

Original Research

Assessment of serum leptin level and the risk of ischemic stroke

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ABSTRACT:

Background: Leptin is a major adipokine that regulates weight balance and energy homeostasis. The present study was conducted to assess serum leptin level and the risk of ischemic stroke. **Materials & methods:** 65 patients with first ever-ischemic stroke of both genders (Group I). Equal age- and sex-matched subjects were included as controls (Group II). 5 ml venous blood was collected and erythrocyte sedimentation rate (ESR), white blood cell (WBC), fasting blood glucose, total cholesterol, high-density lipoprotein (HDL)-cholesterol, low-density lipoprotein (LDL)-cholesterol, triglycerides, and leptin levels was measured **Results:** The mean age in group I was 54.2 years, in group II was 54.6 years, BMI was 26.5 Kg/m² in group I and 22.4 Kg/m² in group II. Blood glucose level was 110.2 mg/dl in group I and 108.4 mg/dl in group II, WBC count was 9812.4 in group I and 7814.6 mg/dl in group II and ESR was 36.2 in group I and 15.3 in group II. Total cholesterol was 184.2 mg/dl and 156.4 mg/dl, HDL was 44.5 mg/dl and 43.1 mg/dl, LDL was 120.3 mg/dl and 94.2 mg/dl, triglyceride was 145.2 mg/dl and 142.8 mg/dl, VLDL was 28.9 mg/dl and 25.7 mg/dl, CRP was 14.5 mg/dl and 5.1 mg/dl and leptin was 6598.2 pg/ml and 3012.5 pg/ml in group I and II respectively. The difference was significant (P< 0.05). **Conclusion:** Stroke patients had higher leptin level. Leptin may have a role in atherosclerosis mediated through inflammation.

Key words: Atherosclerosis, Stroke, Leptin

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INTRODUCTION

Leptin is a major adipokine that regulates weight balance and energy homeostasis. There is inconsistent evidence linking circulating leptin levels to risk of stroke. leptin demonstrates a direct association with body mass.¹ It is higher in obese individuals and lower in persons of normal weight. Leptin inhibits appetite and increases energy expenditure. However, central leptin resistance occurs in obese individuals resulting in a hyperleptinemic state.² There is evidence suggesting a potential role of leptin in glucose regulation, insulin sensitivity, hematopoiesis, fatty acid catabolism, angiogenesis, and vascular and endothelial function. Leptin also induces proinflammatory cytokines, such as interleukin-promotes platelet aggregation and may have a role in arterial thrombosis associated with obesity.³

Stroke is a leading cause of morbidity and mortality worldwide affecting millions of people every year. Stroke is a major health problem in India. According to the India stroke factsheet updated in 2012, the estimated age-adjusted prevalence rate for stroke

ranges between 84/100,000 and 262/100,000 in rural and between 334/100,000 and 424/100,000 in urban areas.⁴ Inter-stroke study showed that hypertension, current smoking, waist-to-hip ratio, diet risk score, regular physical activity, diabetes mellitus, alcohol intake, psychosocial stress, cardiac causes, and ratio of apolipoproteins B to A1 accounted for 88.1% of the population-attributable risks for all stroke. Apart from the conventional risk factors, leptin has been studied as a risk factor for obesity-associated atherosclerosis.⁵ The present study was conducted to assess serum leptin level and the risk of ischemic stroke.

MATERIALS & METHODS

This study comprised of 65 patients with first ever-ischemic stroke of both genders (Group I). Equal age- and sex-matched subjects were included as controls (Group II).

In all, body mass index (BMI) was calculated as weight (kg)/height (m²) and categorized as normal weight 18.5–22.99 kg, overweight 23.0–27.49 kg, and obese >27.5 kg. Magnetic resonance imaging and

carotid vertebral Doppler study was done for all patients. Carotid intima-media thickness test (CIMT) was measured. 5 ml venous blood was collected and erythrocyte sedimentation rate (ESR), white blood cell (WBC), fasting blood glucose, total cholesterol, high-density lipoprotein (HDL)-cholesterol, low-density

lipoprotein (LDL)-cholesterol, triglycerides, and leptin levels using commercially available enzyme-linked immunosorbent assay kit (pg/ml) was measured. Results were tabulated, compiled and assessed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Parameters	Group I	Group II	P value
Age (years)	54.2	54.6	0.14
BMI (Kg/m ²)	26.5	22.4	0.02
Blood glucose (mg/dl)	110.2	108.4	0.17
WBC (cu/mm)	9812.4	7814.6	0.05
ESR	36.2	15.3	0.01

Table I, graph I shows that mean age in group I was 54.2 years, in group II was 54.6 years, BMI was 26.5 Kg/m² in group I and 22.4 Kg/m² in group II. Blood glucose level was 110.2 mg/dl in group I and 108.4 mg/dl in group II, WBC count was 9812.4 in group I and 7814.6 mg/dl in group II and ESR was 36.2 in group I and 15.3 in group II. The difference was significant (P< 0.05).

