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Original Research Paper

Antioxidants and Ischemia Modified Albumin in Hypothyroidism Patients

Medical Science

KEYWORDS : Antioxidants, Ischemia modified albumin, hypothyroidism, oxidative stress.

*** Dr.P.T. Komala** — Associate Professor, Department of Biochemistry, Meenakshi Medical college and Research institute, Kanchipuram, Tamil Nadu, India, * Correspondence Author

Dr. Ursula Sampson — Professor & Head, Department of Biochemistry, Meenakshi Medical college and Research institute, Kanchipuram, Tamil Nadu, India

ABSTRACT

Aim: *The aim of this study was to estimate the levels of Antioxidants and Ischemia Modified Albumin in hypothyroidism patients. Reactive oxygen species (ROS) are constantly generated and eliminated in the biological system. They play an important role in normal biochemical functions and abnormal pathological functions. Ischemia Modified Albumin (IMA) is an ischemia/reperfusion injury marker which has been considered to be formed under oxidative stress conditions. Thyroid is one of the largest endocrine gland in the body. The thyroid gland, so named by Thomas Wharton in 1965. It is larger in females than in males. The structure and function of the thyroid change in different stages of the sexual cycle in females. Its function is slightly increased during pregnancy and lactation and is decreased during menopause.* ***Materials and methods***: *A cross sectional study was done with 30 newly diagnosed hypothyroid patients as cases and 30 age and sex matched healthy controls. Serum levels of Antioxidants and IMA were estimated by colorimetric methods and thyroid profile was done by CLIA methodology.* ***Results*** *: Antioxidants and Ischemia Modified Albumin levels were found to be significantly decreased in hypothyroid patients when compared to healthy controls (p=0.00).*
Conclusion: *We conclude that there was decrease in antioxidants and IMA levels which could be due to the consequence of ischemia which is present in hypothyroidism.*

I. Introduction

Hypothyroidism results from under secretion of thyroid hormone from the thyroid gland. The result is "slowing down" of physical activity. There are many disorders that result in hypothyroidism. These disorders may directly or indirectly involve the thyroid gland. Because thyroid hormone affects growth & development, and many cellular processes, inadequate thyroid hormone has widespread consequences for the body. Of the nearly 25 million people suffering from a thyroid condition, most have hypothyroidism[1].

Vitamin C and E comprise the non-enzymatic antioxidant system that protects the cells against free radicals and ROS. Antioxidant vitamins have a number of biological activities such as immune stimulation, scavenging the free radicals and alteration in metabolic activation of carcinogens. They can utilize reactive oxygen metabolites, protecting biopolymers and reduce oxidative DNA damage. Ascorbic acid is the most widely cited form of water soluble antioxidants, which prevents oxidative damage to cell membrane, induced by aqueous radicals. In addition, recycling of tocopheroxyl radicals to tocopherol is achieved by reaction with ascorbic acid.

Ischemia modified albumin (IMA) is considered as one of the marker of ischemia/ reperfusion injury in clinical conditions which include ischemic events in their pathophysiology. The human serum albumin has the ability to bind to certain metal ions particularly cobalt and copper at the N-terminus. On exposure to ischemic environment, structure of albumin N-terminus is changed such that it can no longer bind to cobalt. It also acts as a mortality predictor in renal disorder and myocardial ischemia[2,3,4] .Studies have shown that hypothyroidism can aggravate neurological damage due to cerebral ischemia and modulates the outcome of ischemic reperfusion injury. Free thyroid hormone levels are found to be decreased in ischemic stroke patients[5]. Sheu et al., found that the complications of ischemic stroke was 1.44 times greater in hypothyroidism patients[6,7].

This study was done to know, how the IMA levels are found to be affected by ischemic changes that occur in hypothyroidism and not many studies are found in literature hence we undertook this study. Here we evaluated the levels of IMA, as a markers of ischemia.

II. Materials and Methods

IIa. Chemicals:

Antioxidants and IMA were estimated by colorimetric methods and thyroid profile was done by CLIA methodology. All the other chemicals used were of analytical grade.

