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RESEARCH ARTICLE
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Evaluation of serum leptin levels in hypertensive men in Thi Qar City-Iraq (a comparative study)

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ABSTRACT

Leptin, a hormone secreted from adipose tissue, is closely related to inflammatory, metabolic, and homeostasis factors. This hormone has also been shown to perform a significant involvement in the development of hypertension. This study aimed to measure serum leptin levels and lipid profiles in hypertensive males and compare them with control healthy males that were congruent with age and BMI. The current study included 50 subjects from Thi Qar city people, and it was divided into two groups. The first group included 25 hypertensive adult male patients who had BMI (Mean±SD 27.98±2.9), while the second group included 25 healthy adults males as a control group who had BMI (Mean±SD 27.41±3.5). The current study included evaluating serum leptin and lipid profile of studied groups after 8-12 hours of fasting state. It was found that the level of leptin was high significant variance in hypertensive adults males compared to the healthy control group (22.4±3.4ng/ml against 13.9±1.6 ng/ml, respectively; $p<0.03$), A good correlation was also found between leptin levels and systolic, diastolic blood pressure, and body fat percentage (r=0.648, r=0.506, and r=0.490, respectively). It was also found that moreover male patients had a bad Lipid profile when compared to the healthy control group.

Keywords: *Leptin, Body Fat Percentage, Blood Pressure, Hypertension, Lipid profile*

INTRODUCTION

Adipose tissue was considered an energy storage organ in the form of lipid only until 1994, but in present years adipose tissue has been recognized as an essential organ of the endocrine system where it produces many hormones known called adipocytokines such as leptin, Adiponectin, estrogen, resistin, and tumor necrosis factor-alpha (TNFα), interleukin-6 (IL-6) and others (1,2).

Adipose tissue primarily produces leptin, which is then released into the blood. The quantity of circulating leptin reflects the volume of adipose tissue and varies with diet situation (3). It is a 16 kDa, 167 amino acid protein hormone that serves as an adipostin. It is a polypeptide hormone generated by the ob gene as a sensor of the hypothalamus (4).

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Leptin's C-terminus features a ring structure with two cysteine residues and an intermolecular disulfide linker, whereas the N-terminus has a signal peptide sequence of 21 amino acid residues (5). The signal peptide is eliminated at the N-terminus after entering the circulation to produce physiologically active leptin. It then reaches central or peripheral tissues and functions biologically in connection with a diversity of leptin receptors, either free in the bloodstream or bound to the leptin-binding protein (6). Although it can also be present in the brain, pituitary gland, gastrointestinal epithelium, fetus, skeletal muscle, testes, and sperm, leptin is mostly located in adipose tissue (7). the normal physiology of the reproductive system, immune system perform, bone and cartilage development, vascular function, and systemic inflammatory response (8,9). Leptin is also known to regulate cardiovascular and renal functions(10,11).

while, Many obese people for unexplained reasons, acquire resistance to leptin's weight-loss and satiety benefits, just as patients with type 2 diabetes (DM-type 2) develop resistance to but retain the effects of the hormone insulin. the leptin-mediated sympathetic system activates cells in non-thermogenic tissues like the heart, kidneys, and adrenals, and hence plays a major part in the physiological processes of vascular tendons, renal hemodynamics, and hypertension (12).

The most common complications in obese patients are cardiovascular disease and blood pressure, as more than 12% of the world's population currently suffers from hypertension, and it is expected to reach 20% by 2025(13).

newly, it is believed that the central nervous system plays a significant role through the action of the hormone leptin and links obesity to high blood pressure (2).

Obesity accounts for approximately 65-75% of primary hypertension, so understanding the exact mechanism of obesity-induced primary hypertension is important to reducing cardiovascular disease (14).

