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CORRELATION OF SERUM LEPTIN LEVELS WITH BODY MASS INDEX (BMI) IN PATIENTS WITH THYROID DISORDERS

Biochemistry

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ABSTRACT

The two most common thyroid diseases are hypothyroidism and hyperthyroidism. Leptin is one of the most important adipose derived hormones. Leptin carries the message that fat reserves are sufficient. BMI represents an index of an individual's fatness. Serum immunoreactive leptin levels show a strong positive correlation with body fat and Body Mass Index. The hospital based case-control study was conducted on 80 individuals including 50 known cases of thyroid disorders and 30 age and sex matched controls. Blood samples were estimated for serum leptin levels. BMI was measured using Quetelet's index.The correlation between S. Leptin and BMI was positive in both in study as well as control group .On statistical analysis, p value came out to be extremely significant both in study and control group. Clinician should be particularly alert to the possibility of thyroid dysfunction in obese patients.

KEYWORDS

Bmi, Leptin, Thyroid Disorders.

INTRODUCTION

Leptin, the ob gene product is a peptide hormone, secreted by adipocytes.[1] It circulates at levels proportional to body fat. Leptin enters the central nervous system in proportion to plasma concentration. It controls food intake and energy expenditure by acting on receptors in mediobasal hypothalamus.[2] Leptin acts as part of a feedback loop to maintain constant stores of fat. A loss of body fat (starvation) leads to a decrease in leptin, which in turn leads to a state of positive energy balance wherein food intake exceeds energy expenditure. Conversely, an increase in adiposity leads to an increase in the levels of leptin and a state of negative energy balance, with energy expenditure exceeding food intake. [3] BMI is the currency by which we define the obesity issue throughout the Western world. The common interpretation is that it represents an index of an individual's fatness.[4]

Thyroid hormones increase the Basal Metabolic Rate (BMR) (a measure of O_2 consumption) in virtually all tissues of the body. [5] Thyroid Hormones which increase the basal metabolic rate and thermogenesis, have been reported to be one of leptin's regulating factors because alterations of thyroid status might lead to compensatory changes in circulatory leptin. [6] Furthermore, serum immunoreactive leptin levels show a strong positive correlation with body fat and Body Mass Index.[7] Although leptin is a circulating signal that reduces appetite, obese individuals generally exhibit an unusually high circulating concentration of leptin.[8] It was concluded that hyperthyroidism is characterized by the decreased fat mass and serum leptin levels whereas in hypothyroidism there is increased fat mass and serum leptin levels.

MATERIAL AND METHODS:

The hospital based case-control study was conducted in the department of Biochemistry in a tertiary care centre .The study comprises 80 individuals including 50 known cases of thyroid disorders (hypothyroidism and hyperthyroidism), most of which were middle aged females with rural background and 30 age and sex matched controls.

EXCLUSION CRITERIA

- History of any drug intake
- History of any infection/illness
- Pregnant females
- Diabetic Patients
- Cancer including thyroid cancer

INCLUSION CRITERIA FOR CASES

- Clinically diagnosed patients with thyroid disorders like :
  - Hypothyroidism
  - Hyperthyroidism
  - Thyroid nodule
  - Thyroiditis

INCLUSION CRITERIA FOR CONTROLS

- Age and sex matched healthy individuals.
- Fasting plasma glucose levels should be normal.
- No family history of any thyroid disease.

METHODOLOGY:

3ml of blood was taken after cleaning the venepuncture site with spirit swab using dry autoclaved glass syringe under aseptic conditions. Serum was then separated by centrifugation at 3000rpm for 10 minutes. The serum was then analyzed for Serum leptin by AviBion Human Leptin ELISA Kit[9] and readings were taken on ELISA reader.

BMI was measured in these individuals using Quetelet's index.[10]

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

STATISTICAL ANALYSIS :

For comparing the two variables unpaired t test was used. Pearson's correlation was used to find out the correlation of leptin and BMI which was found extremely significant. All tests were performed at 5% level significance; thus a difference was significant if the value was less than 0.05(p value <0.05).

