

Evaluation of Serum Copper and Zinc in Hypothyroidism Patients

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ABSTRACT

Decreased thyroid hormone synthesis and low levels of circulating thyroid hormones result in biochemical and clinical hypothyroidism. Deficiency of thyroid hormones causes many metabolic processes to slow down. The maintenance of optimal health requires an adequate supply of carbohydrates, proteins and lipids, and macronutrients, micronutrients, and trace elements. In this work, the serum content of the trace elements; Zn and Cu in hypothyroidism patients was determined and compared to that of normal subjects. Fifty hypothyroid patients and fifty normal healthy control persons participated in this study. Serum zinc and copper was determined using atomic absorption spectrophotometer. The results showed that serum zinc level of hypothyroidism patients was significantly lower as compared to the normal subjects. There is no significant difference between the groups in serum copper. The results of this study indicates, the role of these trace elements in many metabolic process either as essential nutrients or as cofactors for different enzymes contributed directly or indirectly to the hypothyroidism. Consequently, the results of this study suggest that the metabolism of zinc is abnormal in hypothyroidism disease.

Keywords: *Hypothyroidism, Copper, Zinc.*

1. INTRODUCTION

The maintenance of optimal health requires an adequate supply of carbohydrates, proteins lipids, and macronutrients, micronutrients, and trace elements (1). Many trace elements play an essential role in a number of biological processes through their action as activators or inhibitors of enzymatic reactions, by competing with other elements and proteins for binding sites, by influencing the permeability of cell membranes, or through other mechanisms. Trace elements are known to influence hormones at levels of action, including hormone secretion and activity and binding to target tissue. Conversely, hormones influence trace metals metabolism at several levels of action, including excretion and transport of trace metals (2, 3 and 4). Hence, trace elements assay in biological fluids can be used as diagnostic or prognostic aid in patients with different hormonal disturbances alongside with other biochemical parameters.

Thyroid hormones regulate the rate of metabolic processes and consequent development of organism, Deficiency of thyroid hormones causes many metabolic processes to slow down. Symptoms of hypothyroidism include enlargement of thyroid gland-or goiter, impairment of cognition slowing of mental and physical performance, increased risk of coronary heart diseases many and different other symptoms (5). In the present study the serum contents of some trace elements Zn and Cu was determined in hypothyroidism patients and compared with the normal subjects.

2. MATERIAL AND METHODS

Venous blood samples were collected from 50 healthy controls in fasting condition and similar conditions were maintained while taking the blood samples of patients with Hypothyroidism Patients The

patients were diagnosed depending on the results of the clinical examinations, serum hormones level (T3, T4 and TSH). 10 ml of blood was collected and made to clot before serum was separated by centrifuging at 5000 r.p.m for 20 min.

This supernatant serum sample was collected in separate test tubes and stored at -40°C prior to analysis. The metals copper and zinc in the blood serum were determined by Atomic Absorption Spectrometry (AAS) (Model, A-20 Varian). Trace metals were determined using air-acetylene flame.

The standards from 1 to 5 ppm for each of the metal separately were run on the spectrometer and the calibration curves were obtained prior to run the samples for the determination of metals in the blood serum of normal subjects and the malarial patients.

The supernatant blood serum was used for the analysis of metals copper and zinc using Atomic Absorption Spectrometer inserting appropriate hollow cathode lamp in it. All standards used were of analytical grade.

2.1 Chemicals and reagents

Sulphosalicylic acid was obtained from Merck, Darmstadt, Germany and other chemicals to prepare standards were purchased from Sigma Chemical Co. All chemicals were of analytical grade.

2.2 Stock Solutions and working Metal standards

Stock solution of 1000 ppm Copper and Zinc for each were prepared for corresponding sulphate salts of analytical grade (Sigma Chem.). Working standards were prepared from the stock solutions by diluting with

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appropriate volume of deionized water and addition of few drops of corresponding concentrated acid.

3. RESULTS

Table (1) showed the results of serum trace elements expressed as mean±standard deviation. Serum zinc level of hypothyroidism patients are significantly lower ($p<0.05$) than the level in normal subjects, whereas, there is no significant difference between the groups ($p>0.05$) in serum copper as shown in Table (1).

Trace Metals	Normal Subjects	Patients
Copper	19.63±5.22	17.44±5.32
Zinc	7.06±2.44	6.09±2.34

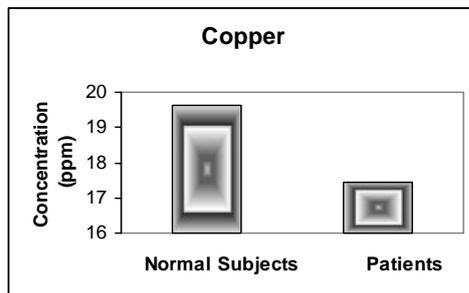


Fig 1

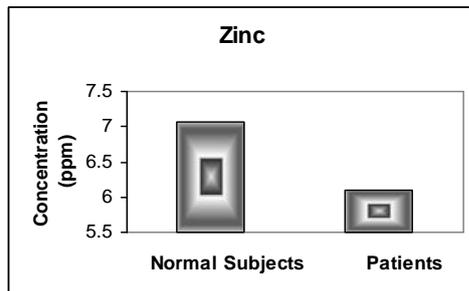


Fig 2

Fig 1: The decreases level of copper patients whereas figure 2 the increased zinc level patients as compared to the normal subjects.

4. DISCUSSION

It is reported that the significant decrease levels of Zn in hypothyroidism patients as comparison to the normal subjects in other different researches (6, 7, and 8). One possible explanation for these findings, that gastrointestinal absorption of zinc is severely impaired in hypothyroidism subjects. An alternative explanation would be a change in zinc distribution; the low zinc level may reflect sequestration of zinc by the liver or other tissues (7). Another explanation is due to the significant influence of TSH in the variation of the concentration of iodine, selenium and zinc in normal and altered human thyroid tissues (9). In one research, the serum zinc levels in hyperthyroid patients were clearly higher than in the hypothyroid patients group (10). Zinc has important roles in thyroid metabolism (11, 12 and 13) and a fundamental role in protein synthesis (14). It involves in T3 binding to

its nuclear receptor, and participates in the formation and mechanism of action of TRH (15) reported in hypothyroidism patients, thyroid hormones did not correlate with indices of zinc status; although, in rats and humans (16), Hence, the correlation between hypothyroidism and serum zinc is not a simple correlation and needs more specific studies.

There is no significant change in serum copper in patients with hypothyroidism as compared to that of normal subjects. There is no precise evidence, in literature, corresponding to the correlation between serum copper and hypothyroidism. More investigations are required using larger sample size and severe hypothyroidism to be sure about the lack of correlation between the disease and different copper indexes.

Furthermore, the overall results of this study suggest an abnormal metabolism of zinc in hypothyroidism disease.

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