Graph I Distribution of patients

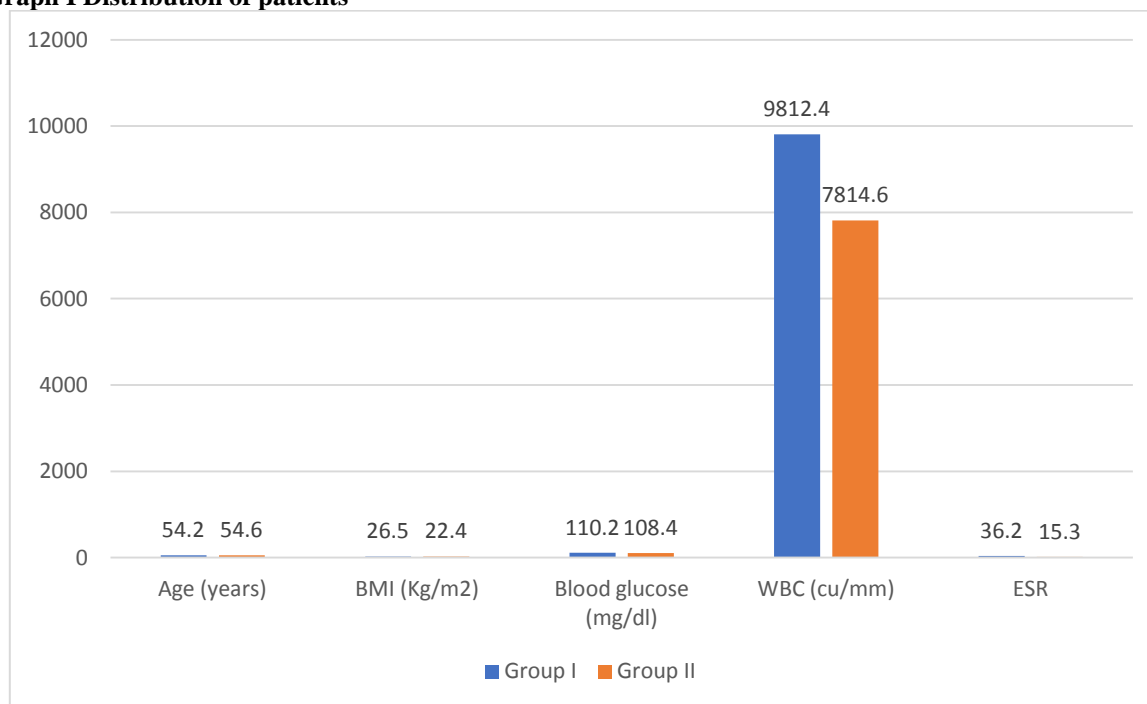
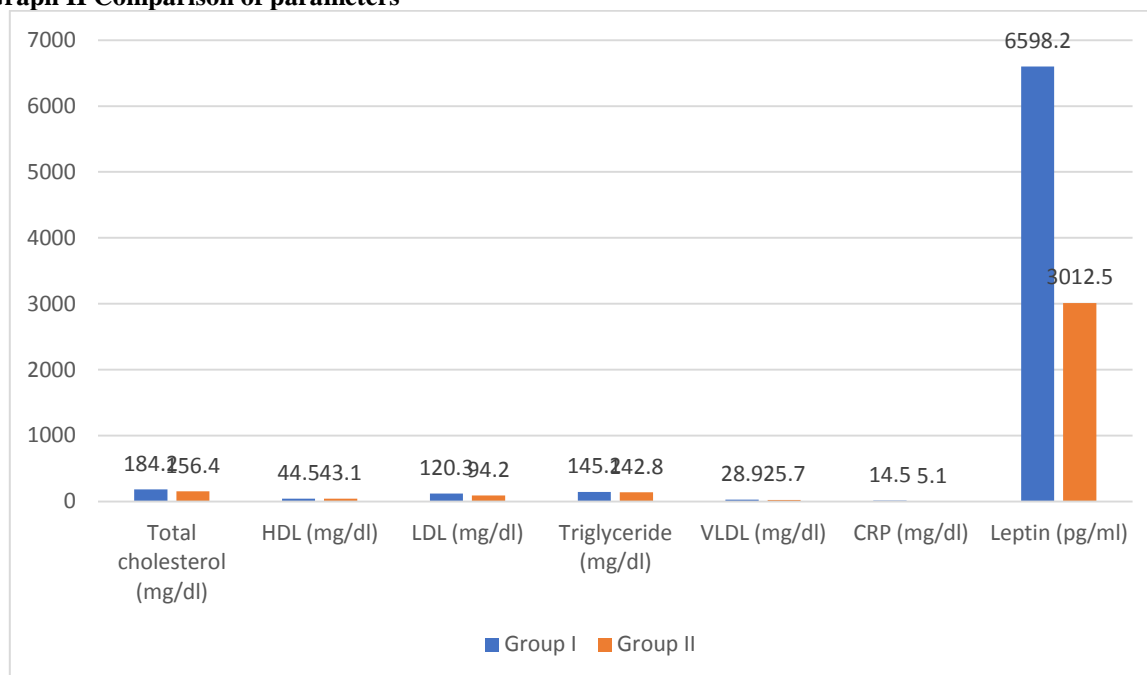


