Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com

Biochemistry

A Correlative Study of Serum Zinc and TSH Levels in Hypothyroidism Patients in Rohilkhand Region, Uttar Pradesh

Dr. Geetika Mohan[1], Dr. Biswajit Das[2*], Dr. Saurav Rai[1], Dr. Ujjawal Kumar[1], Dr. Ayaz Khurram Mallick[3], Priyanka Mishra[1]

[1]Postgraduated students, Dept of Biochemistry, Rohilkhand Medical College and Hospital, Bareiliy, Pilibhit Bypass Road, Near Ashish Royal Park, Bareilly, Uttar Pradesh, India

[2]Professor and Head, Dept of Biochemistry, Rohilkhand Medical College and Hospital, Bareiliy, Pilibhit Bypass Road, Near Ashish Royal Park, Bareilly, Uttar Pradesh, India

[3]Associate Professor, Dept of Biochemistry, Rohilkhand Medical College and Hospital, Bareiliy, Pilibhit Bypass Road, Near Ashish Royal Park, Bareilly, Uttar Pradesh, India

Original Research Article

***Corresponding author**
Dr. Biswajit Das

Article History
Received: 26.03.2018
Accepted: 13.03.2018
Published: 30.03.2018

DOI:
10.21276/sjams.2018.6.3.64

Abstract: The significance and role of thyroid gland for maintenance of adequate growth and health is well known. According to data available from various studies on thyroid disease it has been estimated that about 42 million people in India were suffer from thyroid diseases. Zinc is a trace element and an essential nutrient in humans. It play important role including T3 binding to its nuclear receptors and is needed for the formation and action of TRH. The present study has been undertaken to determine the serum zinc level in hypothyroidism patients and to study the correlation between the levels of zinc with TSH levels. This study has been carried out in the department of Biochemistry in RMCH, Bareilly, with 60 known cases of hypothyroidism and 60 apparently healthy controls. The zinc levels were estimated by colorimetric method and TSH by sandwich ELISA method. Our study shows that mean ± SD of serum zinc was significantly lower in cases than in control. Correlation between serum Zn and TSH is inversely proportional. Thus routine screening for serum Zn should be carried out in person with thyroid dysfunction to assess the therapeutic improvement.

Keywords: TSH, Zinc, Hypothyroidism, ELISA, TRH.

INTRODUCTION

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes [1]. Nearly 108 million people in India suffer from endocrine and metabolic disorders.

Thyroid disorders are the most common among all the endocrine diseases in India and hyperthyroidism and hypothyroidism are more frequent in women [2, 3]. Studies of the goitrous subjects in India showed overall prevalence of hypothyroidism in 5.4% [4]. Pathology of the thyroid gland (Primary hypothyroidism) accounts for over 99.5% of cases of thyroid gland failure and < 0.5% result from disorder of the Pituitary gland or hypothalamus (central hypothyroidism) [5, 6].

Trace elements or micro minerals refer to those minerals whose daily requirement is less than 100 mg/day. Although their requirement is less, some of these micro mineral such as iron, zinc, iodine, cooper, selenium play very important role in maintenance of proper metabolic function and wellbeing. Trace elements participate in various bio-chemical reactions. Zinc is the second most abundant trace element in the body after iron. It is mainly an intracellular element. RDA of zinc is 8mg/day for females and 11 mg/day for males 85% of total zinc found in muscles and bone where as 0.1 % in the plasma [4].The highest concentration of zinc is found in choroid of eye and optic nerve followed by in muscle and bone. Zinc is involved in numerous cellular metabolic processes. About 10% of the human proteins bind to zinc and more than 200 enzymes require zinc at their catalytic site for its activity [5]. Zinc also plays a role in immune function, protein synthesis, synthesis of DNA and cell division. Zinc is also believed to have antioxidant properties which protects against accelerated aging and promotes healing after injury [7]. Zinc is an intracellular element it can influence the development and normal growth of tissues. It has an important role in thyroid metabolism. It involves in T3 binding to its nuclear receptors and is needed for the formation and action of TRH. Studies have shown association between

zinc deficiency and decrease in iodothyronine levels. In turn, thyroid function influences zinc metabolism [8, 9]. Hence the correlation between serum zinc and hypothyroidism is not a simple one and needs more specific studies. Hence the presence studies has been under taken to determine the serum level of zinc in patients with hypothyroidism and to study the correlation between the levels of zinc with TSH levels in patients with hypothyroidism

MATERIALS AND METHODS

Case control study was conducted at the Department of Biochemistry, Rohilkhand Medical College and Hospital (RMCH), Bareilly, Uttar Pradesh after obtaining clearance from institutional ethical committee. Study was done in the year of 2015-16. 60 diagnosed patients of hypothyroidism aged between 20 to 60 years were taken as cases and 60 apparently healthy age and gender matched individuals were taken as controls. Patients suffering from liver disorder, renal disorder, malabsorption syndrome, diagnosed with cancer or patients antioxidants or nutritional supplements were excluded from the study. 4 ml venous blood samples were collected from antecubital vein after an overnight fasting from all participant's with aseptic precautions. Blood samples were allowed to clot at room temperature and the serum was separated by centrifugation. The estimation of the biochemical parameters were carried out within 4-6 hrs by using Chem 5 plus semi-auto analyze and ErbaLisascan II.