MATERIAL AND METHOD

Patients

The current study was conducted in the Thi Qar city from January 14, 2022, to March 20 of the same year. The current study included 50 participants, including 25 male patients with hypertension, between the ages of 30-55 years, who were collected according to medical documents at Al-Hussein Teaching Hospital. All their clinical data, medical histories, and related complications were recorded. All patients with other chronic diseases were excluded. 25 healthy males of the same age group were considered as a control group. the agreement was obtained from all participants in this study and it was conducted by the ethical principles outlined in the Declaration of Helsinki of 1964 and subsequent revisions.

Collection of blood samples

5 ml of whole blood was taken from all participants after a fasting state for 8-12 hours. The obtained blood was distributed into a gel tube, carefully shaken, and left at room temperature to allow coagulation. The blood was then centrifuged at 4,000 rpm for 10 minutes to collect the serum, which was transported to Eppendorf tubes and stored at -20 °C until use.

Measurement biochemical parameters

Serum leptin was estimated utilizing the ELISA procedure by utilizing DRG (Germany) leptin ELISA Kit.

The serum lipid profile was measured using Automatic Chemistry Analyzer BS-230 Close System (Mindray- Chinese) Diastolic and systolic blood pressures were estimated utilizing a mercury sphygmomanometer, with an average of three measurements of diastolic and systolic blood pressure. Patients were classified as getting hypertension if their systolic blood pressure (SBP) was larger than or equivalent to 140 mm Hg, and their diastolic blood pressure (DBP) was larger than or equivalent to 90 mm Hg. Body Mass index (BMI) is evaluated using electronic balance and height equipment for weight and height. To calculate the body mass index, the following formula was utilized(15).

BMI= weight (Kg)/height ($m2$)

The CUN-BAE equation was used to calculate body fat percentage:

$$\text{Body Fat\%} = (1.2 \text{ x BMI}) + (0.23 \text{ x age}) - 5.4 - (10.8 \text{ x gender})$$

where gender is substituted by 0 for males and 1 for females (16).

Statistical analysis

The data were statistically estimated by using the SPSS software (SPSS, Version 23). For the relationship of studied groups in the evaluated parameters, Pearson Correlations coefficient (r) and T-test were used at significant P<0.05. Mean ± Standard deviation was used in the description of outcomes.

RESULTS AND DISCUSSION

Table(1) shows the demographic data of the studied groups. The comparison of serum leptin levels, and systolic and diastolic blood pressure was shown in Table(2) and Figure(1), with the results showing a significant variance in leptin levels (p<0.03) and a highly significant variance in systolic and diastolic blood pressure (p<0.001). The lipid profiles of the studied groups were included in Table(3) and Figure(2), and they were compared, with statistical results indicating a highly significant variance in triglycerides (p <0.001), low-density lipoprotein (p <0.01), and cholesterol (p <0.01), as well as significant variance in high-density lipoprotein (p<0.05). Figure 3 showed a Pearson correlation coefficient between leptin levels and blood pressure levels in the patients' group that showed a good positive correlation with systolic and diastolic blood pressure (r= 0.648, r= 0.506 respectively), While Figure 4 showed a Pearson correlation coefficient between the level of leptin and the body fat percentage and it was a positive correlation (r= 0.490).

TABLE 1: Comparison of demographic data (age (year), weight (kg), height (m), and B.M.I (Kg/m2), and Body fat (%)) between the groups studied.

Items	patients group	control group	T-test
	Mean±SD	Mean±SD	P-value
Age (year)	37.5±8.4	39.6±8.9	NS
Weight (kg)	85.7±5.7	83.2±8.4	NS
Height (m)	1.75±0.03	1.76±0.05	NS
BMI (Kg/m^2)	27.98±2.9	27.11±3.5	NS
Body fat (%)	43±4.77	41±6.88	NS

TABLE 2: Comparison of serum leptin levels, systolic and diastolic blood pressure between patients males group and healthy control males group.

