



SERUM ADIPONECTIN AS A BIOMARKER OF ETHNIC HETEROGENEITY IN INDIAN SUBJECTS

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ABSTRACT:

Objectives: Ethnic heterogeneity is reported to be one of the causes of variation regarding the effect of obesity as a risk of chronic diseases. Indians with their unique ethnic background may prove to be good subjects of study to demonstrate whether serum adiponectin level could act as a marker of ethnic diversity. **Materials and Methods:** Among the 1500 Local Indian subjects who came for medical check-up at Nalanda Medical College Hospital, Patna during 2014-2015, 300 subjects were taken for the study. They were divided into 2 groups: Group I-control subjects (n=150) and Group II-obese subjects (n=150). Serum adiponectin, leptin and resistin were measured by ELISA method. **Results:** In this preliminary study it was demonstrated that serum levels of adiponectin did not show marked difference between the two groups, controls and obese subjects ($p=0.28$). But the serum leptin level and resistin levels are higher in obese subjects ($p<0.001$) compared to control subjects. **Conclusion:** The result suggests that serum leptin and resistin levels are increased in obese subjects. The serum adiponectin level in Indian subjects is comparatively lower than those reported for western population. Therefore it appears that serum adiponectin may be considered as a marker of ethnic heterogeneity for obesity risk of metabolic disorders.

Keywords: Adiponectin, biomarker, body mass index, ethnic variation, waist circumference.

INTRODUCTION:

Variation in genetic make-up and ethnic heterogeneity result in variation in the effect of obesity as a major risk factor of chronic diseases in different populations. This is due probably to the difference in body habitus and the distribution of adipose tissue. For example Asians have a higher proportion of abdominal obesity

compared to other ethnic groups. That is why Asians carry higher risk for diabetes, hypertension and coronary vascular diseases at a lower level of body mass index (BMI) compared to other populations. [1, 2] Japanese are reported to carry twice the risk of developing diabetes at all levels of BMI compared to Caucasians.[3] This has created a need to identify a biomarker(s) for ethnic heterogeneity in the development of chronic diseases.

In this regard adipocytokines adiponectin, leptin and resistin are considered as potential candidates to delineate the mechanisms involved in such ethnic differences related to chronic diseases. It is demonstrated that adiponectin levels reflect visceral adiposity and leptin the subcutaneous one. It is also reported that serum adiponectin levels are lower in Chinese, Malay, Japanese, Koreans, south Asians compared to Caucasians [1-3]. There is another adipocytokine resistin which is related to adiposity. It is shown that resistin is present more in visceral adipose tissue compared to other fat depots and a diet rich in fat induces greater secretion of resistin. [4] Therefore, the adiponectin, leptin and resistin trio could be considered as biomarkers of ethnic heterogeneity.

Obesity is a major public health concern of India with higher prevalence of obesity related diseases hypertension, type 2 diabetes (T2DM) and coronary vascular disease. [5] Therefore, the present preliminary study was undertaken in Indian subjects with their unique ethnicity, life style and cultural habits to demonstrate whether such differences occur in serum adiponectin, leptin and resistin levels in relation to adiposity particularly visceral adiposity.

MATERIALS AND METHODS

Subjects:

Among the 1500 local Indian subjects who came for medical check-up at Nalanda Medical College Hospital, Patna, India during 2014-2015, 300 subjects were taken for the study. They were divided into 2 groups: Group I –control subjects (n=150) and Group II- obese subjects (n=150). Serum adiponectin, leptin and resistin were measured by ELISA method.

They were divided into two groups based on their Body Mass Index (BMI). Each group had 150 subjects. The first group's BMI was 27.5 kg/m². The second group consisted of 150 subjects whose BMI was 34.5 kg/m². Informed consent was taken from each participant and approval for the study taken from Institutional Ethics Committee.

Anthropometric measurements:

Height, weight and waist circumference were measured. The measurements and examinations were carried out by the same physician. BMI was calculated by the formula: Weight (kg)/Height² (m²). Normal BMI was taken as 18-25 kg/m². Patients with BMI values of 25-30 kg/m² were classified as overweight; and those with BMI \geq 30 kg/m² were considered obese.

Waist circumference (WC-cm) was measured parallel to the midpoint between the lower limit of the 12th costa and the ischial spine. The limits were accepted as >102 cm in men, and >88 cm in women (ATP: adult treatment panel III criteria). [6]

Sample collection:

Fasting blood samples were collected in vacutainer tubes .All biochemical variables were measured on the same day of the blood collection. Remaining serum specimens were stored at -20°C until analysis of adiponectin, leptin and resistin were carried out.