Estimation of serum Zinc was done by colorimetric method [10, 11] while serum TSH was estimated by the Bene Sphere by Avantor ELISA test kit [12, 13].

Reference Range

Zinc: 60 - 120 µg/dl , TSH: 0.28-6.82 µUI /mL

STATISTICAL ANALYSIS

Data were presented as mean ± SD. Comparison of serum levels of the parameters between cases and control was performed by student's t test and $p < 0.05$ was considered as statistically significant.

RESULTS

Table-1 and Fig-1 Age group distribution

The table and diagram shows that highest number of hypothyroidism cases included in this study were in the 21-30 years age group (40 %) followed by 31-40 years age group (26.7%), the 41-50 and above 50 years age group showed 8 cases each with percentage 13.3% each. The lowest no. of cases i.e. 4 with 6.7% were in the age group of less than 20 years.

Table-1: Age Group Distribution

Age Group (In Years)	Case		Control	
	No	Percentage(%)	No	Percentage(%)
≤ 20	4	**6.7 %**	**5**	**8.4%**
21-30	**24**	**40.0%**	**27**	45%
31-40	**16**	**26.7%**	12	20%
41-50	**8**	**13.3%**	8	13.3%
> 50	**8**	**13.3%**	8	13.3%
Total	**60**	100.0%	60	100.0%
Mean Age(In Years) Mean ± S.D		34.7 ± 11.28		32.05 ± 12.76

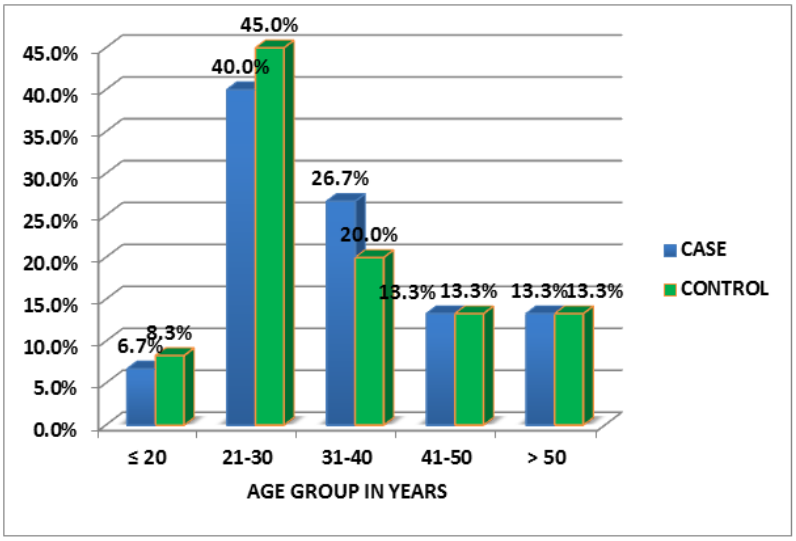

Fig-1: Age Group Distribution

Table-2 and Fig-2 shows the comparison between serum mean ± SD of zinc and TSH between cases and control and found that the Zinc values were significantly lower in cases in comparison to controls and TSH level was significantly higher in cases than in controls.

Table-3; Fig-3 shows the correlation between serum zinc and TSH in hypothyroidism patients. Correlation is significant at the 0.01 level (2-tailed).

Table-2: Comparison of Serum Zn & TSH in Case and Control Group.

	CASE		CONTROL			
PARAMETER	**MEAN**	**SD**	**MEAN**	**SD**	**t-Value**	**p-Value**
Zn	80.60	39.45	141.66	46.31	6.3472	<0.001*
TSH	51.77	41.10	2.29	0.88	-7.6120	< 0.001*

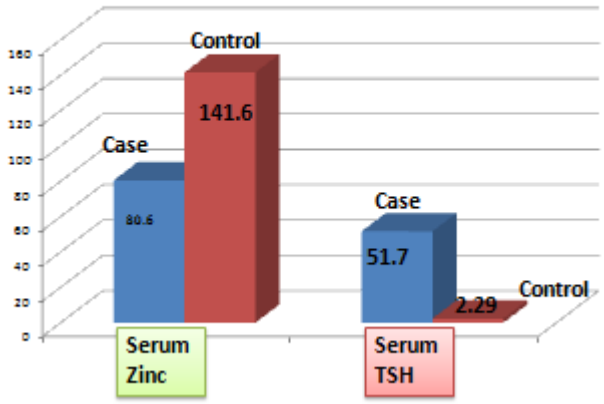

Fig-2: Comparison of Serum Zn & TSH in Case and Control Group.