Clinical Parameter	Patients group	Control group	T-test
	Mean±SD	Mean±SD	P-value
Leptin (ng/mL)	22.4±3.4	13.9±1.6	<0.03
Systolic blood pressure	147±3	117±2	<0.001
Diastolic blood pressure	88±4	68±3	<0.001

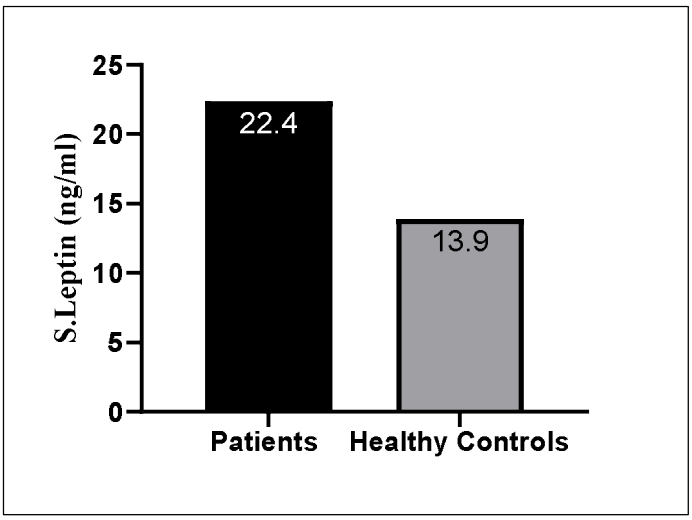

FIGURE 1: Comparison of serum leptin levels between studied groups

TABLE 3: Comparison of lipids profiles (TC, HDL-C, LDL-C, and TG) between patients males group and Healthy control group.

Lipids profile parameters	Patients group	Control group	T-test
	Mean±SD	Mean±SD	P-value
Total cholesterol [TC] (mg/dl)	184.5±46.6	119±40	<0.01
Triglycerides [TG] (mg/dl)	166.88±91.7	88.9±60.1	<0.001
Low-density lipoprotein [LDL-C] (mg/dl)	113.14±38.7	81.54±25.6	<0.01
High-density lipoprotein [HDL-C] (mg/dl)	33.78±12.2	49.65±9.9	<0.05

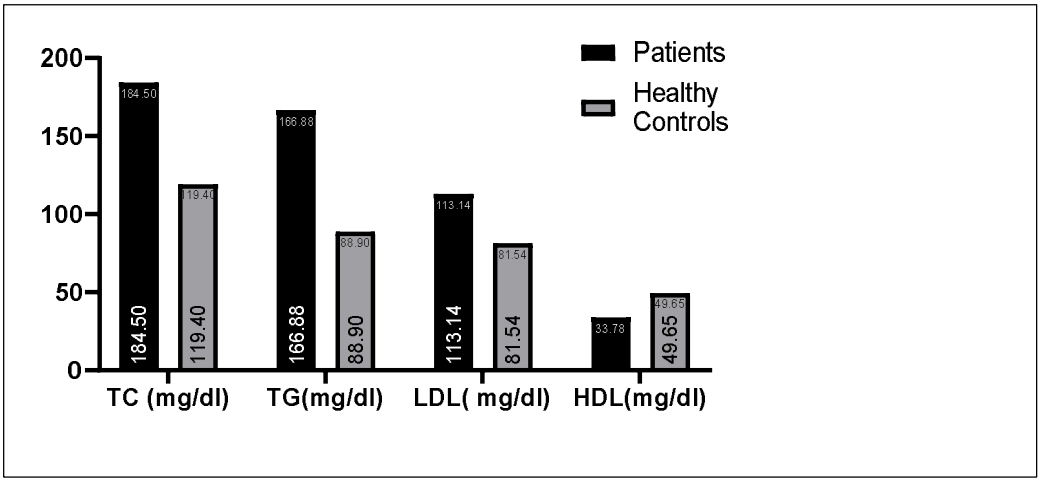

FIGURE 2: Comparison lipids profiles (TC, HDL-C, LDL-C, and TG) between the groups studied

