

To Study Serum Ceruloplasmin Level in Early Diagnosed Patients with Subclinical Hypothyroidism

G. G. Kaushik¹, Avinash Bairwa²

¹Senior Professor, Department of Biochemistry, J.L.N. Medical College, Ajmer (Rajasthan). Rajasthan University of Health Sciences, Jaipur (Corresponding Author)

²M.Sc. (Med.) Student, Department of Biochemistry, J.L.N. Medical College, Ajmer (Rajasthan). Rajasthan University of Health Sciences, Jaipur.

Corresponding Author Email: [bairwaavinash91\[at\]gmail.com](mailto:bairwaavinash91[at]gmail.com)

Abstract: The aim of study was to measure serum level of ceruloplasmin in Subclinical hypothyroidism (SCH) subjects and compare with healthy control subjects. In this study 120 SCH and 120 healthy subjects (age and gender matched) were enrolled. BMI, Serum free triiodothyronine (FT₃), Serum free thyroxine (FT₄), Serum thyroid stimulating hormone (TSH) and Serum Ceruloplasmin were assessed. Serum Ceruloplasmin levels were lower in Subclinical hypothyroidism (SCH) subjects compared with healthy controls (17.8 ± 2.1 mg/dl vs 28.8 ± 5.1 mg/dl, respectively). These value were found to be statistically highly significant (p<0.0001).

Keywords: Ceruloplasmin, Subclinical hypothyroidism (SCH)

1. Introduction

Hypothyroidism is a common endocrine disorder resulting from deficiency of thyroid hormone. It is often the primary process in which the thyroid gland produces insufficient amounts of thyroid hormone.

Subclinical hypothyroidism (SCH) can be defined as a state of high serum thyroid stimulating hormone (TSH) levels (less than 10μ IU/L) with normal serum free thyroxine (FT₄) levels. Today subclinical hypothyroidism is a common biochemical finding in the general population. Overall, the population prevalence of subclinical hypothyroidism is around 3% - 8%.

Ceruloplasmin is a ferroxidase enzyme that in humans is encoded by the *CP* gene. Ceruloplasmin is the major copper - carrying protein in the blood, and in addition plays a role in iron metabolism. It was first described in 1948. Another protein, hephaestin, is noted for its homology to ceruloplasmin, and also participates in iron and probably copper metabolism. Although there are many evidences linking obesity, serum ceruloplasmin and Subclinical hypothyroidism (SCH). Data about serum ceruloplasmin concentration in Subclinical hypothyroidism (SCH) is limited. Therefore, present study was undertaken to evaluate serum ceruloplasmin levels in patients with Subclinical hypothyroidism (SCH) and to compare it with healthy controls.

2. Materials & Methods

The present study has been conducted on 120 newly diagnosed Subclinical Hypothyroidism patients of 20-50 years age group of both sex attending the OPD of Department of Medicine, J.L.N. Medical College & Associated group of Hospitals, Ajmer from January 2020 to December 2020. Diagnosis of thyroid disorder has been made according to the criteria recommended by the

European Thyroid Association Guidelines-2013. The result has been compared with age and gender matched 120 euthyroid subjects acting as controls. Detailed history of participants including age, history of any medications, addictions has been taken. Written consent from all the subjects has been obtained for the study. Blood samples has been collected from anticubital vein by venepuncture in plain vials. Serum has been separated by centrifugation at 2500 rpm for 10 minutes.

BMI was determined following standard procedures. Biochemical analytes Serum free triiodothyronine (FT₃), Serum free thyroxine (FT₄) and Serum thyroid stimulating hormone (TSH) were measured by chemiluminescence immuno assay (CLIA). Serum Ceruloplasmin were measured using an enzyme linked immunosorbent assay (ELISA) technique.