Table-3: Correlation of Different Parameters (Serum Zinc and TSH)

		TSH	**Zinc**
TSH	Pearson Correlation	1	-.185
	Sig. (2-tailed)		.253
	N	60	60
Zinc	Pearson Correlation	-.185	1
	Sig. (2-tailed)	.253	
	N	60	60
	Correlation is significant at the 0.01 level (2-tailed).		

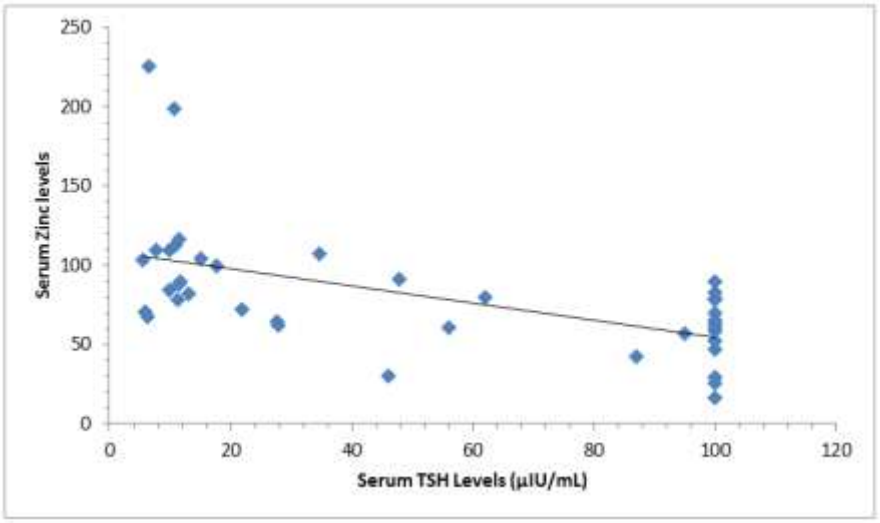

Fig-3: Correlation between serum Zinc (ug/dl) and TSH levels

DISCUSSION

The present study was based on the estimation of serum zinc and TSH in 60 diagnosed cases of hypothyroidism and 60 apparently healthy age and sex matched individuals who served as controls. In our study maximum patients belongs to the age group of 21-30 years (37.5%) followed by 31-40 years age group (27.5%), the 41-50 and above 50 years age group showed 5 cases each with percentage 12.5% each. The lowest no. of cases i.e. 4 with 10% were in the age group of less than 20 years as shown in table-1; Fig- 1. Our study was closely related to study done by other authors namely Ashok et al [14], Ali Jabbari *et al*., [15].

On analyzing the results of our study, we observed that the mean ± SD of serum zinc level (80.60 ± 39.45) were significantly lower ($p < 0.01$) than control group (141.66± 46.31) and TSH significantly higher than control as shown in table-2 and Fig-2. Table-3; Fig-3 shows the correlation between serum zinc and TSH in hypothyroidism cases. One possible explanation for these findings is that gastrointestinal absorption of zinc is severely impaired in hypothyroidism subjects. Our analytical results were in an agreement with other authors namely Aktuna *et al*., [16]. Yoshida *et al*., [17], Zhang *et al*., [18]. Dhawan *et al*., [19]. They believed that the lower value of zinc would be a change in zinc distribution; the low zinc level may reflect sequestration of zinc by the live or other tissues. In 1998, Lee H.H explained that 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 [20].

Aktuna *et al.*, in his study observed that the serum zinc levels in hyperthyroid patients were clearly higher than in the hypothyroid patients group [16]. Olivieri *et al*., [21] reported in hypothyroidism patients, thyroid hormones did not correlate with indices of zinc status; although, in rats and humans [22], zinc deficiency has been led to decrease iodothyronine levels and also they found a strong positive association between zinc and FT3 levels. The effects of zinc on thyroid hormone levels and the thyroid gland in general are still not clear [21, 22]. Animal and human studies have yielded conflicting results, low T_3 levels being found in some patients with zinc deficiency. Dhawan *et al*., in 2007 [19] and Pekary *et al*., in 1991 [23] and Handy RC [24] reported that zinc has important roles in thyroid metabolism, it involves in T_3 binding to its nuclear receptor, and participates in the formation and mechanism of action of TRH. Hence, the correlation between hypothyroidism and serum zinc is not a simple correlation and needs more specific studies.

