

A Descriptive Comparative Study of Evaluation of Ischemia Modified Albumin and Its Relationship in Hyperthyroidism

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Abstract

Introduction: Ischemia modified albumin (IMA) is a biomarker the levels of which increase secondary to myocardial and skeletal muscle ischemia, and which is measured by the albumin cobalt binding test. IMA levels can also increase in diseases in which oxidative stress is elevated, including obesity, type 2 diabetes mellitus (DM), hypercholesterolemia, preeclampsia and polycystic ovary syndrome. Androgenetic alopecia (AGA) is the most important cause for hair loss in men.

Materials and Methods: A descriptive, comparative study was done with 30 newly diagnosed hyperthyroid patients with elevated T3, T4 values, and decreased TSH values were considered as cases, and 30 age and sex matched individuals with normal thyroid function tests were considered as controls. Thyroid profile was done by Enzyme linked immunofluorescent assay and IMA was estimated by colorimetric methodology.

Results: Individuals with normal thyroid function tests i.e. T3 (0.9-2.3nmol/L), T4 (60-120nmol/L), TSH (0.25-5μIU/mL) were considered as controls. The cases were selected from the medicine outpatient department after being investigated for hyperthyroidism for the first time. 23 females and 7 males were selected in our study as cases between the age group 35 to 55 years. 30 age and sex matched individuals as Controls were selected based on the thyroid function tests which were under the normal limits. Patients with history of chronic smoking; alcoholism; diabetes mellitus; liver, kidney, cardiac, endocrinal and immunological diseases were excluded in both the groups. Sample size was considered as per the convenience.

Conclusion: Our study concludes that an elevated level of IMA is seen in hyperthyroidism, which may be due to oxidative stress and ischaemia which is prevailing in hyperthyroidism status. Major limitation of this study is the small sample size. Studies with larger sample size are needed for further evaluation.

Key Words: Ischemia modified albumin, DM, AGA, hyperthyroidism

Date of Submission: 30-10-2019

Date of Acceptance: 18-11-2019

I. Introduction

Ischemia modified albumin (IMA) is a biomarker the levels of which increase secondary to myocardial and skeletal muscle ischemia, and which is measured by the albumin cobalt binding test. IMA levels can also increase in diseases in which oxidative stress is elevated, including obesity, type 2 diabetes mellitus (DM), hypercholesterolemia, preeclampsia and polycystic ovary syndrome. Androgenetic alopecia (AGA) is the most important cause for hair loss in men. There is an important link between hair and identity as well as social life, mood and self-confidence of the individual. Hair loss makes individuals feel older and unconfident. The history of hair loss dates back 4.000 years. To date, various ethnic and familial factors, diseases and hormones have all been held responsible for the disease etiology.

Oxidative stress is known to cause cellular damage and aging. In this context, it is thought that there may be a relationship between oxidative stress and follicle miniaturization, which is the primary cause of AGA.

II. Materials And Methods

This study was conducted in the Department of Biochemistry, Siddhartha Medical College, Vijayawada from January 2018 to December 2018. A descriptive, comparative study was done with 30 newly diagnosed hyperthyroid patients with elevated T3, T4 values, and decreased TSH values were considered as cases, and 30 age and sex matched individuals with normal thyroid function tests were considered as controls. Thyroid profile was done by Enzyme linked immunofluorescent assay and IMA was estimated by colorimetric methodology.

III. Results

Individuals with normal thyroid function tests i.e. T3 (0.9-2.3nmol/L), T4 (60-120nmol/L), TSH (0.25-5µIU/mL) were considered as controls. The cases were selected from the medicine outpatient department after being investigated for hyperthyroidism for the first time. 23 females and 7 males were selected in our study as cases between the age group 35 to 55years. 30 age and sex matched individuals as Controls were selected based on the thyroid function tests which were under the normal limits. Patients with history of chronic smoking; alcoholism; diabetes mellitus; liver, kidney, cardiac, endocrinal and immunological diseases were excluded in both the groups. Sample size was considered as per the convenience.

Under aseptic measures, blood sample was drawn and was used for analysis of thyroid profile and serum IMA levels. Bar-Or et al method was used for estimation of IMA levels. 200µL of serum is incubated with 50µL of 0.1% cobalt chloride in water for 10min. at room temperature for adequate cobalt-albumin binding. 50µL of dithiothreitol (DTT) was used for colorizing the reaction for 2min. before quenching with 1mL of 0.9% NaCl. The absorbance (Optical density) was measured at 470nm. Colour development with DTT was compared with serum-cobalt blank without DTT and expressed as OD units. Thyroid profile analysis was done by ELFA (Enzyme linked immunofluorescent assay) methodology. Reference range of different parameters are IMA (0.25-0.32OD units), FT3 (4-8.3pmol/L), FT4 (9-20pmol/L).

S.No	Parameter	Cases (35)	Control (35)	P-value
1	Age (years)	46.21 ± 4.21	46.01 ± 3.253	
2	IMA (OD units)	0.72 ± 0.11	0.29 ± 0.01	0.001
3	T3 (nmol/L)	4.37 ± 0.92	1.62 ± 0.37	0.001
4	T4 (nmol/L)	255.5 ± 70.43	90.35 ± 15.46	0.001
5	TSH (µIU/mL)	0.03 ± 0.01	3.25 ± 0.67	0.001
6	FT3 (pmol/L)	8.15 ± 3.18	4.34 ± 0.35	0.001
7	FT4 (pmol/L)	24.13 ± 14.65	17.24 ± 1.34	0.001

Table 1: Laboratory Parameters

Ischaemia Modified Albumin levels were found to be significantly increased in hyperthyroid patients (0.72 ± 0.11 OD units) when compared to healthy controls (0.29 ± 0.01 OD units) ($p=0.00$).

IV. Discussion

From the study, we can see that IMA levels are significantly elevated in hyperthyroid patients as compared to healthy controls (0.72 ± 0.11) (p value-0.001). Ischaemia Modified Albumin (IMA) is considered as one of the marker of ischaemia/reperfusion injury in clinical conditions which include ischaemic 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 ischaemic environment, structure of albumin N-terminus is changed such that it can no longer bind to metal ions.

Hyperthyroidism is a clinical condition characterized by excess secretion of thyroid hormones (T3, T4) by thyroid gland with decreased TSH values. It is more common in females than males with sex ratio of up to 5:1. It is a hyper metabolic state known for high level of oxidation and ischaemic events leading to alteration in the albumin interaction site with metal ions. Studies have shown that hyperthyroidism can aggravate neurological damage due to cerebral ischaemia and modulates the outcome of ischaemic reperfusion injury. Free thyroid hormone levels are found to be elevated in ischaemic stroke patients. Sheu et al found that the complications of ischaemic stroke were 1.44 times greater in hyperthyroidism patients. IMA has been considered as biochemical marker for the myocardial ischaemia and coronary vasospasm. It has been proved in literature that IMA is a marker of oxidative stress, hence the increased IMA levels in hyperthyroidism points towards oxidative stress which could be due to production of reactive oxygen species as a result of ischaemia/reperfusion injury.

V. Conclusion

Our study concludes that an elevated level of IMA is seen in hyperthyroidism, which may be due to oxidative stress and ischaemia which is prevailing in hyperthyroidism status. Major limitation of this study is the small sample size. Studies with larger sample size are needed for further evaluation.

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Dr. Gurinda Palli Jyothi Swarna Laya Latha. "A Descriptive Comparative Study of Evaluation of Ischemia Modified Albumin and Its Relationship in Hyperthyroidism." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 11, 2019, pp 69-71.