The following reference values were used for Serum leptin and BMI:

SERUM LEPTIN[11]

Men = 2000-5600 pg/ml
Women = 3700-11100 pg/ml

TABLE-1: Reference values of BMI[10]

BMI (kg/m^2)	Weight Status
Below 18.5	Underweight
18.5 - 24.9	Normal
25.0 - 29.9	Over Weight
30	Obese

RESULTS:

The data was analyzed thoroughly and following results were obtained:

TABLE-2: COMPARISON OF SERUM LEPTIN IN STUDY AND CONTROL GROUP

Hormone	Group	No. of Patients	Range	Mean±SD	P value
S. Leptin (pg/ml)	Study	50	744-29280	8078.1±6054.3	0.786 (NS)
	Control	30	1600-14600	7741.6±3929.47	

TABLE-3: COMPARISON OF BMI IN STUDY AND CONTROL GROUP

Parameter	Group	No. of Patients	Range	Mean±SD	p value
BMI (kg/m^2)	Study	50	16.33-35.55	24.91±5.01	0.211 (NS)
	Control	30	17.9-32.0	23.58±3.68	

TABLE-4: CORRELATION OF SERUM LEPTIN AND BMI IN STUDY AND CONTROL GROUP

Correlation	Group	r	df	p	S
S. Leptin and BMI	Study	0.781	48	<0.0001	Extremely Significant
	Control	0.863	28	<0.0001	Extremely Significant

TABLE-5 LEPTIN LEVELS (, or NORMAL) IN STUDY GROUP ON THE BASIS OF BMI

BMI (kg/m^2)	No. of Cases	Normal Leptin Levels		Increased Leptin Levels		Decreased Leptin Levels	
		No.	%age	No.	%age	No.	%age
Below 18.5 (Under weight)	7	1	14	-	-	6	86
18.5-24.9 (Normal)	19	10	53	1	5	8	42
25.0-29.9 (Overweight)	14	4	29	7	50	3	21
30 (Obese)	10	-	-	10	100	-	-

As evident from the Table-2, the mean value in case of study group was 8078.1±6054.3pg/ml whereas it was 7741.6± 3929.47pg/ml in case of control group. On statistical analysis, the difference was found to be non significant (p =0.786) among the two groups.

Table-3 shows that mean in the study group was 24.91±5.01 kg/m^2 and in the control group was 23.58±3.68 kg/m^2. On statistical analysis, the difference was found to be non significant (p =0.211).

Table-4 shows the correlation between S. Leptin and BMI was positive in both in study as well as control group with r values 0.781 and 0.863 respectively.On statistical analysis, p value came out to be extremely significant both in study and control group (p <0.0001 for both).

Table-5 shows that the patients in the study group who were having BMI below 18.5 kg/m^2 were 7 in number. Out of those 7 patients, 1 (14%) patient was having normal leptin levels and 6 (86%) patients were having decreased leptin levels. 19 patients were having BMI in the normal range i.e. 18.5-24.9 kg/m^2. Out of these 19 patients, 10 (53%) patients were having normal leptin levels, 1 (5%) patient was having increased leptin levels and 8 (42%) patients were having decreased leptin levels. Patients in the overweight category i.e. BMI in the range of 25.0-29.9 kg/m^2 were 14 in number out of which 4 (29%) patients were having normal leptin levels, 7 (50%) patients were having increased leptin levels and 3 (21%) patients were having decreased leptin levels. Obese patients i.e. BMI 30 kg/m^2 were 10 in number and all the 10 (100%) patients were having increased leptin levels.

DISCUSSION:

In the present study (2012) correlation between serum leptin and BMI came out to be positive both in study (r=0.781) and control (r=0.863) group. The p value came out to be extremely significant (p<0.0001) (Table-3).

Another study by Sreenan et al[12] also gave positive correlation with highly significant p value (p=0.0002). Pinkney et al[13] and Al-shoumer et al[14] (2000) also gave positive correlation with significant p value (p=0.02 in both).

Asami et al[15] reported positive correlation with significant p value (p<0.01). Hseih et al[6] also gave significant correlation with p value (<0.05). Chow and Phoon et al[16] gave positive correlation with highly significant p value (p=0.000). Al Maskari and Alnaqdy[17] gave significant positive correlation (p=0.09), Sieminska et al[18] gave highly significant correlation between serum leptin and BMI (p <0.001) and Azza M Abdu Allah et al[19] also supported the present study by giving positive correlation between S.leptin and BMI and also significant p value.

So from the above discussion it was concluded that the correlation of serum leptin and BMI in the present study was in accordance with the other previous studies.

CONCLUSION:

There was significant correlation of S. leptin and BMI, which gives the reason why some of the control obese subjects had increased leptin levels. So clinician should be particularly alert to the possibility of thyroid dysfunction in obese patients and measurement of serum leptin levels should be added in the investigation protocol of thyroid patients.

DECLARATIONS:
FUNDING : Nil
CONFLICT OF INTEREST: Nil
ETHICAL APPROVAL: The study was approved by Institutional Ethics Committee.

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