

Article

## Improving the Treatment and Prevention of Dental Diseases in Iron Deficiency Anemia in Military Personnel

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**Abstract:** Inflammatory periodontal diseases in patients with iron deficiency anemia (IDA) are characterized by increased severity and reduced responsiveness to standard dental treatment. This study aimed to evaluate the effectiveness of conventional periodontal therapy in military personnel with normal hemoglobin levels and those with IDA and to determine the benefits of complex therapy including hematological management. A total of 108 patients were examined and divided into four groups according to the type of periodontal disease and hemoglobin status. Clinical assessments included oral hygiene, bleeding index (Muhlemann), papillary-marginal-alveolar (PMA) index, and periodontal pocket depth. Results showed that patients with IDA exhibited persistent inflammation, higher PMA and bleeding indices, and slower recovery despite professional hygiene and local anti-inflammatory therapy. After four months of combined periodontal and hematological treatment, 88–91% of patients with IDA achieved stable remission, demonstrating significant improvement in periodontal indices and reduction of inflammatory signs. These findings indicate that management of underlying iron deficiency is essential for achieving effective treatment outcomes in patients with periodontal disease, highlighting the importance of integrated multidisciplinary care.

**Keywords:** Gingivitis, periodontitis, iron deficiency anemia, periodontal indices

### 1. Introduction

Inflammatory periodontal diseases create the preconditions for the development of foci of chronic infection in the oral cavity, tooth loss, the development of acute and chronic diseases of other organs and systems of the body and, as a result, a decrease in the quality of life and psychological state of patients. At the same time, only 25% of those in need are treated annually.

A major role in the development of periodontal diseases belongs to general somatic pathology and functional disorders that reduce the body's resistance. Such factors include endocrine diseases, rheumatism, hypovitaminosis, gastrointestinal diseases, and immunodeficiency states [1-2]. Studies conducted in our country and abroad have shown a close relationship between dental pathology and blood diseases, in particular iron deficiency anemia (IDA). It has been established that patients with IDA experience changes in the humoral and cellular links of immunity. In iron deficiency conditions, the body's resistance to infectious and inflammatory diseases decreases [3]. A number of studies have shown that the development and progression of inflammatory and destructive processes in the periodontium are caused by impaired functional activity of neutrophils [4].

It can be assumed that the disruption of the protective function of neutrophilic leukocytes is associated with iron deficiency in the body, since the antibacterial systems of neutrophils contained in the cytoplasmic granularity contain iron-containing enzymes. Treatment of periodontal diseases involves specialists of various profiles, is labor-intensive and expensive, and when periodontal pathology is combined with iron

Citation: Xojiboyev, A. A. Improving the Treatment and Prevention of Dental Diseases in Iron Deficiency Anemia in Military Personnel. International Journal of Health Systems and Medical Sciences 2025, 4(3), 154-158.

Received: 08<sup>th</sup> June 2025  
Revised: 15<sup>th</sup> July 2025  
Accepted: 28<sup>th</sup> August 2025  
Published: 06<sup>th</sup> September 2025



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deficiency conditions, it is unsuccessful in most cases. All this determines the need to develop clear criteria for the effectiveness of periodontal treatment in individuals with concomitant pathology.

The aim of the study is to compare the effectiveness of standard methods of treating inflammatory periodontal diseases in patients with normal blood hemoglobin levels and in patients with iron deficiency anemia.

Materials and methods of the study A total of 108 patients with chronic inflammatory periodontal diseases were examined. All patients were divided into 4 main groups: Group 1 – 39 patients with chronic generalized catarrhal gingivitis and normal blood hemoglobin levels; Group 2 – 34 patients with chronic generalized catarrhal gingivitis and iron deficiency anemia; Group 3 – 19 patients with mild to moderate chronic generalized periodontitis and normal blood hemoglobin levels; Group 4 – 16 patients with mild to moderate chronic generalized periodontitis and iron deficiency anemia[5].

## 2. Materials and Methods

This study involved a total of 108 military personnel diagnosed with chronic inflammatory periodontal diseases. Patients were stratified into four groups based on the type of periodontal pathology and hemoglobin levels: Group 1 – 39 patients with chronic generalized catarrhal gingivitis and normal hemoglobin; Group 2 – 34 patients with chronic generalized catarrhal gingivitis and iron deficiency anemia (IDA); Group 3 – 19 patients with mild to moderate chronic generalized periodontitis and normal hemoglobin; Group 4 – 16 patients with mild to moderate chronic generalized periodontitis and IDA[6].