The quantitative variables were expressed as the Mean ± SD (Standard deviation) median (range). The baseline characteristic between Subclinical hypothyroidism (SCH) and healthy subjects were assessed using student's t-test for continuous variables (as applicable). All P-values were based on a two sided test of statistical significance. Significance was accepted at the level of p<0.05.

3. Results and Observation

In this study, 120 cases of impaired glucose tolerance were compared with 120 healthy controls.

Table 1: Anthropometric parameters of SCH subjects & Healthy controls

| Parameters | SCH Cases (Mean ± SD) | Healthy Controls (Mean ± SD) | P-Value |
|--------------------------|-----------------------|------------------------------|-------------|
| AGE (yrs) | 40.25 ± 11.8 | 39.50 ± 10.8 | 0.644 (NS) |
| WEIGHT (kg) | 60.27 ± 3.8 | 52.58 ± 5.0 | - |
| HEIGHT (cm) | 156 .0 ± 4.9 | 154.8 ± 4.5 | - |
| BMI (kg/m ²) | 24.5 ± 2.6 | 21.9 ± 2.8 | <0.001 (HS) |

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Table 2: Biochemical parameters of SCH subjects & Healthy subjects

| Parameters | SCH Cases (Mean \pm SD) | Healthy Controls (Mean \pm SD) | P-Value |
|--------------------------------|------------------------------|--|-------------|
| Serum FT3 (pg/ml) | 2.20 \pm 0.55 | 2.42 \pm 0.64 | <0.0001(HS) |
| Serum FT4 (ng/dl) | 0.82 \pm 0.14 | 0.90 \pm 0.16 | <0.0001(HS) |
| Serum TSH (μ IU/ML) | 7.45 \pm 2.5 | 2.84 \pm 1.44 | <0.0001(HS) |
| Serum Ceruloplasmin (mg/dl) | 17.8 \pm 2.1 | 28.8 \pm 5.1 | <0.0001(HS) |

P value <0.0001 is considered highly significant while $p < 0.01$ is considered significant

Basic anthropometric parameters of SCH subjects and healthy subjects are summarized in table-1. There was no significant difference between SCH subjects and healthy subjects regarding mean age (40.25 \pm 11.8 vs. 39.50 \pm 10.8 yrs.). BMI mean \pm SD in kg/m² in SCH and healthy subjects was (24.5 \pm 2.6 vs. 21.9 \pm 2.8) and it was highly significant. Biochemical parameters of SCH subjects and healthy subjects are presented in table-2. SCH subjects had lower Ceruloplasmin levels compared to healthy subjects (17.8 \pm 2.1 vs. 28.8 \pm 5.1, $P < 0.0001$).

4. Discussion

In the present study, SCH subjects have significantly lower levels of ceruloplasmin as compared to healthy control subjects. A number of articles have reported decreased levels of serum ceruloplasmin in Subclinical hypothyroidism, but SCH subjects have not been studied extensively to know whether the decrease in the serum ceruloplasmin levels begin before the onset of Subclinical hypothyroidism. Our findings are in agreement with Dumitriu L et al. (1988), who found that ceruloplasmin concentrations were significantly lower in Subclinical hypothyroidism group than the Normal healthy group, suggesting a possible association between serum ceruloplasmin concentration and thyroid hormones. Vivek R Joshi et al. (2011) also reported that plasma levels of ceruloplasmin in patients with Subclinical hypothyroidism were significantly lower than these in patients with Normal healthy subjects. Results of this study suggest that plasma levels of ceruloplasmin are decreased in patients with SCH.

5. Limitations of Study

Our sample size was relatively small.

6. Acknowledgements

Nil

7. Conflicts of Interest

We have no competing interests.

8. FUNDING

Nil

9. Conclusion

From the present study it is concluded that serum ceruloplasmin levels gets decreased prior to onset of hypothyroidism. ceruloplasmin serve as a valuable marker along with TSH for early diagnosis of hypothyroidism. It could be considered among therapeutic agents used in the prevention of hypothyroidism and in the prevention or reduction of its critical complications.

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