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Original Research Paper

Gender Differences in Circulating Leptin Levels and It's Association with Adiposity

BIOCHEMISTRY

KEYWORDS : Leptin, body fat percentage, gender, Kerala

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ABSTRACT

The aim of this study was to evaluate the gender difference in serum leptin level among apparently healthy adult population in Kerala. 149 males and 155 females in the age group of 20-60years were evaluated using adiposity indices;Body Mass Index, Waist Hip Ratio and Body Fat percentage. Serum leptin levels estimated by sandwich ELISA showed a significant difference among the study groups and associated with body fat percentage. Circulating leptin level were significantly higher in females than males, irrespective of whether they are lean or obese. Elevated leptin levels are significantly correlated with adiposity measures.There is a significant gender difference in serum leptin level among the adult population in Kerala.

Introduction

Leptin, a 16kD cytokine protein secreted by adipose tissue as the product of '*ob*' gene located on chromosome 7 in humans, plays a key role in the regulation of appetite, glucose homeostasis and body fat[1].The primary physiological role of leptin is to communicate with the central nervous system about the abundance of available energy stores and to check food intake, induce energy expenditure and decrease body weight[2].The secretion of leptin is influenced by many hormonal and metabolic factors[3]. Many studies reported that leptin levels are influenced by different factors such as adipose tissue mass, waist circumference, BMI, insulin etc.and mainly regulated by the percentage of body fat.[4] Men and women are different in terms of body composition and fat distribution. Women have more body fat than men; while men have more muscle tissue. In addition to this, men have more visceral fat and women have more subcutaneous fat[5].

Recent studies point out the clinical utility of leptin as a biomarker of obesity. Obese subjects typically have elevated leptin levels[6,7]while leptin levels decrease considerably during weight loss[8].Kerala ranks second only to Punjab in the incidence of obesity among the Indian states[9]. Eventhough, hyperleptinemia has been reported among the obese subjects in Kerala, the gender difference in serum leptin levels has not been studied. Here we analysed the significant variation in leptin level with respect to gender and its association with other indices of obesity such as BMI, WHR and body fat percentage in an apparently healthy adult population in Kerala.

Subjects and methods

The study group consists of 149 males and 155 females in the age group of 20-60 years. Anthropometric measurements such as height, weight, waist and hip circumferences were done by standard techniques and BMI, waist to hip ratio and body fat percentage[10] were calculated by standard formula. An in vitro sandwich ELISA10 (DRG instrument, Germany) was employed for the quantitative measurement of human leptin in serum. Analysis of data was done by using SPSS version 17.Data was expressed as mean ±SE. $p<0.05$ was considered to be statistically significant. Student's t-test was used to examine gender differences in serum leptin levels and its association with measures of adiposity. Males and females were grouped[11] in to obese and non obese based on BMI with a cut off value of 25, to analyse the significance of gender difference of serum leptin among obese and non-obese women with that of men. Pearson's correlation was used to analyse the relation of serum leptin with measures of obesity.

Results

Anthropometric measurements and serum leptin of the study groups are shown in Table1. There was no significant difference in the age among either gender. Despite the fact that women displayed higher body fat percentage than men, no significant gender difference was observed in WHR and BMI. However plasma leptin concentrations were more than two times higher in women than in men. Based on BMI with a cut off value of 25, the male group consist of 74 obese and 75 non- obese subjects. Female group has 78 obese and 77 non- obese subjects.

The mean serum leptin concentration was much higher in the obese and non-obese women (75.25 ng/mL and 22.03 ng/mL respectively) than in men of both categories (33.4 ng/mL and 7.2 ng/mL respectively)(Table 2). Graph 1 displays the comparison of increase in serum leptin level in obese and normal women than the corresponding men.

Table 3 shows the results of Pearson's correlation analysis. In both men and women, plasma leptin levels showed strong correlation with measures of adiposity except WHR. At the same time height showed a negative correlation with serum leptin level but was not statistically significant.