Diagnosis of iron deficiency anemia was confirmed through hematological testing, including serum iron, ferritin, and transferrin saturation levels. Periodontal assessment included clinical examination, evaluation of oral hygiene using the Green-Vermilion index, bleeding on probing assessed by the Muhlemann index, and inflammation quantified with the papillary-marginal-alveolar (PMA) index. Additional imaging methods, including targeted dental radiography, panoramic radiography, and computed tomography, were employed to assess the periodontal bone structure and detect underlying pathology[7].

All patients underwent a structured periodontal treatment program, including mechanical removal of dental plaque using ultrasonic scaling and Air-Flow devices, polishing, restoration of carious cavities, and replacement of non-functional orthopedic structures. Local anti-inflammatory therapy, professional oral hygiene sessions, oral hygiene education, and individualized recommendations for oral care and nutrition were provided. Multivitamin complexes were prescribed to support systemic health.

Clinical outcomes were monitored at 2-month and 4-month intervals, focusing on gingival inflammation, bleeding indices, periodontal pocket depth, tooth mobility, and oral hygiene levels. Patients with IDA received additional hematological therapy under the supervision of a hematologist. Data were analyzed comparatively to determine the efficacy of standard periodontal treatments in patients with normal hemoglobin versus those with iron deficiency anemia[8].

## 3. Results and Discussion

The diagnosis of IDA was confirmed by hematological tests, as well as determination of the level of serum iron, ferritin, and transferrin saturation with iron. Results of the study and their discussion Before treatment, patients in groups 1 and 2 complained of bleeding gums when eating and brushing teeth, gum pain, and bad breath. Patients in groups 3 and 4 reported bleeding gums when eating and brushing teeth, changes in gum color and shape, bad breath, gum pain when eating and brushing teeth, mobility and changes in tooth position. In addition, patients in groups 2 and 4 complained of a feeling of dryness of the oral mucosa, paresthesia, taste perversion, dizziness, and weakness[9].

During the examination of the oral cavity, the hygiene level was assessed first. For this purpose, the Green-Vermilion index was used, which had the following values before the treatment: Group 1 –  $2.04 \pm 0.03$  points; Group 2 –  $2.08 \pm 0.17$  points; Group 3 –  $3.58 \pm 0.07$  points; Group 4 –  $3.44 \pm 0.15$  points. All patients with chronic catarrhal gingivitis were

found to have a large amount of soft and pigmented plaque, supragingival tartar, and patients with chronic generalized periodontitis were characterized by a significant amount of soft plaque and tartar on all tooth surfaces. Also, patients in groups 3 and 4 were found to have periodontal pockets with a depth of 3 to 5.5 mm; with moderate periodontitis, there was 1–2 degree tooth mobility, tooth displacement in the dental row, bite deformations, and changes in gum configuration[10].

In patients of all groups, gingival bleeding upon probing was determined to varying degrees. For its objective assessment, the bleeding index (Muhlemann) was used, which in the 1st group was  $1.51 \pm 0.07$  rel. units; in the 2nd group -  $2.26 \pm 0.15$  rel. units; in the 3rd group -  $3.14 \pm 0.12$  rel. units; in the 4th group -  $3.72 \pm 0.21$  rel. units. The intensity and boundaries of the inflammatory process in the gingival area were assessed using the papillary-marginal-alveolar index (PMA). Before treatment, the PMA index in the first group was  $42.2 \pm 2.2\%$ ; in the second group -  $54.5 \pm 1.3\%$ ; in the third -  $62.2 \pm 0.7\%$ ; in the fourth -  $70.4 \pm 1.7\%$ . Additional examination methods included targeted dental radiography, panoramic radiography, and computed tomography. A comprehensive periodontal treatment program was developed for patients in all four groups[11-12]. At the first stage, it included manual removal of dental plaque, using an ultrasonic scaler and an Air-Flow device, followed by thorough polishing of teeth, filling of carious cavities, and restoration of contact points. In the presence of insolvent orthopedic structures, their replacement was recommended. Local anti-inflammatory therapy was administered.

Professional oral hygiene for patients in groups 1 and 2 was performed in 1–2 visits, and for patients in groups 3 and 4 – in 3 visits. During these visits, oral hygiene training was also provided, individual oral hygiene products, applications with Metrogyl Denta gel, and antiseptic rinses were recommended. Multivitamin complexes were prescribed for the treatment period, and general hygiene recommendations were given: giving up bad habits, rational nutrition.

Objectively, there was a decrease in edema and hyperemia of the gingival margin, the PMA index was  $20.4 \pm 3.6\%$ , the bleeding index was  $1.1 \pm 0.27$  relative units, and the hygiene index (OHI-S) was  $1.4 \pm 0.003$  points. After 2 months, remission was observed in 82% of patients in this group, the PMA index averaged  $4.27 \pm 1.2\%$ , the bleeding index decreased to  $0.32 \pm 0.1$  relative units, and a satisfactory hygiene level was noted (the OHI-S index was  $1.0 \pm 0.003$  points)[13].

