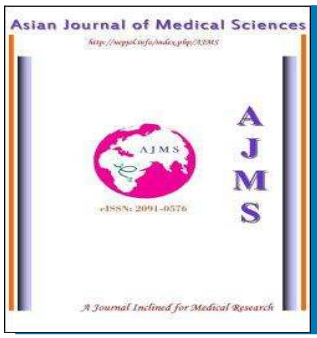

IMPACT OF ADIPOCYTOKINES-LEPTIN AND ADIPONECTIN ON THYROID STIMULATING HORMONE AMONG HYPOTHYROID PATIENTS

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"Impact of leptin and adiponectin on TSH in hypothyroid patients"

ABSTRACT

Background: Adipocytokines, secreted from the adipose tissues have profound effect on complex metabolic and endocrine functions. Among them, leptin and adiponectin are the most recognized molecules which influence body homeostasis and metabolism. Moreover, patients with thyroid disease usually exhibit disturbances of these metabolic activities. Thus adipocytokines and thyroid hormones may influence similar aspects of metabolic functions.

Objective: The main objective of current study was to evaluate the association and impact of leptin and adiponectin on thyroid stimulating hormone (TSH) among hypothyroid patients.

Materials and Methods: For the present study a total 350 individuals were enlisted, out of which 200 were hypothyroid patients and 150 age and sex matched healthy controls aged ≥ 12 years. The serum TSH, leptin and adiponectin concentration were measured by CLIA method and results were computed by statistical methods such as mean, standard deviation, standard error and correlation using MS-Excel 2007.

Result: Our data showed that hypothyroidism was more prevalent in the age group 30-50(62%) and an elevated TSH level was observed with advancing age among the patients as compared to controls. The inverse relation of leptin and adiponectin has been seen among the patients. When patients were compared with controls, they were with normal values which were in the range of standardized lab values leptin (3.7-13ng/dl) and adiponectin (5-10µg/ml).

Conclusion: In conclusion, our data interpreted variations in the level of leptin and adiponectin among the hypothyroid individuals with high TSH level. As abnormal levels of these adipocytokines indicates the risk for other metabolic diseases like cardiovascular disease, obesity etc.

Keywords: Adipocytokine, Adiponectin, Leptin, Thyroid Stimulating Hormone (TSH), Chemi luminescent Immunoassay (CLIA).

INTRODUCTION

Adipocytokines or adipokines are bioactive product secreted by adipose tissues which regulate body homeostasis such as energy expenditure, thermogenesis, and metabolic efficiency. Leptin and adiponectin are recently discovered adipocytokines which act as mediators in metabolic regulation of our body.[1]

Leptin is a protein hormone encoded by the obesity gene (ob) acts as neurotransmitters to brain to maintain body weight. It is majorly produced from white adipose tissue, but can also be produced by other tissues like placenta, ovary, mammary epithelial cells, hypophysis, stomach, and liver. The normal level of leptin in female is 7-13ng/dl and in male is 1-5ng/dl. Its concentration increases in obesity, Type 2 diabetes mellitus, hypertension and metabolic syndrome.[2] Whereas adiponectin is a unique adipokine secreted by adipocytes has anti-atherogenic, anti-inflammatory and insulin sensitizing properties. Clinically normal range of plasma adiponectin is 5-10µg/ml. Its concentration is decreased with obesity, non-insulin dependent diabetes mellitus insulin resistance and dyslipidaemia.[3]

Thyroid hormones are also crucial for the regulation of total energy consumption and body composition besides their roles in normal growth, development, and reproduction. The normal levels of these hormones i.e. T_3, T_4 and TSH are in the range of 0.87-2nmol/L, 6.09-12.23nmol/L and 0.34-5.6µIU/L respectively. Hypothyroidism and hyperthyroidism are associated with thyroid dysfunction. Clinical presentations are most commonly for hypothyroid and goiters and infrequently for hyperthyroidism. [4]

Because of their similar effects on metabolism, thyroid hormones, leptin and adiponectin are believed to be associated with each other. A few studies suggest that leptin has stimulatory effects on release of TSH.[5,6] Leptin promotes in vitro thyroid releasing hormone (TRH) biosynthesis through the action of TRH neurons which in turn is signals for TSH production.[7,8] Adiponectin and thyroid hormones share some physiological action such as reduction of body fat by increasing thermogenesis and lipid oxidation. Hence it has been speculated that adiponectin might participate in the regulation of thyroid hormone production.[9,10,11] In case of adiponectin the levels were high in hyperthyroidism and low in hypothyroidism.[12,13,14] The current study was undertaken to observe the association of leptin and adiponectin on TSH levels in hypothyroid patients.

