



## Nutritional and Endocrine Disorders of Protozoan Infections

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The nutritional and endocrine disorders and complications described in protozoan infections are varied and complex, in many cases forgotten or neglected by health professionals in the therapeutic management of these pathologies of great importance in public health, due to their high morbidity rates, a circumstance that requires to describe these pathophysiological phenomena, the objective of this paper, as a tool for the adequate management of these parasitosis. In this sense, a positive association has been reported between asymptomatic giardiasis and protein-energy malnutrition with serious micronutrient deficiency, due to loss of intestinal surface that unfortunately contributes to growth retardation in children. In giardiasis, subjects who suffer from hypothyroidism have their clinical condition affected, due to the malabsorption of levothyroxine, that is, its impact on thyroid function is indirect [1,2].

Of leishmaniasis, only visceral leishmaniasis has been described as affecting body weight as a consequence of compromised appetite and thyroid endocrine alteration, the latter with or without symptoms. When symptoms are shown, it is primary adrenal insufficiency with biochemical evidence, probably due to parasitic infiltration of the organ, with a prevalence that can reach 50% in these people with visceral leishmaniasis. Decreased levels of ionized and total calcium are frequently reported, probably due to low levels of parathyroid hormone. Likewise, the hyponatremia described in visceral leishmaniasis is an important factor in mortality from this disease. Hypomagnesemia is common due to renal loss, malabsorption and diarrhea. Furthermore, in visceral leishmaniasis, low levels of TSH, T4 and T3 have been reported due to pituitary dysfunction, as well as low levels of testosterone, and high levels of FSH and LH [1,3-5].

In trypanosomiasis, some endocrine structures can serve as a reservoir for *Trypanosoma cruzi*; for example, a correlation has been described between Chagas myocarditis and infection of the central vein of the adrenal gland. The endocrine disorder reported to have an influence on the nutritional sphere is hypothyroidism. Also, hypoglycemia has been reported as a metabolic abnormality resulting from infection by *Trypanosoma* spp. derived from the consumption of glucose by the parasite. Hypoglycemia (described in 60% of children with severe malaria) and hyperglycemia (mainly due to *Plasmodium falciparum* and uncommon), and hypocalcemia are reported in severe malaria. The hypoglycemia of severe malaria is explained by iatrogenic administration of quinine, by the increase in glucose turnover derived from the increase in glucose uptake in anaerobic glycolysis and by alterations in glucose production [1,6,7].

Multiple factors participate in the genesis of malaria hyperglycemia, among which the following stand out: the release of counterregulatory hormones and proinflammatory cytokines in response to the stress of the underlying disease, decreased insulin sensitivity, and increased gastric permeability and from the small intestine to sucrose. The hypocalcemia of severe malaria follows a behavior inversely proportional to the concentration of parasites, that is, as these decrease, the serum calcium tends to normal. In addition, alterations in the function of the parathyroid gland are cited as the cause of hypocalcemia of magnesium metabolism. In malaria, although sporadically, diabetes insipidus has been reported due to obstruction of the neurohypophyseal microvasculature; diabetes insipidus has also been reported in congenital toxoplasmosis; in addition, this disease is considered a risk factor in the development of diabetes mellitus type II [1,8,9].

After what has been exposed in the field of nutritional and endocrine disorders related to protozoa that frequently infect humans, approaches arise such as the need for the health professional to review their expertise and level of knowledge on the subject in order to ensure the greatest possible well-being of the community that it is responsible for serving, and as well as the urgency of research in the area that allows the discovery of the pathophysiological mechanisms, as a prior step to the development of therapeutic interventions to counteract the parasitic infection and the complications it produces [10].

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### Conflict of Interest

None declared.

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