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ORIGINAL RESEARCH

Assessment of correlation of serum ferritin levels and oral mucosal lesions among patients with microcytic anemia

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Abstract
Background: Anemia is characterized by a decrease in the percentage of red blood cells within the bloodstream. Hence; the present study was undertaken for assessing the correlation of serum ferritin levels with occurrence of oral mucosal lesions among patients with microcytic anemia.
Materials & methods: The current research was undertaken for evaluating the correlation of serum ferritin levels with occurrence of oral mucosal lesions among patients with microcytic anemia. The study involved 333 patients diagnosed with orofacial diseases.Each participant was thoroughly informed about the study, and written consent was secured from all. Venous blood samples were collected via venipuncture, which were subsequently analyzed for hemoglobin levels, complete blood count, and red blood cell indices. Patients identified with low hemoglobin levels indicative of anemia underwent further testing for serum ferritin to confirm iron deficiency.
Results: According to WHO criteria the maximum number of patients belonged to the moderate group where hemoglobin was 7.0-9.9 g/dl i.e. 183 (54.96%) cases followed by the severe group where hemoglobin <7 g/dl were 110 (33.03%) cases, and then the mild group with hemoglobin 10-11.9 g/dl comprised of 40 (12.01%) cases respectively. Ferritin levels in the study were >15 ng/dl in 207 (62.16%) cases and <15 ng/dl in 126 (37.84%) cases. Significant correlation was seen while correlating serum ferritin levels with occurrence of oral mucosal lesions.
Conclusion: Sustaining an optimal balance of iron, in conjunction with other essential minerals, is crucial for the proper functioning of the body, including oral health.
Key words: Ferritin, Oral mucosal lesions, Anemia.

Introduction

Anemia is characterized by a decrease in the percentage of red blood cells within the bloodstream. It is important to note that anemia itself is not a standalone diagnosis; rather, it serves as an indicator of an underlying health issue. The manifestation of symptoms in a patient is influenced by the specific cause of the anemia, the rapidity of its onset, and the existence of additional health conditions, particularly cardiovascular diseases. Typically, patients begin to exhibit symptoms associated with anemia when their hemoglobin levels fall

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below 7.0 g/dL.[1, 2] Erythropoietin (EPO), produced in the kidneys, plays a crucial role in stimulating the production of red blood cells (RBCs). The primary trigger for EPO production is tissue hypoxia, and there is generally an inverse relationship between EPO levels and hemoglobin concentration. Consequently, an anemic individual with low hemoglobin levels will typically present with elevated EPO levels. However, in patients with renal failure, EPO levels are often lower than anticipated. In cases of anemia of chronic disease (AOCD), EPO levels may be elevated, but they do not reach the expected levels, indicating a relative deficiency of this hormone.[3, 4]

Conditions such as white glossy tongue, pale patchy buccal mucosa, cracking at the angle of the mouth, dysphagia etc. were observed in middle-aged anemic women in some of the studies carried out in the early part of this century.' Although the early authors believed that these lesions were a direct result of anemia, it was subsequently thought that these lesions are due to a lack of iron-containing compounds in tissues rather than tissue hypoxia.[5- 7] Hence; the present study was undertaken for assessing the correlation of serum ferritin levels with occurrence of oral mucosal lesions among patients with microcytic anemia.

Materials & methods

The current research was undertaken for evaluating the correlation of serum ferritin levels with occurrence of oral mucosal lesions among patients with microcytic anemia.This research employed a cross-sectional and analytical design. Following the approval from the Institutional Ethics Committee, the study was carried out in the Department of Medicine at Shyam Shah Medical College, along with the associated Sanjay Gandhi and Gandhi Memorial Hospital in Rewa, Madhya Pradesh, from September 2022 to August 2023, involving 333 patients diagnosed with orofacial diseases.Each participant was thoroughly informed about the study, and written consent was secured from all. Venous blood samples were collected via venipuncture, which were subsequently analyzed for hemoglobin levels, complete blood count, and red blood cell indices. Patients identified with low hemoglobin levels indicative of anemia underwent further testing for serum ferritin to confirm iron deficiency. Statistical analysis was performed on all collected data, with appropriate statistical tests applied following data compilation and tabulation. A p-value of less than 0.05 was deemed statistically significant.

