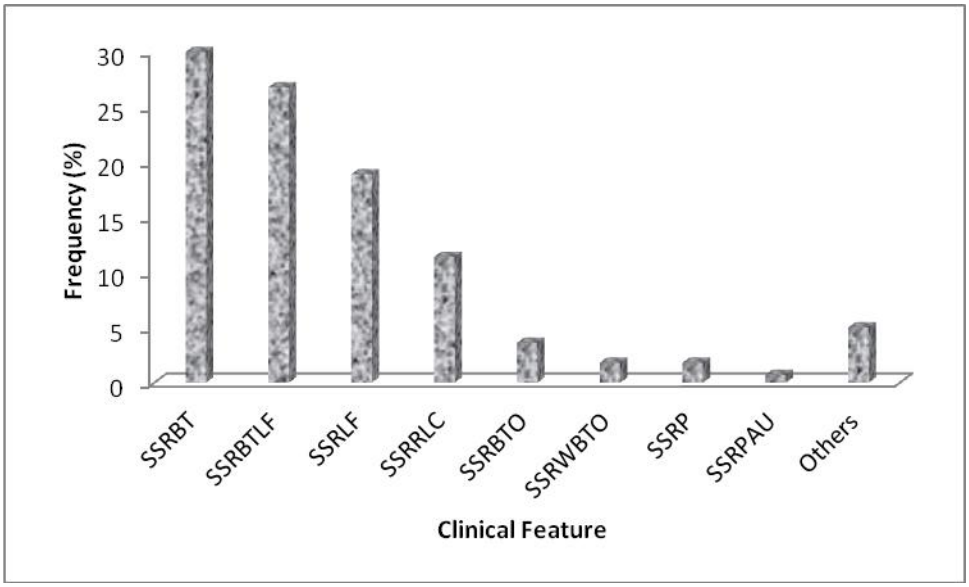

Figure 1: Patterns of Tongue in anemic patients with periodontal disorders (SSRBT: Smooth, shiny, and red with burning tongue; SSRBTLF: Smooth, shiny, and red without burning tongue and lip fissure; SSRLF: Smooth, shiny, and red with lip fissure; SSRRLC: Smooth, shiny, and red with red lip corner; SSRBTO: Smooth, shiny, and red with burning tongue and Odynophagia; SSRWBTO: Smooth, shiny, and red without burning tongue and Odynophagia; SSRP: Smooth, shiny, and red with papillae; SSRPAU: Smooth, shiny, and red with papillae with aphthous ulcers)

DISCUSSION:

New studies have suggested that periodontal disease lead to reduction in red blood cells production and serum hemoglobin levels leading to iron deficiency anemia. Some studies showed that more than a third of people suffering from severe periodontitis had hemoglobin levels below normal concentrations that women are at more increased risk of anemia [6]. Thomas et al. found that periodontitis patients have lower hematocrit, lower numbers of erythrocytes, lower hemoglobin levels and higher erythrocyte sedimentation rates when compared to healthy controls [11]. Rai and Kharb revealed increased in hemoglobin and RBC levels in patients with severe periodontitis after scaling and root planning [12]. Also, Agarwal et al. demonstrated a significant improvement in hemoglobin value and erythrocyte count after periodontal treatment [8]. Interestingly, the manifestation of iron deficiency anemia can primarily recognized by dental examination before its more clinical pronounced systemic manifestations and this issue is very important in terms of clinical evaluation of anemia.

Several clinical and experimental studies have documented the mechanisms which predisposing oral alterations in patients with iron deficiency anemia [13]. Most of these mechanisms involve cell-mediated immune effectors pathways and cytokines. In fact, various cytokines, acute-phase proteins and radicals with regulatory effects on iron-homeostasis may be altered following periodontal inflammatory or infectious states resulting in anemia [14]. On the other hand, the release of these cytokines by periodontal tissues in response to bacterial infection can be the main fundament of periodontal disease-induced anemia.

For assessing periodontal characteristics of anemic patients, the current study was conducted that revealed some important gingival changes in these patients population. First, we observed more incidence of anemia in affected women than men that was also previously documented [6]. The mean age of affected patients was 30 years as well as mean duration of anemia was less than 3 years explaining the early occurrence of anemia following periodontal disorders. Regarding tongue features, burning sensation in the tongue and lip fissure were the most prevalent symptoms in anemic patients with periodontal disorders. These manifestations have been commonly showed in iron deficiency anemic patients [15,16]. We also found that the method of brushing in most of the patients was rolling. It seems that improper brushing pattern result in inappropriate changes in the gums and teeth grinding that

predispose to oral and dental inflammation and infection. With respect to gingival characteristics, prominent gingival color was red pink, prominent consistency was spongy, prominent gingival contour was non-scalloped, prominent texture was non-stippling, and prominent gingival size was recessed. These findings can certainly help clinicians to early predict dental and gingival evidences of iron deficiency anemia in those with periodontal disorders. Meanwhile, according to the measurement of GBI and CPR indices, most of the patients suffered from bleeding within probing that might be an introduction for more progression and severity of anemia in these patients.

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