Biochemical Methods

Serum adiponectin levels were measured by enzyme linked immunosorbent assay (ELISA) with a sensitivity of 3 ng/ml. Serum leptin levels were measured by an active human leptin ELISA (DSL, Diagnostic System Laboratories, USA) with a sensitivity of 0.05 ng/ml. Serum resistin levels were measured by ELISA (Linco Research, USA) with a sensitivity of 0.16 ng/ml.

Statistical analysis

The Kolmogorov-Smirnov test was used to assess the normality of distribution of investigated parameters. All parameters in our study were distributed normally. Data were expressed as mean \pm standard deviation. Differences were tested by two-tailed t-test. The values $P < 0.05$ were considered statistically significant. Statistical analysis was done using SPSS for Windows (Statistical Package for the Social Sciences, version 20.0; SSPS Inc. Chicago, IL, USA).

RESULTS

The mean BMI in Indian adults is reported to be 27.7 kg/m² (26.4 kg/m² in men and 29 kg/m² in women), and the mean WC is 93.3 cm.[5] In the present study compared to other ethnic groups Indian Men and women have higher BMI and WC carrying higher risk for metabolic complications as well as for chronic diseases. The normal control group had higher BMI as well as higher waist circumference indicating both subcutaneous- and visceral fat are increased in the subjects studied. [Table 1]

DISCUSSION

Obesity is a major public health concern for India, as it is reported that about 20% of Indian adults are obese. About 44% of Indian adults are either overweight or obese, obesity progressively increasing with age, and two times more common among Indian women than men. [5]

Table 1: Serum Adiponectin, Leptin and Resistin levels in normal and obese Indians

Control normal (n=150)	Obese controls (n=150)	<i>P</i> -value	Adjusted <i>P</i> -value	
Body mass index(kg/m²)	27.5(25 to 30)	34.5 (30-35)	0.000	P<0.001
Waist circumference(cm)	104	112	0.000	P<0.001
Leptin, ng/mL	13.90 \pm 3.16	28.10 \pm 5.00	0.000	P<0.001
Adiponectin, μg/mL	2.01 \pm 1.05	1.92 \pm 0.75	0.18	P=0.28
Resistin, ng/mL	6.80 \pm 3.70	18.46 \pm 8.80	0.000	P<0.001

There was a significant increase in the levels of serum leptin and resistin levels in obese Indian subjects compared to the control Indian subjects as shown by this study. Serum levels of leptin and adiponectin has been reported to respond in a reciprocal manner to increase in adiposity. [9] The present study shows that serum leptin levels and resistin levels are significantly higher in obese subjects when compared to the control subjects. The increase in serum leptin levels in Indian obese subjects are quite similar to increases reported for obese subjects in other populations. There is considerable body of evidence to suggest that variation in adipose tissue distribution may be due to ethnic differences. Therefore ethnic heterogeneity may play a key role in adipose tissue distribution among different ethnic population which may be reflected by serum levels of adipokines. It appears that adiponectin concentrations may determine visceral obesity and leptin by subcutaneous tissue. [7] The increase in leptin levels followed by a lower levels of adiponectin

in Indian subjects may indicate that there is a greater subcutaneous as well as visceral adipose tissue deposition in the subjects studied.

Furthermore, lower adiponectin levels are found in the Indian subjects and the values appear to be quite similar the values reported for Chinese, Japanese, Korean, and South Asians compared to Caucasians (2 to 3ug/ml when compared to 9 to 12 ug/ml for Caucasians). [2, 3, 8] Therefore the preliminary findings suggest that ethnicity plays a role in adipose tissue distribution in local Indian subjects. Serum adiponectin levels possibly reflect such ethnic variation in adiposity and therefore could be considered as a biomarker for ethnic heterogeneity for obesity risk of metabolic disorders.

CONCLUSION

BMI and WC are higher for Indian subjects compared to other populations. Serum leptin and resistin levels are increased in obese Indian subjects. The serum levels of adiponectin did not show marked variation between the control and obese subjects. But the serum level of adiponectin appears to be low for Indian subjects compared to other Asian population. [8]

Further detailed study with respect to these biomarkers of obesity in diabetic and coronary artery disease patients are being carried out.

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