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Mini Review

# Nutrient Factors for Risk of Nodular Goiter

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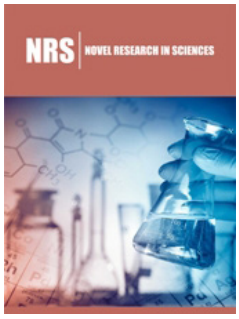


**Abstract**

A brief review of the literature presents current data on micro- and macronutrients in euthyroid nodular goiter. Among them are iodine (I), selenium (Se), iron (Ir), zinc (Zn), copper (Cu), magnesium (Mg), calcium (Ca). The role of iodine deficiency in the development of pathology was determined. The possible fate of other specified elements in the occurrence of the disease was considered. Presented data of the author's research.

**Keywords:** Iodine deficiency; Magnesium; Nodular goiter; Thyroid gland; Tomography

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## Introduction

Nodular Goiter (NG) is an extremely common endocrine pathology, which leads to an increase in the thyroid gland (thyroid gland) in the form of diffuse and nodular neoplasms. NG is an overgrowth of thyroid tissue caused by structural and functional changes in several parts of the gland [1]. It was reported that 10% of the population has this pathology [2]. The use of modern diagnostic methods, ultrasound and computed tomography significantly increased the prevalence of this disease to 19-68% in randomly selected individuals, with a higher frequency in women and the elderly [3,4].

## Micro and Macro Elements in Nodular Goiter

The main risk factor for NG is insufficient intake of iodine. Iodine deficiency causes an increase in TSH and accumulation of peroxide in the thyroid gland, which leads to an increase in insulin-like growth factor, fibroblast growth factor and mutation of follicular cells [5-7]. The follicular cells will continue to change by forming single nodules in the thyroid tissue. There is a large number of studies showing a significant decrease in goiter cases after iodine prophylaxis [8-11]. The presence of nodular pathology even after the introduction of iodine prophylaxis indicates the importance of other factors in their occurrence. An important role in the normal metabolism of thyroid hormones is played by selenium, which is part of glutathione peroxidase and acts as an antioxidant, a protector of thyrocytes from peroxide damage [12,13]. Se can affect the progression of autoimmune thyroid diseases, affecting the immune response [14,15]. There are reports that it also affects the size of the thyroid gland [16]. The joint action of iodine and selenium is presented in many publications [17-21]. The effect of other elements on thyroid function and nodule formation is under study. A number of studies in animals and humans have shown that iron deficiency can alter the synthesis of thyroid hormones, which is explained by a decrease in the activity of Thyroxine Peroxidase (TPO), which is a heme-dependent protein [22,23]. Zinc is necessary for the proper functioning of the enzyme iodothyronine deiodinase, which is responsible for the conversion of thyroxine (T4) into the active form of triiodothyronine (T3) [24-26]. The role of copper in thyroid tissue is not yet clear. Magnesium is required for the thyroid to use iodine and convert inactive T4 to active T3 [27] and its serum level, due to its effect on DNA mutations, correlates with thyroid cancer [28-30]. Regarding calcium, there is evidence that. an increased concentration of TSH can increase the concentration of $Ca^{2+}$ in human thyrocytes and serum of experimental rats [31]. Our studies in Ukraine in a region with mild iodine deficiency found that the median serum concentrations of selenium, zinc, calcium, magnesium and other elements were lower

in the NG group compared to the control group. Risk analysis of nodular goiter odds ratio (OR) after adjusting the results for sex, age and ioduria showed the highest values with a simultaneous deficiency of macro- and microelements [32]. The OR was found to be 5.83 (95%, CI 1.87-18.9, p<0.01) at low concentrations. Ca, Mg and Zn in serum, whereas with a simultaneous decrease in the concentration of zinc, calcium and magnesium in serum, together with low values of ioduria, the OR increased to 12.5 (95%, CI 2.15-79.42, p<0.05).

## Conclusion

The combined deficiency of essential micro and macro elements in the body against the background of iodine deficiency suggests the highest risk for the occurrence of nodular goiter. Further study of the content of nutrients in the body of patients with nodular goiter will be an important premise for the development of methods for preventing NG and thyroid cancer in iodine prophylaxis and food fortification.

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