Table II Comparison of parameters

Parameters	Group I	Group II	P value
Total cholesterol (mg/dl)	184.2	156.4	0.05
HDL (mg/dl)	44.5	43.1	0.91
LDL (mg/dl)	120.3	94.2	0.03
Triglyceride (mg/dl)	145.2	142.8	0.90
VLDL (mg/dl)	28.9	25.7	0.81
CRP (mg/dl)	14.5	5.1	0.001
Leptin (pg/ml)	6598.2	3012.5	0.002

Table II, graph II shows that total cholesterol was 184.2 mg/dl and 156.4 mg/dl, HDL was 44.5 mg/dl and 43.1 mg/dl, LDL was 120.3 mg/dl and 94.2 mg/dl, triglyceride was 145.2 mg/dl and 142.8 mg/dl, VLDL was 28.9 mg/dl and 25.7 mg/dl, CRP was 14.5 mg/dl and 5.1 mg/dl and leptin was 6598.2 pg/ml and 3012.5 pg/ml in group I and II respectively. The difference was significant (P< 0.05).

Graph II Comparison of parameters**DISCUSSION**

Higher circulating leptin levels have been associated with an increased prevalence of various vascular risk factors, including insulin resistance, diabetes mellitus, hypertriglyceridemia, and hypertension, and with lower levels of high-density lipoprotein cholesterol.^{6,7} However, the association of leptin with vascular diseases is controversial. Although some studies suggest that higher circulating leptin levels increase risk of vascular disease, including myocardial infarction and stroke, other investigations have reported no such association or have reported a protective role for leptin in determining overall mortality and risk of coronary disease.⁸ Moreover, although several longitudinal studies have examined the association of circulating leptin levels with incident coronary heart disease, there are limited prospective data on their association with the risk of stroke.⁹ The present study was conducted to assess serum leptin level and the risk of ischemic stroke.

In present study, mean age in group I was 54.2 years, in group II was 54.6 years, BMI was 26.5 Kg/m² in group I and 22.4 Kg/m² in group II. Blood glucose level was 110.2 mg/dl in group I and 108.4 mg/dl in group II, WBC count was 9812.4 in group I and 7814.6 mg/dl in group II and ESR was 36.2 in group I and 15.3 in group II. Menon et al¹⁰ studied 52 patients with acute ischemic stroke and measured leptin levels and compared with age- and sex-matched healthy controls. Risk factors, body mass index (BMI), biochemical parameters, intima-media thickness (IMT) on carotid vertebral Doppler and neuroimaging was done. Serum leptin was significantly elevated in stroke patients (6598.1 ± 1035.1) compared to controls (3090.7 ± 698.86) ($P < 0.01$). Patients had higher BMI (26.9 ± 1.7) than controls (26.9 ± 1.7)

($P < 0.00$). BMI, total cholesterol, low-density lipoprotein (LDL) cholesterol, white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), and C reactive protein (CRP) were significantly elevated in stroke patients than controls. Correlation analysis among patient group showed that serum leptin positively correlated with CRP ($r = 0.41$, $P < 0.05$), WBCs ($r = 0.28$, $P < 0.05$), ESR ($r = 0.429$, $P < 0.01$) total cholesterol ($r = 0.31$, $P < 0.05$), LDL-cholesterol ($r = 0.19$, $P < 0.05$), and IMT ($r = 0.714$, $P < 0.001$).

We found that total cholesterol was 184.2 mg/dl and 156.4 mg/dl, HDL was 44.5 mg/dl and 43.1 mg/dl, LDL was 120.3 mg/dl and 94.2 mg/dl, triglyceride was 145.2 mg/dl and 142.8 mg/dl, VLDL was 28.9 mg/dl and 25.7 mg/dl, CRP was 14.5 mg/dl and 5.1 mg/dl and leptin was 6598.2 pg/ml and 3012.5 pg/ml in group I and II respectively. Saber et al¹¹ in their study 119 individuals developed stroke (99 ischemic strokes). In multivariable Cox regression models, log leptin levels were not associated with incidence of all-stroke or ischemic stroke (hazard ratios per SD increment in log leptin 0.90 [0.73–1.09] and 0.89 [0.72–1.11], respectively). The results were suggestive for potential effect modification by waist/hip ratio for the association between leptin and stroke ($P = 0.03$). Adjusting for age, sex, and established stroke risk factors, analysis stratified by waist/hip ratio quartiles revealed a lower incidence of first-ever all-stroke and ischemic stroke associated with higher leptin levels among only subjects in the top waist/hip ratio quartile (hazard ratio, 0.64 [0.43, 0.95] versus 0.98 [0.77, 1.25] for incident all-stroke and 0.61 [0.39, 0.95] versus 0.96 [0.74, 1.26] for ischemic stroke).

An earlier study investigating the role of leptin with IMT of the CCA concluded that leptin was independently associated with IMT; however, the association was dependent on obesity which is in accordance with our study too.¹²

CONCLUSION

Authors found that stroke patients had higher leptin level. Leptin may have a role in atherosclerosis mediated through inflammation.

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