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Scenario of Anthropometric variables with Leptin in Diabetic Subjects free from Micro and Macro Vascular Disease.

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ABSTRACT

Increased amount of adipose tissue or its disproportionate distribution between central and peripheral body regions is related to the development of insulin resistance, type 2 diabetes mellitus. To assess the relationship of various anthropometric variables and leptin with the glycemic index intype 2 diabetic subjects who have still no developed any micro and macrovascular disease. A cross sectional study conducted in the Dakshina Kannada district of Karnataka region, which comprises of 229 diabetic subjects free from any micro and macro vascular disease, matched with the controls was recruited for the study. The demographic data show that the diabetic population had a higher weight, Waist Circumference (WC), Hip Circumference (HC) and leptin with regard to the normal subjects matched and were statistically significant between the groups. BMI showed no much variation between the groups. In diabetic study group the leptin showed positive correlation with all the anthropometric parameters like WC($r=0.198$, $p<0.01$), HC($r=.299$, $p<0.01$), BMI($r=.315$, $p<0.01$) and also with HbA1c($r=.269.p<0.01$). This correlation was lost in the normal study group. (Except for a weaker positive correlation BMI($r=.141$, $p<0.05$). Though the clinical appearance of vascular complications does not exist, the correlation between leptin and anthropometric variable clearly suggests that the positive link between obesity (inflammation) and metabolic syndrome exists even before the appearance of clinical manifestation of the vascular complications. This leads to increased inflammation, tissue injury and complications of obesity which is most predominant in diabetic state.

Keywords: Leptin, type 2 diabetes mellitus, anthropometric variables, micro and macro vascular disease.

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INTRODUCTION

Diabetes has now emerged as a multifactorial chronic disease characterized by hyperglycemia. Further, the action of insulin is impaired in the adipose tissue leading to insulin resistance which is most commonly seen in type 2 diabetes. The adipocyte of the adipose tissue is the most important resource of energy for the human body. Leptin, an adipokine is mainly an adipocyte-secreted protein. Shortly after the discovery of the protein, results of the research emerged out focused on the role of leptin in body weight regulation [1], thus aiming the pathophysiology of human obesity. Further, the role of leptin emerged as a regulator of food intake, energy balance, metabolic and neuroendocrine hormone [2]. Obviously, it is also involved in glucose metabolism, as well as in normal sexual maturation [3] and reproduction [4]. Further, the regulation of leptin by other hormones has also been explained [5]. The effects on different endocrine axes of leptin, mainly on the hypothalamic-pituitary-gonadal axis and on insulin metabolism [6] are mostly understood. Leptin may thus be considered a new endocrine mediator, besides its obvious role in body weight regulation, correlates strongly with percentage body fat in both genders [7].

Since leptin is an endocrine mediator of the body fat distribution, the obesity being a risk factor for diabetes and in turn for vascular complication, a relation of leptin with the anthropometric variables in diabetic person without any micro and macro vascular complications would ensure the understanding of the interdependence of leptin and vascular complications.

MATERIALS AND METHODS

This was a cross sectional study of 229 cases of type 2 diabetics and 205 healthy individuals of Dakshina Kannada district. The study population was aged between 30-70 years. Persons with a history of type 2 diabetes for at least one year, without any micro and macro vascular complications and on oral or on diet control were selected as the study group. Similarly, age and sex matched healthy individuals were selected as the control group. Criteria for inclusion should have been recognized as a diabetic for at least one year, should be on oral hypoglycemic drugs or diet control, free from diabetic neuropathy, nephropathy and retinopathy, free from any pre- existing cardio vascular disease, non-pregnant in case of females and free from usage of oral contraceptives. Relevant examination was done to establish the inclusion and exclusion criteria. Written informed consent was obtained from the selected subjects. 5 ml of blood in the fasting state was drawn and the separated serum was stored at -30^{o}C in the department of Biochemistry, Yenepoya Medical College and was used within 45 days for the estimation of Leptin with Ray biotech kit, using ELISA instrument. Anthropometric variables like height, weight, waist circumference (WC), Hip circumference (HC) and BMI were measured as per the standard procedure. Measurements of the weight to the nearest 0.1 kg by a weighing machine and height to the nearest of 0.1 cm by an anthropometer rod were done. BMI was calculated as weight (in kg) divided by height in meter square. HbA1c was done by immunoturbidometric technique in fresh fasting samples by Thyrocare technologies Limited. The results were analyzed using SPSS 10.0.Student's unpaired 't' test was