Results

According to WHO criteria the maximum number of patients belonged to the moderate group where hemoglobin was 7.0-9.9 g/dl i.e. 183 (54.96%) cases followed by the severe group where hemoglobin <7 g/dl were 110 (33.03%) cases, and then the mild group with hemoglobin 10-11.9 g/dl compressed of 40 (12.01%) cases respectively. Ferritin levels in the study were >15 ng/dl in 207 (62.16%) cases and <15 ng/dl in 126 (37.84%) cases. Significant correlation was seen while correlating serum ferritin levels with occurrence of oral mucosal lesions.

Table 1: Distribution of patients according to WHO criteria for Hemoglobin

SN	Hb g/dl WHO Criteria	Total	
		Number	Percentage
1	Mild 10-11.9 g/dl	40	12.01
2	Moderate 7.0-9.9 g/dl	183	54.96
3	Severe <7 g/dl	110	33.03
Total		333	100.0

Unpaired t test =92.12 p Value <0.0001

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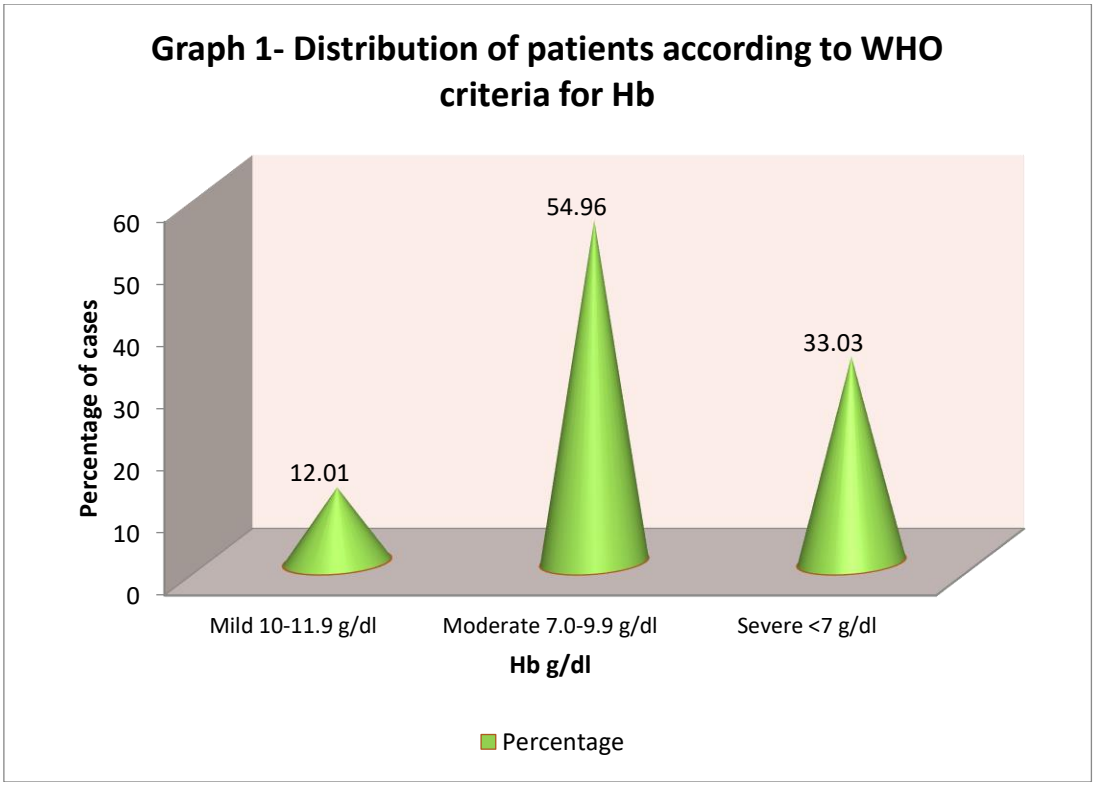

Table 2: Distribution of cases according to ferritin levels

SN	Ferritin Level	Total	
		Number	Percentage
1	<15 ng/dl	126	37.84
2	>15 ng/dl	207	62.16
Total		333	100.0