MATERIALS AND METHODS

The current study was conducted on 350 subjects of which 200 were hypothyroid patients from Visakha Steel General Hospital and King George Hospital (KGH), Visakhapatnam and 150 age sex matched healthy individuals have been included as controls from the same area of Visakhapatnam. Patients were selected in the age range of 10-80 years old. We have included only females due to their high frequency than that of males and all the patients were under medications. We have excluded the females below the age of 12 years. The study was approved by the authorities of Andhra University and King George Hospital Ethical committees. Blood samples (5ml) were drawn in the morning after an overnight fast from all the subjects. It was centrifuged immediately and serum was stored at 25°C. Serum leptin and adiponectin levels were determined by enzyme linked immunosorbent assay method using ready kit of Leptin ELISA (Diagnostics Biochem Canada Inc.) and AviBion Human Adiponectin ELISA kit (Orgenium Laboratories Business Unit, Finland) respectively. The clinical analysis was done in the department of Human Genetics, Andhra University and TRIMS (Translational Research Institute of Molecular Sciences), Visakhapatnam. The parameters involved in this study were expressed as mean and standard deviation. For all tests, a $p<0.001$ considered as statistically significant. Correlation analysis was performed by Pearson's correlation coefficient. For all the analyses we have used MS-Excel 2007.

RESULTS

The data collected along with the blood samples through prescribed proforma consisting of both demographical and clinical information from the hypothyroid patients and healthy controls.

The mean and standard deviation of thyroid profiles (T3, T4 and TSH) among the patients and controls were given in Table-1 and 2 respectively. Hypothyroidism was most prevalent in the age group of 30-50 years (62%)

Table.1 Distribution of mean and standard deviation of T_3, T_4 AND TSH among patients

Age	No	T_3			T_4			TSH		
		$\bar{x}$	SE	σ	$\bar{x}$	SE	σ	$\bar{x}$	SE	σ
10-20	08	1.25	0.95	0.26	9.65	0.58	1.64	6.5	0.78	2.20
20-30	24	1.22	0.19	0.09	9.08	0.66	3.21	18.13	7.93	38.32
30-40	62	1.21	0.19	0.15	9.53	0.39	3.09	15.99	2.92	23.01
40-50	61	1.70	0.23	1.77	9.87	0.30	2.36	14.97	0.73	36.4
50-60	23	1.27	0.04	0.18	9.36	0.40	1.91	18.23	1.09	41.86
60-70	14	1.21	0.04	0.16	10.52	0.42	1.57	41.2	15.83	59.26
70-80	08	1.35	0.78	0.22	9.5	0.57	1.62	6.10	2.05	5.80
Total	200	1.37	0.07	1.01	9.64	0.18	2.59	16.67	2.41	34.06

Table. 2 Distribution of mean and standard deviation of T_3, T_4 and TSH among controls

Age	No	T_3			T_4			TSH		
		$\bar{x}$	SE	σ	$\bar{x}$	SE	σ	$\bar{x}$	SE	σ
10-20	05	1.25	0.12	0.27	6.74	0.19	0.44	1.96	0.22	0.48
20-30	18	1.06	0.10	0.43	6.86	0.14	0.61	2.34	0.26	1.12
30-40	51	1.28	0.04	0.31	6.82	0.08	0.54	1.94	0.07	0.52
40-50	50	1.10	0.56	0.39	6.63	0.06	0.43	1.60	0.07	0.49
50-60	14	1.38	0.07	0.27	6.87	0.11	0.39	1.82	0.15	0.54
60-70	07	1.01	0.09	0.24	6.91	0.56	1.47	2.19	0.13	0.34
70-80	05	0.97	0.22	0.48	6.52	0.14	0.31	1.92	0.66	0.15
Total	150	1.18	0.03	0.37	6.76	0.05	0.57	1.88	0.05	0.64

Table. 3 Correlation of TSH and Leptin among patients and controls

Subjects	Patients		Controls	
	TSH	LP	TSH	LP
$\bar{x}$	16.67	82.78	1.87	2.33
σ	34.06	68.00	0.64	0.50
R	-0.114		0.081	

Table.4 Correlation between TSH and adiponectin among patients and controls

Subjects	Patients		Controls	
	TSH	ADP	TSH	ADP
$\bar{x}$	16.67	0.42	1.87	3.85
σ	34.06	0.58	0.64	6.85
R	-0.159		-0.016	