IIb. Experimental Design

The present study was under taken in the Department of Biochemistry, Meenakshi Medical College, Tamil Nadu, India for a period of two years from Jan 2013 -December 2015. Patient sample collected for TFT was utilized for study. Approximately 5ml of blood is collected before treatment. Serum was separated immediately by centrifugation at 3000rpm for 10 minutes at 4°C. 100 patients sample selected for study age ranging between 25±10 of which 30 were hypothyroid patients. They were compared with 30 healthy control subjects. The study was conducted with 2 groups. Group-1, 30 newly diagnosed hypothyroid patients and Group-2, 30 healthy controls. Patients with history of chronic smoking, alcoholism, diabetes mellitus, liver, kidney, cardiac, endocrinal and immunological diseases were excluded in both the groups.

III. Statistical Analysis

Data were analyzed using the SPSS software package, version 17.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed using range, mean, SD, and median, whereas qualitative data were expressed as frequency and percentage. P value was assumed to be statistically significant at 0.05.

IV. ETHICAL CONCERN

Ethical clearance was obtained from the Ethical committee meeting conducted at Meenakshi Medical College and Research Institute, Kanchipuram, Tamil Nadu, India

V. RESULTS

Table:1. ANTIOXIDANTS, IMA AND THYROID PROFILE IN HYPOTHYROIDISM

Groups	Control	Cases	p-value
Number(n)	30	30	0.000
FT_3 (nmol/L)	2.57±0.26	0.12±0.01 [a*]	0.000
FT_4 (pmol/L)	1.25±0.12	0.08±0.01 [a*]	0.000
TSH (µIU/ml)	4.35±0.51	37.05±3.9 [a*]	0.000

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Vitamin C (mg/dL)	1.3±0.2	0.45± 0.05 [a*]	0.000
Vitamin E (µg/dL)	9.8 ± 1.1	4.3±0.4 [a*]	0.000
IMA (OD units)	0.29±0.01	0.18±0.01 [a*]	0.000

Each value is expressed as mean ± SD for thirty patients in each group.

a: as compared with control

Statistical significance: [*] p<0.001; [@] p<0.01; [#] p<0.05.

Table.1. shows that Ischemia Modified Albumin levels were found to be significantly decreased in hypothyroid patients (0.18±0.01 OD units) when compared to healthy controls (0.29±0.01 OD units) (p=0.00). Ischemia modified albumin was negatively correlated with TSH levels (r = -0.564, p < 0.001), and positively correlated with FT4 and FT3 levels (r = 0.517, p < 0.001 and r = 0.315, p = 0.000, respectively).

Antioxidants like Vitamin C and Vitamin E levels were found to be significantly decreased in hypothyroid patients.

VI. DISCUSSION

Vitamin C is one of the antioxidant vitamins. Therefore, it can promote thyroid health by reducing the oxidative stress placed on the gland either by foreign toxins and harmful free radicals or from the reactive oxygen species produced during the synthesis of thyroid hormones. The free radicals and reactive oxygen species produced caused significant damage to the thyroid and reduced thyroid hormone production. However, the feedback mechanism controlling thyroid functioning increased the production of TSH to stimulate the thyroid to secrete more hormones even though the thyroid was too damaged to respond.

The major antioxidant that protects the cell is vitamin E. In addition to its antioxidant properties vitamin E also functions as a biologic response modifier influencing the production of second messengers and products of arachidonic acid cascade which have profound effect on cell proliferation.

Serum IMA initially emerged as a marker of ischemia thought to be of possible use in the identification of acute coronary syndromes. However, IMA is not specific to be heart, IMA levels have also been shown to rise in conditions such as pulmonary embolism, cerebral ischemia, diabetic ketoacidosis, chronic kidney disease and liver disease[8].

Hypothyroidism is associated with atherosclerosis and a chronic ischemia process. Hypothyroidism is also related to atherosclerotic disorders and oxidative damage[9]. Ma SG et al[10] have detected that flow- mediated dilatation of the branchial artery, which is a surrogate marker for coronary artery endothelial function is decreased in patients with hypothyroidism. The degree of atherosclerosis has been reported to rise independent of age, sex or other risk factors in hypothyroid patients. The present study showed decreased levels of IMA in hypothyroid patients as compared to healthy controls.

VII. CONCLUSION

From the study we can conclude, decrease in Vitamin C, E and IMA levels may be due to the consequence of oxidative stress and ischemia which is prevailing in hypothyroidism status.

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