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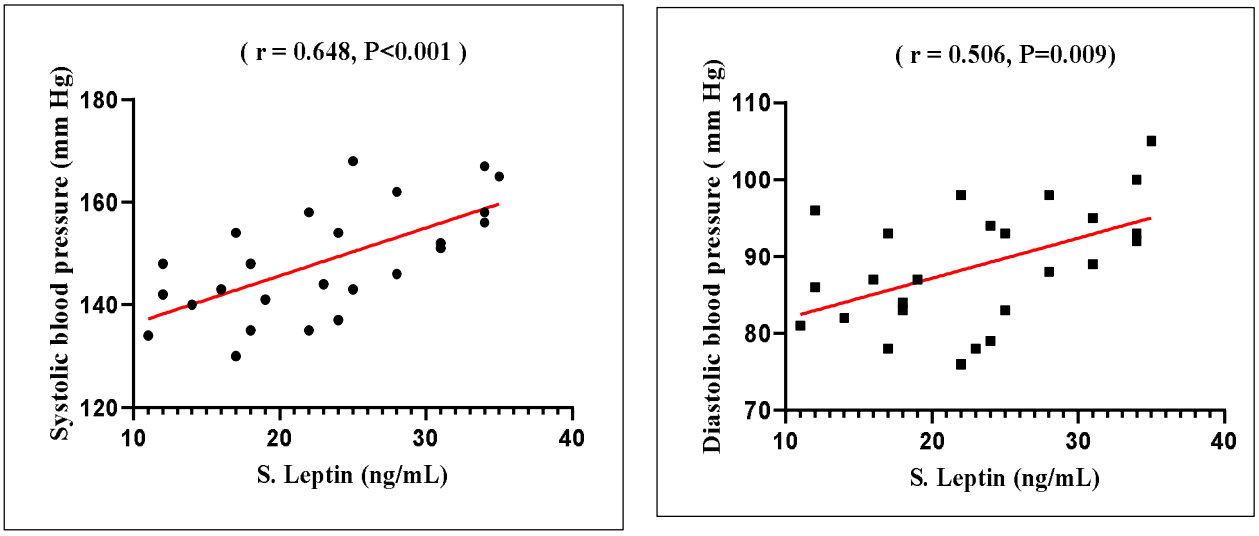

FIGURE 3: Pearson correlation coefficient (r) between s.leptin and blood pressure levels

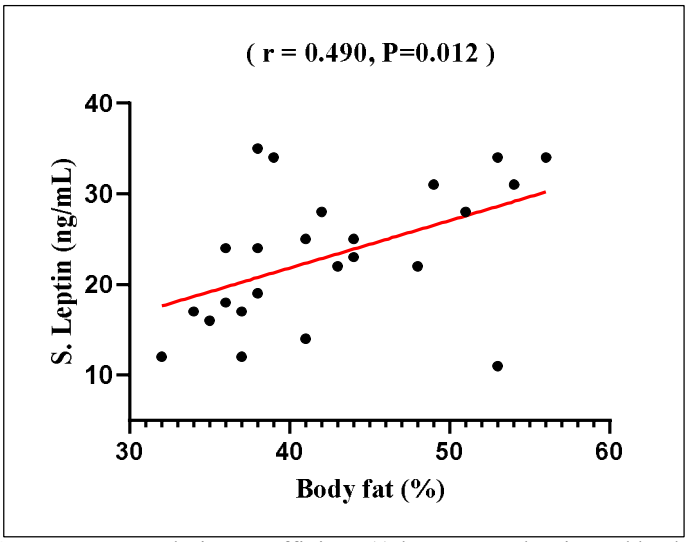

FIGURE 4: Pearson correlation coefficient (r) between S.leptin and body fat percentage

Recent research (17, 18) found that after adjusting for age, BMI, insulin, creatinine, and other factors, individuals with high leptin values had a greater hazard of creating hypertension. It has been demonstrated that chronic hyperleptinemia decreases nitric oxide-dependent vasodilation and natriuresis while increasing sympathetic nerve activity (19). and Numerous research on fat individuals and animals have revealed a strong link between hypertension and obesity. In obese patients, a high amount of serum leptin hormone occurred in the blood, together with selective leptin resistance, highlighting mechanisms that contribute to sympathetic activation and high blood pressure (14, 20).