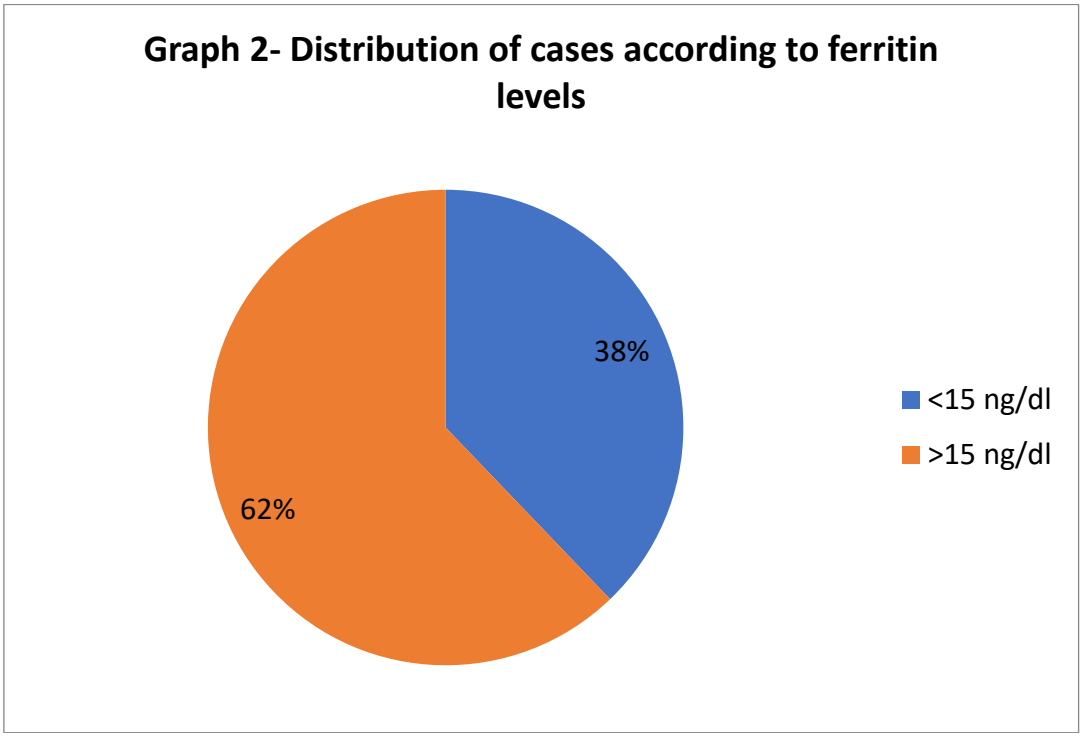

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Table 3- Overall comparison of Ferritin level v/s Oral cavity examination

Oral cavity examination	S Ferritin Level <15 ng/dl		S Ferritin Level >15 ng/dl		t test	P value
	Mean	SD	Mean	SD		
Conjunctival Pallor	11.24	2.88	22.33	4.92	23.00	<0.0001
Mucosal Pallor	11.06	2.99	22.34	4.91	23.28	<0.0001
Erythematous Mucositis	12.4	1.92	22.0	6.0	17.41	<0.0001
Atrophic Glossitis	11.46	2.82	21.39	4.77	21.21	<0.0001
Geographic tongue	11.35	2.75	21.89	4.65	23.09	<0.0001
Fissured tongue	10.72	3.14	22.69	5.14	23.59	<0.0001
Oral Ulcers	11.53	3.34	22.89	5.39	21.29	<0.0001
Angular Chelitis	10.72	3.05	21.97	5.17	22.18	<0.0001
Candidal Infections	12.34	1.58	24.76	4.76	28.33	<0.0001
Oral Pigmentations	10.67	2.49	19.0	3.07	25.73	<0.0001
Periodontitis	11.0	1.80	24.2	1.25	78.23	<0.0001