used to compare between the two groups and Pearson's correlation was used to find the correlation between the subjects. P value <0.01 was taken as the level of significance. The Inter assay Coeffeicent of Varition (CV)% and intra assay CV% for Leptin estimation was <10% in the analysis of biochemical parameters. Ethical clearance for the study was obtained from Yenepoya University Ethics Committee, Mangalore.

RESULTS

The Demographic data in the form of mean, standard deviation (SD) of anthropometric variables and leptin of the study population is depicted in table 1. The data shows that the mean values of the anthropometric variables of WC, HC, and BMI along with the leptin, HbA1c are higher in diabetic study group than in healthy controls. Further, statistical significance was seen between the two groups except for the BMI.

Table 1: Demographic data of anthropometric variables and leptin of the study population

Parameters	Diabetic group	Non- diabetic group	P Value	95% CI
	Mean ± SD	Mean ± SD		
Weight in kg	75.75 ± 8.99	69.24 ± 8.16	0.0001***	4.88 to 8.14
HC in cm	98.12 ± 4.73	92.82 ± 6.59	0.0001***	4.23 to 6.37
WC in cm	95.87 ± 4.29	90.48 ± 5.24	0.0001***	4.49 to 6.29
BMI	27.62 ± 4.98	27.14 ± 3.39	0.2487	-0.33 to 1.29
Leptin	12.10 ± 7.74	8.32 ± 4.97	0.0001***	-2.56 to -5.02
HbA1c	6.98 ± 1.13	6.25 ± 0.85	0.0001***	0.53 to 0.92

*P<0.01; **P<0.001; ***P<0.0001 statistically significant

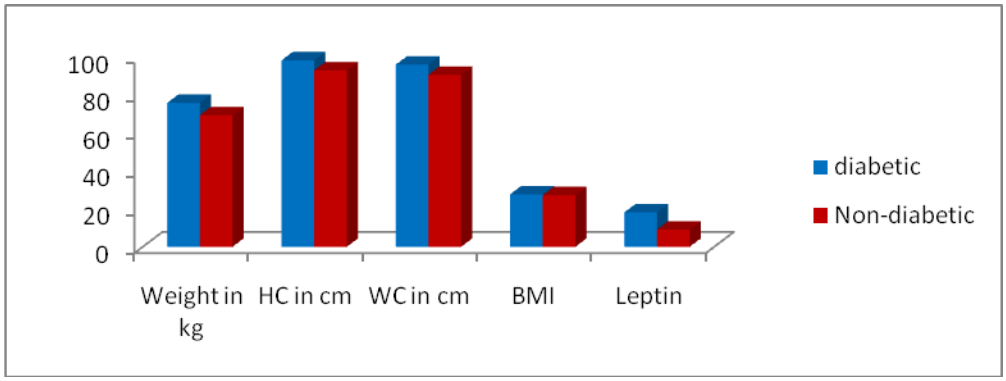

Figure 1: Comparison of the Anthropometric variables and leptin in diabetics and Non-diabetics subjects.

Table 2 represents the correlation-ship of leptin with anthropometric variables of the diabetic groups. This table shows that leptin in diabetic study group showed positive correlation with all the anthropometric parameters like WC(r=0.198, p <0.01), HC(r=.299, p<0.01), BMI(r=.315, p<0.01) and also with HbA1c(r=.269.p<0.01). This correlation was lost in the normal study group as shown in table 3(except for a weaker positive correlation BMI(r=.141, p<0.05).

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Further in diabetic study group the relation between leptin and BMI is more linear (fig2) than in the control group (Fig. 3).