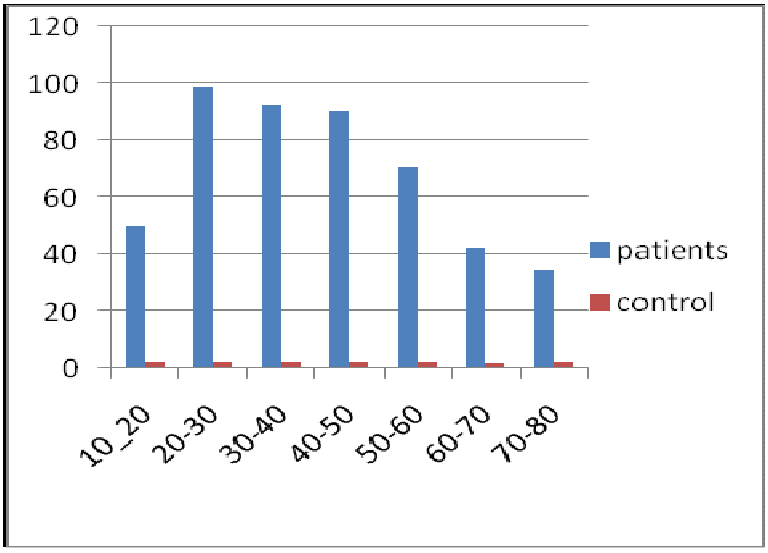

Figure 1. Leptin concentration among the patients and controls

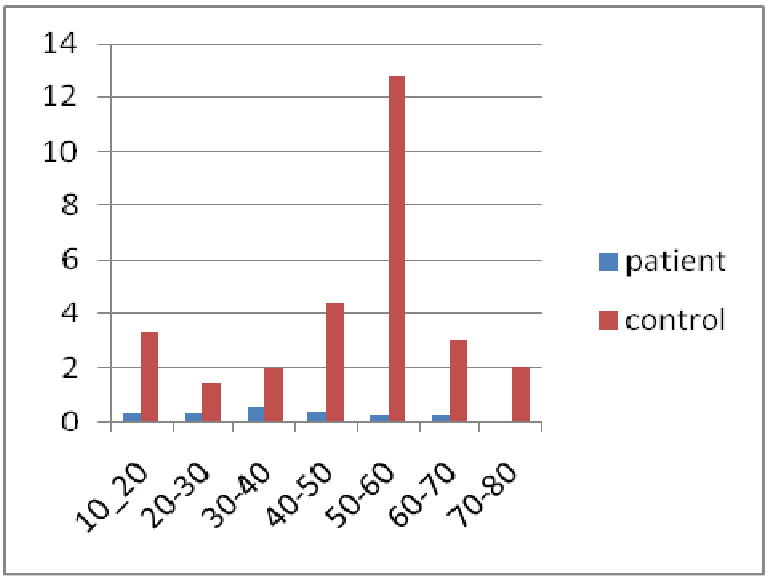

Figure 2. Adiponectin concentration among the patients and controls

than in any other age group. It was also observed that increased TSH levels among patients at the age group of 60-70 years (41.2µIU/L). Control group showed the normal values for thyroid profiles (T_3-1.18 nmol/L, T_4-6.76nmol/Land TSH-1.88µIU/L).

Leptin and adiponectin were measured through kit method. The significant difference in mean score of leptin (ng/dl) among patients (82.78) and controls (2.33) were shown in Table-3. According to Figure.1, the concentration of serum leptin was more in patients than that of control group and the rise in the concentration of leptin (ng/dl) was observed in patients of 20-50 years(93.3) and in later age it declined (50.3). In addition to this Table. 3 also showed that the affect of the TSH on leptin was negatively correlated among the patients and positively correlated to controls.

The mean score of adiponectin (µg/ml) was 0.42 and 3.85 in patients and controls respectively (Table-4). Figure.2 depicted that adiponectin concentration was in lower range in hypothyroid patients among post menopausal females of 50-70 years (0.35). Both TSH and adiponectin were negatively correlated in patients and controls.

DISCUSSION

Leptin and adiponectin were considered to be the upcoming research material and many research work has been going on different aspects with different population of various countries and worldwide. But the population of north coastal Andhra Pradesh is still deprived of such experimental work. In this view, we have selected the population of north coastal Andhra Pradesh as the current study area to observe the impact of leptin and adiponectin on TSH levels in hypothyroid patients. Our result demonstrated that hypothyroidism was found to be more prevalent in female within age group 30-50 years and elevated TSH levels were observed in elderly subjects of 60-70 years. An elevated TSH level with advancing age was also observed in otherstudies.[15,16,17] This raise in TSH was may be due to factors such as hormonal imbalance, metabolic disturbances and stress during the post delivery and post menopausal phase of life.In this study the leptin concentration was higher in age of 20-50 years i.e luteal phase of menstrual cycle where as it's showed a decline after 50 years which was considered to be menopausal phase. Similar trends have been observed in few studies.[18,19] According to data, TSH was negatively correlated with leptin in patients. Similar findings were reported by few authors who demonstrated that thyroid hormones have a negative effect on leptin secretion in vitro; [20, 21&22] thus leptin levels should be expected to be low in hyperthyroidism and high in hypothyroidism, but the data in literature are contradictory. [23,24,25]

In the present study adiponectin levels were showing lower values among hypothyroid patients than that of controls. In hypothyroidism reduced levels of adiponectin has been shown by Dimitriadis et al whereas no significant differences was found by Christina et al. [26,27]

CONCLUSION

In conclusion, our data show that this imbalance in the levels of the adipocytokines can in turn make the hypothyroid individual at the risk of different metabolic syndromes or diseases like diabetes, cardiac related disease etc.Hence in view of this the clinicians should advice the hypothyroid patients to take preventive steps to overcome these risk factors to lead a healthy and happy life as early as possible.

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Authors Contributions:

P E: Concept , design of the study ,literature search, data and sample collection and Laboratory work.

BDP: Concept, design of the study, Statistical analysis, interpretation and manuscript preparation .

GS: Concept ,Design of the study and result analysis and interpretation .

GP: Concept of the study and guided during the work.

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