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Changes in a Number of Biochemical Parameters in Patients with Cutaneous Leishmaniasis in Endemic Foci

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Abstract

This article investigates changes in a number of key biochemical parameters in patients suffering from cutaneous leishmaniasis who live in endemic foci located in the regions of Central Uzbekistan. During the study, the levels of microelements in the blood (iron, zinc, copper, calcium), inflammation-related mediators, and general biochemical indicators (total protein, albumin, glucose, etc.) were assessed. The obtained results demonstrate the presence of disturbances in metabolic and immunobiochemical processes in cutaneous leishmaniasis, which are important for a deeper understanding of the disease pathogenesis and for improving laboratory diagnostics.

Keywords

Cutaneous Leishmaniasis, Central Uzbekistan, Biochemical Parameters, Microelements, Inflammation

INTRODUCTION

Cutaneous leishmaniasis is a transmissible parasitic disease caused by parasites of the *Leishmania* genus, primarily affecting the skin and subcutaneous tissues, and transmitted by sandflies (*Phlebotomus*). According to the World Health Organization, leishmaniasis is widely распространена in many tropical and subtropical regions of the world and is considered a disease of significant social importance.

Central Asia, including the territory of Uzbekistan, is an endemic region for cutaneous leishmaniasis. In particular, the presence of natural and anthropogenic foci in the regions of Central Uzbekistan contributes to the persistent circulation of the disease. Climatic conditions, rodent populations, and the abundance of vectors are important epidemiological factors influencing disease spread.

In recent years, increasing attention has been paid not only to the clinical course of cutaneous leishmaniasis but also to metabolic and biochemical changes involved in its pathogenesis. In particular, disturbances in microelement metabolism (iron, zinc, copper, calcium) and protein metabolism play an important role in weakening immune responses and enhancing inflammatory processes.

Studies have shown that deficiencies of iron and zinc lead to a decrease in cellular immunity, while increased copper levels are associated with activation of inflammatory processes. Disorders in calcium metabolism negatively affect cellular signaling pathways and tissue regeneration. However, comprehensive studies of these biochemical parameters in patients with cutaneous leishmaniasis in Central Uzbekistan remain insufficiently explored.

Therefore, the aim of this study was to determine changes in a number of important biochemical parameters in patients with cutaneous leishmaniasis in endemic foci of Central Uzbekistan and to evaluate their significance in the pathogenesis of the disease.

METHODS

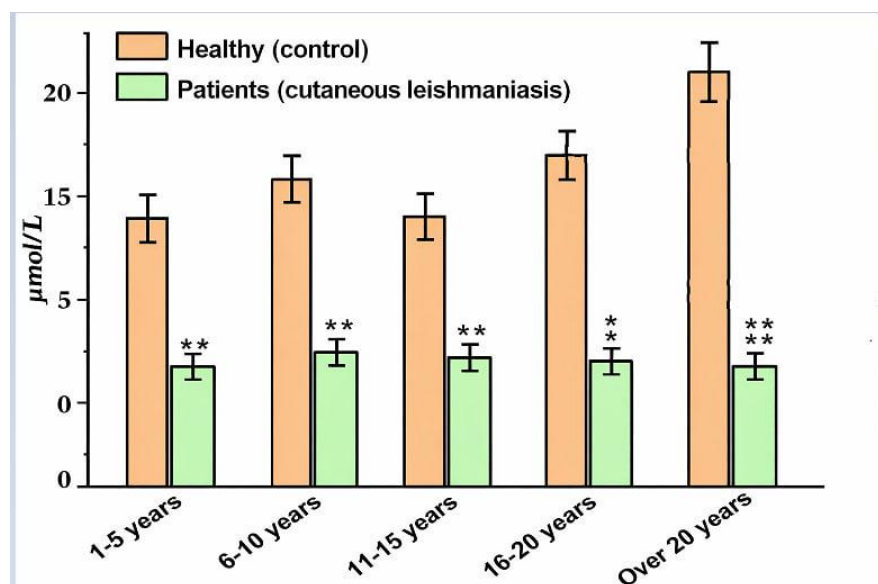
The study was conducted in regions of Central Uzbekistan considered endemic for cutaneous leishmaniasis. The study group included patients diagnosed with cutaneous leishmaniasis based on clinical and laboratory examinations. The control group consisted of healthy individuals living in the same regions who had not been affected by leishmaniasis. The following scientific and methodological approaches were used in the study:

- **Clinical methods** – assessment of the general condition of patients and clinical manifestations specific to cutaneous leishmaniasis (number, location, and duration of lesions).
- **Laboratory diagnostic methods** – diagnosis of cutaneous leishmaniasis was confirmed by microscopic examination (detection of Leishman–Donovan bodies in smears taken from lesions) and clinical-laboratory findings.
- **Biochemical methods** – determination of microelements (iron, zinc, copper, calcium) and general biochemical parameters in blood serum to assess metabolic status.
- **Spectrophotometric methods** – colorimetric spectrophotometric techniques were used to determine iron, copper, and zinc levels.
- **Atomic absorption method** – applied for high-precision measurement of certain microelement concentrations.
- **Enzymatic methods** – standard enzymatic reagent kits were used to determine glucose, total protein, and albumin levels.

RESULTS AND DISCUSSION

According to the results of the study, significant differences were identified in several biochemical parameters between patients with cutaneous leishmaniasis and the healthy control group.

The serum iron level in patients was significantly lower compared to the control group, with mean values showing corresponding changes.



It was recorded at the following levels (**P < 0.01; ***P < 0.001; n = 5).

In contrast, an increase in copper (Cu) levels was observed in patients with cutaneous leishmaniasis. Biochemical analysis of blood samples from the 120 patients we examined revealed that changes in copper levels were also clearly evident across different age groups.

The obtained results indicate the presence of disturbances in microelement metabolism and protein metabolism in cutaneous leishmaniasis.

CONCLUSION

Based on blood samples collected from patients with cutaneous leishmaniasis in the studied regions, the concentrations of microelements were analyzed in comparison with the control group. According to the results, the concentration of iron (Fe) in patients was 6.18 ± 1.07 mmol/L, which is approximately 1.5 times lower than in the control group (9.04 ± 2.62 mmol/L) ($p < 0.001$). Similarly, calcium (Ca) levels decreased from 2.36 ± 0.18 mmol/L in healthy individuals to 1.87 ± 0.36 mmol/L in patients ($p < 0.001$). In contrast, the concentration of copper (Cu) in the blood of patients with cutaneous leishmaniasis was higher. While the mean value in the control group was 18.93 ± 4.01 µmol/L, it increased to 28.04 ± 6.8 µmol/L in patients, representing approximately a 1.5-fold increase ($p < 0.001$). These biochemical findings indicate that an imbalance of microelements in the pathogenesis of cutaneous leishmaniasis—namely deficiencies of zinc, iron, and calcium, along with

an increase in copper—plays an important role in disease development. Analysis of these indicators is of great significance as an additional diagnostic criterion for early detection, assessment of disease severity, and comprehensive treatment of patients.

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