In this current study, it was found that leptin was a higher significant difference (r>0.05) in male patients with hypertension compared with the healthy control group with the same body mass index (BMI) as shown in fiq.1 and table 2. and also Pearson correlation coefficient (r) showed a good positive relationship between leptin levels and systolic and diastolic blood pressure (r=0.648, and r=0.506, respectively) in the hypertensive patient group (fiq.3).

Leptin's ability to stimulate the sympathetic system (21) and renin-angiotensin system (22, 23) and hence influence human blood pressure is the cause of this.

Additionally, leptin increases natriuresis. Leptin's action may therefore be weakened, which could make people more susceptible to developing hypertension (24, 25). In hypertensive individuals, researchers have identified a connection between serum leptin and heart rate (26, 27). Previous studies have also suggested that leptin plays a role important in the progress of cardiac disorder and hypertension (28–29).

This finding is congruent with those of other researchers, who found that obese hypertension patients had higher leptin levels than normotensive obese subjects, even after controlling for age and BMI (30,31).

After controlling for age, gender, BMI, drinking alcohol, and smoking. also, Higher plasma leptin values were found to be positively linked with hypertension. They concluded that elevated plasma leptin values in males and females in a representative sample of adults in the United States of America are linked to hypertension (32).

The hormones leptin and angiotensin II were also found to be strong foretellers of high blood pressure in obese woman patients by Hazimi and Syiamic. (33).

Conversely, Al-Gharabawi et al., in their investigation found that the degree of leptin serum in African American patients has no relationship with blood pressure even after tuning for obesity(34).

It is hypothesized that leptin may only be a regulator of blood pressure in hypertension individuals depending on the significant correlation between blood pressure and leptin level that was identified in hypertensive individuals.

Some potentially significant factors, like BMI, don't appear to have any effect on the relationship between leptin and blood pressure. These results might help us comprehend the relationship between leptin levels and hypertension, a significant risk factor for cardiac disorder.

Leptin concentrations were substantially correlated with the percentage of body fat, which is consistent with the data that adipose cells create the majority of the hormone leptin (35). so Pearson correlation coefficient (r) showed a good positive relationship between leptin levels and body fat percentage (r=0.490) in the hypertensive patient group as shown fiq.4

Previous studies have implicated a role for leptin in fatty acid metabolism not only in adipose tissue but also in other tissues that store triacylglycerol. Leptin enhances lipolysis by rising cyclic adenosine monophosphate (cAMP) quantities (36), which is consistent with the bad lipid profile results presented in Table 3 and fiq.2. which showed a very high significant difference in triglycerides, as well as a significant difference in low-density lipoprotein (LDL), and cholesterol, which was higher in hypertensive males and significantly lower in high-density lipoprotein (HDL) in these patients when compared to healthy males in the control group. This makes leptin level an important factor in predicting atherosclerosis.

The findings of this research on the bad lipid profile are consistent with those of Nayak et al, who found a significant increase in serum total cholesterol, TG, LDL-C, and VLDL in hypertensive patients when compared to healthy controls as a control group, while HDL-C decreased in hypertensive patients (37).

CONCLUSION

Our current study focused the relationship between leptin levels associated with hypertensive men patients on the severity and development of the disease. Where the outcomes showed a significant increase in leptin levels in patients compared with the healthy control group who have the same age and body mass index, and we also proved a good correlation between leptin levels and systolic and diastolic blood pressure, and this confirms role of leptin in the development of disease severity. A good correlation was also found between leptin levels and body fat percentage, and this confirms the effect of adipose tissue on increasing leptin levels.

The lipid profile was also studied and compared between the patients group and the healthy control group, which showed a bad lipid profile for the patients group due to the role of leptin in lipid metabolism, This makes the high level of leptin a predictive sign for the occurrence and development of atherosclerosis in patients with hypertension.

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