A repeated course of periodontal treatment was required by 18% of patients, mainly those with poor oral hygiene and those who did not comply with all doctor's prescriptions. Patients of the 2nd group noted persistent bleeding and pain in the gums 2 weeks after the start of treatment, objectively pronounced edema and hyperemia of the gingival margin persisted, the PMA index decreased slightly - to  $45 \pm 0.6\%$ , the bleeding index was  $2.08 \pm 0.15$  relative units, the OHI-S hygiene index was  $1.6 \pm 0.01$  points. After 2 months of observation, the absence of remission was observed in 83% of patients in this group even with a satisfactory level of hygiene. In patients of the 3rd group, after 2 weeks, a decrease in gum bleeding was noted (Muhlemann index  $2.24 \pm 0.12$  relative units), an improvement in the level of hygiene (the OHI-S index was  $1.8 \pm 0.003$  points), the PMA index decreased to  $50 \pm 0.7\%$ , and the gingival papillae had a physiological configuration[14].

At the same time, periodontal pockets with a depth of 2 to 5.5 mm, tooth mobility of 1-2 degrees in patients with moderate periodontitis remained. In the 4th group, periodontal treatment showed a weak effect, even against the background of improved oral hygiene OHI-S =  $1.75 \pm 0.034$  points. The bleeding index remained high ( $3.47 \pm 0.11$  relative units), the PMA index was  $63 \pm 1.3\%$ . Patients of the 3rd and 4th groups continued treatment: repeated professional hygiene, anti-inflammatory therapy, curettage of periodontal pockets, if necessary - orthopedic treatment, splinting of loose teeth.

Upon examination 2 months after the start of treatment, 89.5% of patients in group 3 showed remission, pink gingival mucosa, physiologically configured periodontal papillae, decreased periodontal pocket depth, decreased tooth mobility, the OHI-S hygiene index was  $1.2 \pm 0.03$  points, the PMA index was  $18 \pm 0.4\%$ , and the bleeding index was  $0.82 \pm 0.2$  rel. units. 73% of patients in group 4 showed no lasting effect from the

treatment after 2 months of observation. The bleeding index decreased slightly to  $2.23 \pm 0.47$  rel. units, and the PMA index in this group was  $53 \pm 0.3\%$  (table). Patients in groups 2 and 4 with IDA were referred to hematologists for treatment of the underlying disease and also underwent a repeat course of periodontal treatment.

Upon examination 4 months after the start of iron therapy, 91% of patients in group 2 showed remission of periodontal pathology: no signs of gingival margin inflammation, PMA index was  $3.16 \pm 10.3\%$ , bleeding index was  $0.37 \pm 0.01$  rel. units. In group 4, after 4 months of IDA treatment, remission of chronic generalized periodontitis was in 88% of patients, there was a decrease or absence of periodontal pockets, a decrease in signs of gum inflammation, PMA index was  $14 \pm 0.3\%$ , bleeding index decreased to  $0.74 \pm 0.31$  rel. units[15]. Thus, these data indicate the ineffectiveness of standard treatment of inflammatory periodontal diseases in individuals with iron deficiency. Achieving a positive result and stable remission in such patients is possible only with complex therapy, including treatment of the underlying disease (IDA) by a hematologist and periodontal treatment. Outpatient observation of such patients should be carried out at least once every 3 months with monitoring of the main periodontal indices and mandatory maintenance therapy.

#### 4. Conclusion

This study highlights the critical influence of iron deficiency anemia (IDA) on inflammatory periodontal diseases in military personnel. Standard periodontal treatments were largely ineffective in patients with IDA, with persistent gingival inflammation, high bleeding indices, and slow tissue recovery observed. In contrast, combining hematological therapy with comprehensive periodontal care significantly improved outcomes, including reduced periodontal pocket depth, normalized gingival morphology, decreased bleeding, and enhanced oral hygiene.

These findings underscore the importance of a multidisciplinary approach, addressing both systemic and local factors, to achieve stable remission. Regular follow-ups, maintenance therapy, patient education on nutrition, oral hygiene, and adherence to treatment protocols are essential to prevent relapse and ensure long-term periodontal health.

In conclusion, effective management of periodontal diseases in patients with IDA requires simultaneous treatment of the underlying anemia and targeted periodontal therapy. Such integrated strategies improve clinical outcomes, enhance patients' quality of life, and provide a model for managing complex periodontal cases in populations with compromised systemic health

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