REFERENCES

1. Gull WW. A collection of the published writings of William Withey Gull: Edited and arranged by TD Acland. New Sydenham Society; 1894.
2. Cáp, J. (2009). Hypothyroidism substitution and adrenal insufficiency in diabetic patients. *Vnitrni lekarstvi*, *55*(4), 371-374.
3. Constant EL, Adams S, SeronX, Bruyer R, Seghers A, Daumerie C. Hypothyroidism and major depression: a common executive dysfunction? J Clin Exp Neuro psychol. 2006.Jul; 28(5):790-807.
4. Klein I, Danzi S. Thyroid disease and the heart Circulcation. 2007 Oct9; 116(15):1725-35
5. Kochupillai, N. (2000). Clinical endocrinology in India. *Current Science*, *79*(8), 1061-1067.
6. Woeber, K. A. (2000). Update on the management of hyperthyroidism and hypothyroidism. *Archives of internal medicine*, *160*(8), 1067-1071.
7. Burtis CA, Ashwood ER, Brouns DE. Vitamins and trace elements. In Tietz Textbokk of Clinical Chemistry and Molecular Diagnostics, 5th Edition.: Elsevier; 2012.p.960-965.
8. Truong-Tran AQ, Ho LH, Chai F, Zalewski PD. Cellular zinc fluxes and the regulation of apoptosis/gene-directed cell death. The Journal of nutrition. 2000 May 1;130(5):1459S-66S.
9. MacDonald RS. The role of zinc in growth and cell proliferation. The Journal of nutrition. 2000 May 1;130(5):1500S-8S.
10. Charkes ND. The many causes of subclinical hyperthyroidism. Thyroid. 1996 Oct;6(5):391-6.
11. Abe A, Yiamashita S. Colorimetric method for the estimation of zinc. Clin Chem. 1989;35(4):552-4.
12. Beck-Peccoz P, Persani L. Variable biological activity of thyroid-stimulating hormone. European journal of endocrinology. 1994 Oct 1;131(4):331-40.
13. Young DS, Pestaner LC, Gibberman V. Effects of drugs on clinical laboratory tests. Clinical chemistry. 1975 Apr;21(5):1D-432D.
14. Lohano AK, Siayal NN, Samie A. Overt hypothyroidism; frequency of common presentations. Professional Medical Journal. 2014 Jan 1;21(1).
15. Jabbari A, Besharat S, Razavianzadeh N, Moetabar M. Common signs and symptoms in hypothyroidism in central part of Iran. Pakistan Journal of Medical Sciences. 2008 Jan 1;24(1):44.
16. Aktuna D, Buchinger W, Langsteger W, Meister E, Sternad H, Lorenz O, Eber O. Beta-carotene, vitamin A and carrier proteins in thyroid diseases. Acta Medica Austriaca. 1993;20(1-2):17-20.
17. Yoshida K, Kiso Y, Watanabe T, Kaise K, Kaise N, Itagaki Y, Yamamoto M, Sakurada T, Yoshinaga K. Erythrocyte zinc in hyperthyroidism: reflection of integrated thyroid hormone levels over the previous few months. Metabolism-Clinical and Experimental. 1990 Feb 1;39(2):182-6.
18. Zhang F, Liu N, Wang X, Zhu L, Chai Z. Study of trace elements in blood of thyroid disorder subjects before and after 131I therapy. Biological trace element research. 2004 Feb 1;97(2):125-33.
19. Dhawan D, Singh Baweja M, Dani V. Zinc sulphate following the administration of iodine-131

on the regulation of thyroid function, in rats. Hell J Nucl Med. 2007 Oct 16;10(3):167-71.
20. Lee HH, Prasad AS, Brewer GJ, Owyang CH. Zinc absorption in human small intestine. American Journal of Physiology-Gastrointestinal and Liver Physiology. 1989 Jan 1;256(1):G87-91.
21. Olivieri O, Girelli D, Stanzial AM, Rossi L, Bassi A, Corrocher R. Selenium, zinc, and thyroid hormones in healthy subjects. Biological trace element research. 1996 Jan 1;51(1):31-41.
22. Ruz M, Codoceo J, Galgani J, Muñoz L, Gras N, Muzzo S, Leiva L, Bosco C. Single and multiple selenium-zinc-iodine deficiencies affect rat thyroid metabolism and ultrastructure. The Journal of nutrition. 1999 Jan 1;129(1):174-80.
23. Pekary AE, Lukaski HC, Mena I, Hershman JM. Processing of TRH precursor peptides in rat brain and pituitary is zinc dependent. Peptides. 1991 Sep 1;12(5):1025-32.
24. Handy RC. The Thyroid gland: A brief Historical perspective south med J. 2002;95(5).