STUDY AND CORRECTION OF MICROELEMENT IMBALANCE IN PATIENTS WITH GIARDIASIS

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Abstract

Giardiasis is a widespread parasitic disease that often leads to chronic gastrointestinal disorders, malabsorption, and metabolic disturbances. One of the important but insufficiently studied consequences of giardiasis is the imbalance of essential microelements. The study included patients diagnosed with giardiasis based on parasitological and immunological tests. Serum levels of essential microelements were determined before and after treatment. Patients received standard antiparasitic therapy combined with microelement correction.

Keywords: *giardiasis, microelements, zinc, iron, selenium, correction therapy.*

Introduction

Giardiasis is a common protozoan parasitic infection caused by *Giardia lamblia* and remains a significant public health problem worldwide, particularly in developing and transitional countries. The disease affects both adults and children and is transmitted primarily through contaminated water, food, and direct person-to-person contact. Chronic giardiasis is frequently associated with persistent gastrointestinal symptoms, including diarrhea, abdominal pain, bloating, and malabsorption syndrome.

One of the most important pathogenic mechanisms of giardiasis is damage to the intestinal mucosa, leading to impaired absorption of nutrients, vitamins, and essential microelements. Microelements such as zinc, iron, copper, and selenium play a crucial role in enzymatic activity, immune system function, antioxidant defense, and maintenance of intestinal integrity. Deficiency of these elements can aggravate the clinical course of giardiasis, weaken host immune responses, and contribute to prolonged or recurrent infection.

Recent studies have demonstrated that parasitic infections are often accompanied by metabolic disturbances and micronutrient deficiencies; however, data on microelement imbalance in giardiasis remain limited and inconsistent. In clinical practice, treatment of giardiasis is mainly focused on eradication of the parasite, while correction of accompanying metabolic disorders is often underestimated. This may partially explain the persistence of symptoms and delayed recovery observed in some patients after standard antiparasitic therapy.

Therefore, comprehensive evaluation of microelement status in patients with giardiasis and the development of effective correction strategies represent an important

direction in improving therapeutic outcomes. Studying the dynamics of microelement levels before and after treatment may contribute to a better understanding of the pathophysiological mechanisms of the disease and support the introduction of personalized correction approaches in clinical practice.

The aim of this study was to investigate changes in the microelement composition of patients with giardiasis and to assess the effectiveness of targeted microelement correction as part of complex therapy.

Materials and Methods

This study was conducted as a prospective observational investigation among patients diagnosed with giardiasis who were treated at an infectious diseases clinic. The study included adult patients aged 2 to 12 years with laboratory-confirmed *Giardia lamblia* infection. The diagnosis was established based on microscopic examination of stool samples and/or detection of *Giardia lamblia* antigens using enzyme-linked immunosorbent assay (ELISA). Patients who had received antiparasitic therapy or vitamin–mineral supplementation within four weeks prior to enrollment, as well as individuals with chronic liver or kidney diseases, endocrine disorders affecting mineral metabolism, pregnancy, lactation, or severe comorbid conditions, were excluded from the study.

Venous blood samples were collected from all participants under fasting conditions before the initiation of antiparasitic therapy and after completion of the treatment course. Serum levels of essential microelements, including zinc, iron, copper, and selenium, were determined using atomic absorption spectrophotometry in accordance with standard laboratory protocols. The obtained values were compared with reference ranges to identify microelement deficiencies.

All patients received standard antiparasitic treatment according to current clinical guidelines. In cases where microelement deficiency was detected, targeted correction therapy was administered using appropriate mineral supplements at therapeutic doses for a period of 14 days. The selection and dosage of microelements were individualized based on baseline laboratory findings.

Quantitative data were expressed as mean ± standard deviation. Differences in microelement levels before and after treatment were evaluated using paired statistical tests, with a p-value of less than 0.05 considered statistically significant. The study protocol was approved by the local ethics committee, and written informed consent was obtained from all participants prior to inclusion in the study.

Results

The analysis of laboratory findings demonstrated that patients with giardiasis had significant disturbances in serum microelement composition prior to treatment. At baseline, reduced levels of zinc, iron, and selenium were detected in the majority of examined patients, while copper concentrations tended to be relatively increased

compared to reference values. Zinc deficiency was observed in 68.4% of patients, iron deficiency in 54.7%, and decreased selenium levels in 61.3%, indicating a high prevalence of microelement imbalance associated with giardial infection.

Following the course of antiparasitic therapy combined with targeted microelement correction, a statistically significant improvement in serum microelement levels was noted. Mean zinc concentrations increased from 8.9 ± 1.2 to 13.6 ± 1.4 µmol/L ($p < 0.05$), while iron levels rose from 9.8 ± 1.5 to 16.2 ± 1.7 µmol/L ($p < 0.05$). Selenium levels also demonstrated a significant upward trend, increasing from 0.62 ± 0.08 to 1.05 ± 0.09 µmol/L after treatment, approaching physiological reference ranges. In contrast, elevated copper levels showed a tendency toward normalization, decreasing from 21.4 ± 2.1 to 17.8 ± 1.9 µmol/L, although in some patients values remained at the upper limit of normal.

Clinical improvement paralleled the laboratory findings. After treatment, patients reported a reduction in gastrointestinal symptoms, including abdominal pain, bloating, diarrhea, and general weakness. The frequency of asthenic symptoms decreased from 72.6% to 18.9%, while appetite improvement was noted in 81.1% of patients. The normalization of microelement status was associated with improved overall well-being and faster recovery of functional capacity.

Comparative analysis revealed that patients who received combined antiparasitic and microelement correction therapy demonstrated more rapid normalization of laboratory parameters and clinical symptoms compared with those treated with antiparasitic agents alone. In the combined therapy group, normalization of zinc and iron levels was achieved in 76.4% of cases versus 48.2% in the control group ($p < 0.05$). These results indicate that microelement imbalance plays a significant role in the pathophysiology of giardiasis and that its correction contributes to improved treatment outcomes.

Discussion

The obtained results confirm that giardiasis is accompanied by significant microelement imbalance, mainly due to impaired intestinal absorption and chronic inflammatory processes. Zinc and selenium deficiencies may weaken immune defense mechanisms, facilitating prolonged parasitic persistence.

The use of microelement correction alongside antiparasitic therapy significantly improves both laboratory parameters and clinical outcomes. This approach contributes to faster recovery and reduces the risk of relapse.

Our findings highlight the necessity of incorporating microelement assessment and correction into the standard management of giardiasis.

Conclusion

The findings of this study demonstrate that giardiasis is associated with significant disturbances in serum microelement composition, primarily manifested by

deficiencies of zinc, iron, and selenium, along with a relative increase in copper levels. These imbalances appear to contribute to the severity of clinical manifestations and delayed recovery in affected patients.

The incorporation of targeted microelement correction into standard antiparasitic therapy resulted in a more rapid normalization of laboratory parameters and improved clinical outcomes. Patients receiving combined treatment showed faster resolution of gastrointestinal and asthenic symptoms, as well as higher rates of microelement level normalization compared to those treated with antiparasitic therapy alone.

These results highlight the importance of routine assessment of microelement status in patients with giardiasis and support the inclusion of microelement supplementation as an integral component of comprehensive treatment strategies. Early identification and correction of microelement deficiencies may improve therapeutic effectiveness, reduce the risk of prolonged disease course, and enhance overall patient recovery.

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