Discussion

Significant increase in serum leptin level observed in both obese and non-obese women compared to men in both categories. This is in agreement with recent study of Kazmi et al.12

Our data indicates that body fat percentage is a major determinant of serum leptin level, which is higher in women than in men with no significant difference in BMI. This is

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in agreement with Rosenbaum et al. 13. Studies reported that there are regional variation in leptin secretion;the rate is higher in subcutaneous than visceral adipose tissue14. Men have more visceral fat and women have more subcutaneous fat.6

Waist circumference is the best overall predictor of visceral adiposity15. In the present study, the mean value of waist circumference was high in men, eventhough there is no statistically significant difference between men and women. So it is clear that visceral adiposity has no role in the elevation of leptin level. Asian Indians have an unexpectedly high percentage of body fat relative to BMI and muscle mass, which is associated with a proportional increase in visceral fat14. In women, higher leptin levels are associated with larger adipocytes and subcutaneous but not visceral fat16which is further supported by other studies reporting that leptin expression is significantly higher in subcutaneous adipose tissue than visceral adipose tissue17,18.

Serum leptin level showed a strong positive correlation with measures of adiposity except for height. This is in agreement with many recent studies19, 20.

Gender difference in circulating leptin levels explain why most women have a higher body fat content than do men.

Conclusion:

Circulating leptin level were significantly higher in females than males,whether lean or obese. Age had no significant relation with serum leptin level in both males and females in this age group. Body fat percentage acts as a major determinant of serum leptin level which is ultimately depends on the distribution of body fat. Visceral adiposity expressed in terms of waist circumference might not have much influence in the elevation of serum leptin level.

1.

Table 1: Comparison of study variables between male and female groups

Study variable	Males(n=149)	Females (n=155)	't' value	'p' value
Age (yrs)	40.5 ± 0.9	38.45 ± 0.88	0.05	NS
Height (cm)	168.6 ± 0.55	155.9 ± 0.52	8.01	<0.001
Weight (cm)	71.4 ± 1.03	61.3 ± 0.93	2.15	<0.05
BMI (kg/m^2)	25.1 ± 0.33	25.25 ± 0.38	0.403	NS
Waist (cm)	92.6 ± 0.86	88.87 ± 1.05	0.003	NS
Hip (cm)	98.2 ± 0.75	97.4 ± 0.93	0.243	NS
WHR	0.94 ± 0.004	0.91 ± 0.005	1.38	NS
BF%	24.79 ± 0.52	38.02 ± 0.57	7.32	<0.001
Leptin(ng/ml)	19.29 ± 2.35	48.76 ± 3.6	3.16	<0.001

Data expressed as mean ± SE.BMI-Body Mass Index, WHR-Waist to hip ratio, BF% - Body fat percentage

Table 2. Comparison of serum leptin level(ng/ml) in both non obese and obese study groups

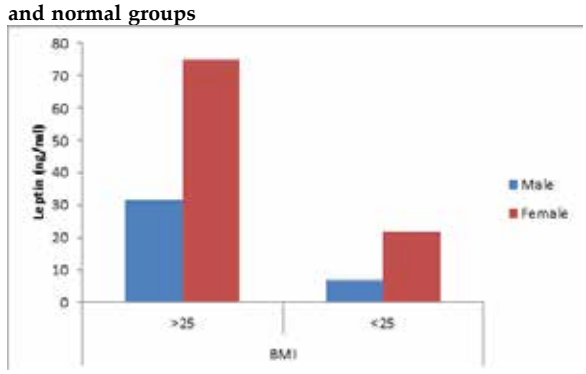
Gender	Male	Female	't' value	'P' value
Obese	33.36 ± 3.88 (n=74)	75.25 ± 5.15 (n=78)	6.75	P<0.001
Non-obese	7.2 ± 1.8 (n=75)	22.03 ± 2.66(n=77)	4.58	P<0.001

Data expressed in Mean ± SE. Obese (BMI>25) Non-obese (BMI<25)

Table 3: Correlation of Leptin with adiposity measures

Study variable	Males(n=149) 'r'	'p' value	Females (n=155) 'r'	'p' value
Height (cm)	-0.018	NS	-0.152	NS
Weight (cm)	0.536	P<0.001	0.563	P<0.001
BMI	0.585	P<0.001	0.627	P<0.001
Waist (cm)	0.526	P<0.001	0.622	P<0.001
Hip (cm)	0.481	P<0.001	0.589	P<0.001
WHR	0.226	P<0.02	0.282	P<0.01
BF%	0.506	P<0.001	0.590	P<0.001

Graph 1 : comparison of leptin with gender in both obese and normal groups



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