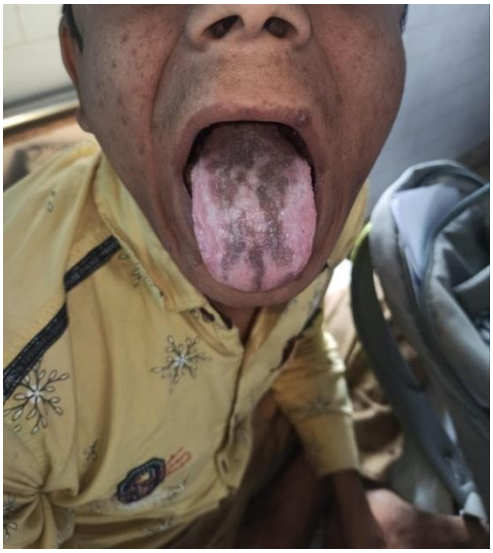

Fig 1: Oral Pigmentation

Fig 2: Geographic tongue

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Discussion

Iron deficiency anemia is the most common hematological disorder. It may manifest in the orofacial region as atrophic glossitis, mucosal pallor and angular cheilitis. Atrophic glossitis "flattening of the tongue papillae" resulting in a smooth and erythematous tongue may mimic migratory glossitis. Migratory glossitis, also known as geographic tongue, is a condition of unknown etiology that affects 12% of the population. It results in lesions on the tongue that are erythematous, non-indurated, atrophic and bordered by a slightly elevated, distinct rim that varies in color from gray to white. In atrophic glossitis, these areas do not have a white keratotic border and they increase in size rather than changing in position. In more severe cases, the tongue may be tender. Angular stomatitis (painful fissures at the corners of the mouth) and cheilosis (dry scaling of the lips and corners of the mouth) are also common findings associated with iron deficiency anemia. [5- 7]Angular cheilitis, however, is often associated with fungal infections (Candida albicans), lip-sucking and dehydration. Treatment must focus on correcting the deficiency state and providing adequate energy, protein, fluids and nutrients to promote healing. When angular cheilitis is due to opportunistic infections brought on by decreased resistance secondary to nutrient deficiencies, treatment should focus on antifungal therapy, correction of the nutrient deficiency and diet modification to make eating a comfortable experience.[7- 10]

According to WHO criteria the maximum number of patients belonged to the moderate group where hemoglobin was 7.0-9.9 g/dl i.e. 183 (54.96%) cases followed by the severe group where hemoglobin <7 g/dl were 110 (33.03%) cases, and then the mild group with hemoglobin 10-11.9 g/dl compressed of 40 (12.01%) cases respectively. Ferritin levels in the study were >15 ng/dl in 207 (62.16%) cases and <15 ng/dl in 126 (37.84%) cases. Significant correlation was seen while correlating serum ferritin levels with occurrence of oral mucosal lesions. Wu YHet al assessed the anemia statuses and hematinic deficiencies in 240 oral mucosal disease patients with microcytosis.The mean red blood cell (RBC) count, mean corpuscular volume, and RBC distribution width, as well as blood concentrations of hemoglobin (Hb), iron, vitamin B12, folic acid, and homocysteine in 240 microcytosis patients and in 240 age- and sex-matched healthy control individuals were measured and compared.Microcytosis patients had significantly lower mean Hb, iron, and folic acid levels as well as significantly higher mean RBC count and RBC distribution width than healthy control individuals. Microcytosis patients also had significantly greater frequencies of Hb, iron, vitamin B12, and folic acid deficiencies as well as of RBC number > 5 × 1012/L, and abnormally high homocysteine levels than healthy control individuals. Moreover, 162 (67.5%) of the 240 microcytosis patients had anemia. Of 162 anemic microcytosis patients, 87 (53.7%) had iron deficiency anemia, 61 (37.7%) had thalassemia trait (TT)-induced anemia, and 14 (8.6%) had other microcytic anemia. They concluded that approximately 45%, 4%, and 5% of microcytosis patients have iron, vitamin B12, and folic acid deficiencies, respectively, and approximately 10% of microcytosis patients have abnormally high homocysteine levels. Moreover, 67.5% of 240 microcytosis patients and 50.8% of 120 TT patients had anemia. Iron deficiency anemia is the most common type of anemia in microcytosis patients, followed by TT-induced anemia and other microcytic anemia.[11]K S, B S, Palaneeswari M S et al studied the meaningful association between recurrent oral ulcer and ferritin.Fifty oral ulcer cases which were diagnosed clinically in the ENT Department of Sree Balaji Medical College and Hospital and Twenty Five controls were included in this study. Serum ferritin was estimated by doing a particle enhanced turbidimetric immunoassay for both cases and controls.66% of cases had decreased ferritin values and 34% had normal values, which was significant. It can be concluded that it is mandatory to screen oral ulcer patients for iron deficiency anaemia by estimating serum ferritin and it is also advisable for

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the patients to have iron supplementation on regular basis, along with diet rich in iron in addition to vitamins.[12]

Conclusion

The correlation between serum ferritin levels in iron deficiency anemia and oral manifestations highlights the critical role of iron in maintaining oral health. These manifestations serve as significant clinical indicators, aiding in the early detection and diagnosis of iron deficiency anemia. Therefore, regular assessment of serum ferritin levels and timely intervention can not only improve systemic iron status but also alleviate oral symptoms, enhancing overall quality of life. This emphasizes the need for multidisciplinary collaboration between healthcare professionals for comprehensive patient care.

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