Table 2: Representation of the correlation of leptin with anthropometric variables of the diabetic group

Diabetics (n=229)	WC	HC	BMI	HBA1C
Leptin (ng/ml)	.198**	.299**	.315**	.269**

Table 3: Representation of the correlation of leptin with anthropometric variables of the control group

Control (n=205)	**WC**	**HC**	**BMI**	**HBA1C**
Leptin(ng/ml)	.099	.112	.141*	-.028

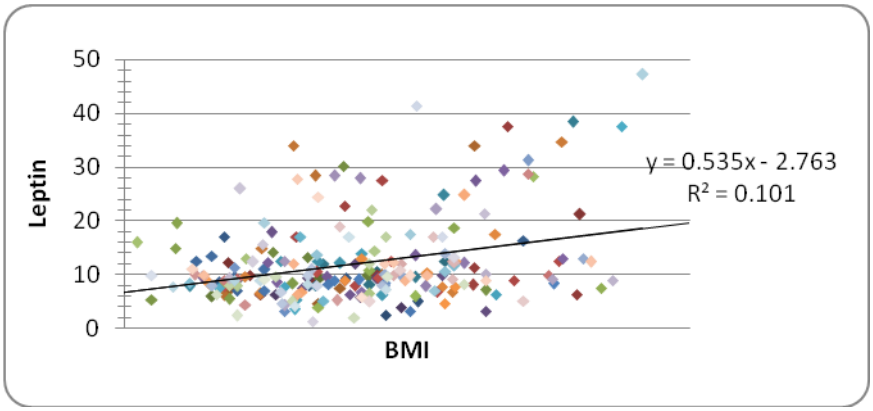

Figure 2: The relation between leptin and BMI in the diabetic group

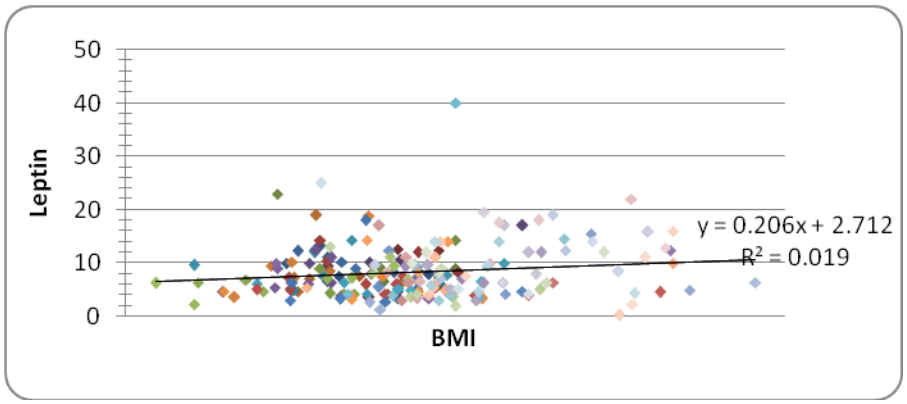

Figure 3: The relation between leptin and BMI in the normal group

DISCUSSION

The component of the metabolic syndrome is known to impair the vascular compliance. Hence obesity being a part of the metabolic syndrome, with diabetes is known to be a traditional risk factor for the cardiovascular events. Obesity and diabetes have a tendency to occur together because carbohydrate metabolism and body weight gain regulation express on

common hormonal (insulin and leptin) and CNS signaling system. Obesity is linked with a state of chronic low-level inflammation (in white adipose tissue) and inflammation is a factor to insulin resistance. Hence it comes to our understanding that the high levels of leptin as seen in the diabetic subjects could contribute to its adverse effects on vascular disease.

A research study by Yamagishi*et al* [8] has shown that leptin induces oxidative stress in the endothelial cells and hence participates in the atherogenesis which includes monocyte chemotactic protein formation. Hence this study has shown an increase in the leptin concentration in diabetic study group, who may be expected to cause a surge in CVD in this generation. Although an important finding is that in healthy individuals the association between leptin and the anthropometric variables is not well correlated, even though there is not much variation in their BMI. The level of the fat indices like waist and hip circumference has shown a positive correlation with the leptin in diabetic subjects indicating that weight gain leads to increased oxidative stress in the adipose tissue and also increase in the leptin levels triggers NO-mediated angiogenesis [9].

However, the results suggest that leptin acts as an important substance in targeting the subjects for vascular diseases.

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