Comparison of Serum Zinc and Serum Copper in Hypothyroid Patients with Normal Subjects

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ABSTRACT
BACKGROUND: The objective of this study is to shed light on the level of trace elements in hypothyroidism. The content of the trace elements (Zn, Cu) in the serum of patients was determined and compared to that of normal subjects. MATERIALS AND METHODS: Serum sample of fifty patients of known case of hypothyroidism and fifty normal subjects were taken. Serum Zinc and serum copper was estimated by colorimeter method in Fully automated Erba XL-640 Analyser. RESULTS: The results showed that serum zinc level of hypothyroidism patients was significantly lower as compared to the normal subjects (p value<0.05). There is no significant difference between the groups in serum copper level. CONCLUSION: 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 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, Serum Zinc, Serum Copper

INTRODUCTION
The maintenance of optimal health requires an adequate supply of carbohydrates, proteins, lipids, macronutrients, micronutrients, and trace elements. 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 action, secretion, activity and binding to target tissue. Conversely, hormones influence trace metals metabolism at several levels of action, including excretion and transport of trace metals. Hence, trace elements assay in biological fluids can be used as diagnostic aid in patients with different hormonal disturbances along 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. 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. Thyroid hormones play an important role in human body metabolism. After binding with a specific nuclear receptor, T3/T4 induces transcription of genetic code via mRNA and regulates proteosynthesis in most tissues. Decreased thyroid hormone synthesis and low levels of circulating thyroid hormones result in biochemical and/or clinical hypothyroidism. This condition occurs more frequently in women; the overall incidences are about 3% of the general population. Hypothyroidism probably is initiated by autoimmunity against the thyroid gland in addition to different other causes. The thyroid glands of most of these patients first have autoimmune “Thyroiditis”, which means thyroid inflammation. This causes progressive deterioration and finally fibrosis of the gland with resultant diminished or absent secretion of thyroid hormone. Several other types of hypothyroidism also occur, often associated with development of enlarged thyroid glands called thyroid goiter.

MATERIALS AND METHODS
The cross sectional study was conducted in civil hospital, ahmedabad during may 2013 to july 2013.Fifty hypothyroidism patients (n=50), their age range between 19-65 years (39 female and 11 male)
participated in this study. The severity of hypothyroid is mild to moderate and all patients were on hormone replacement therapy. The mean age of patients was found to be 41.48±13.17. The patients were diagnosed depending on the results of the following examinations: clinical examinations, serum hormones level (T3, T4 and TSH). Fifty normal Controls healthy persons (n=50) aged 19-65 years (34 female and 16 male) were used as control. The mean age of control was found to be 36.86±12.34. Venous blood samples were collected from patients with Hypothyroidism in fasting condition and similar conditions were maintained while taking the blood samples of controls. About five millilitres of venous blood from were drawn by utilizing disposable plastic syringes in the morning and transferred into sterile test tube. The blood was allowed to clot and centrifuged at 5000 rpm for 5 minute. Sera were separated and stored at -4ºC until analysis. The supernatant blood serum was used for the analysis of metals copper and zinc by colorimetric method in Erba XL-640 Fully Auto Analyser with following principal. Copper, released from ceruloplasmin in an acidic medium, reacts with Di-Br-PAESA(2-(5 bromo-2-pyridylazo)-5-(N-propyl-N-sulphopropylamino) aniline Na salt) to form a coloured complex. Intensity of the complex formed is directly proportional to the amount of Copper present in the sample. Copper + Di-Br-PAESA Coloured Complex Zinc in an alkaline medium reacts with Nitro-PAPS(2-(5-nitro-2-pyridylazo)-5-(N-propyl-N-sulphopropylamino)phenol disodium salt dehydrate) to form a purple coloured complex. Intensity of the complex formed is directly proportional to the amount of Zinc present in the sample. Zinc +Nitro-PAPS Purple Coloured Complex and results were analysed with Graphpad Instat software by using student’s t-test for statistical significance of 0.05.

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. There is no significant difference between the groups (p>0.05) in serum copper as shown in Table (1). Table 1: Level of trace elements in controls & cases.

<table>
<thead>
<tr>
<th>Level of Trace Element</th>
<th>Normal Subject (mean ±SD)</th>
<th>Hypothyroid Patients (mean ±SD)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>92.17±6.82</td>
<td>49.38±5.89</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Copper</td>
<td>94.75±7.15</td>
<td>93.24±6.28</td>
<td>&gt; 0.05</td>
</tr>
</tbody>
</table>

CONCLUSION

In our study we concluded that there is a significant decrease in serum zinc level in hypothyroid patients as compare with normal subject while there is no significant change in serum copper level between this two group. Our study correlates well with other different researches (Iham Amir Al-Juboori et al.2009; Buchinger et al., 1988; Yoshida et al. 1990; Zhang et al. 2004). 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. 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. In one research, the serum zinc levels in hyperthyroid patients were clearly higher than in the hypothyroid patients group. Zinc has important roles in thyroid metabolism and a fundamental role in protein synthesis. It involves in T3 binding to its nuclear receptor, and participates in the formation and mechanism of action of TRH reported in hypothyroidism patients. Hence, the correlation between hypothyroidism and serum zinc is not a simple correlation and needs more specific studies. Furthermore, the overall results of this study
suggest an abnormal metabolism of zinc in hypothyroidism disease. There is no significant change in serum copper in patients with hypothyroidism as compared to that of normal subjects. 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.

REFERENCES