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Research Article

**STRONG POSITIVE ASSOCIATION OF SERUM LEPTIN  
CONCENTRATIONS WITH BODY MASS INDEX (BMI): A  
COMPARATIVE OBSERVATIONAL RESEARCH**<sup>1</sup>Sahar Amjad, <sup>2</sup>Dr. Ayesha Mustafa, <sup>3</sup>Dr Iqra Mumtaz<sup>1</sup>Nishtar Hospital Multan<sup>2</sup>Institution Rawalpindi Medical College.<sup>3</sup>Lahore General Hospital, Lahore**Abstract:**

**Objective:** The determination of the concentrations of the serum leptin from a selected sample population in the perspective of gender, age and BMI was the objective of this research.

**Methods:** Our research design was comparative, observational which was carried out in Nishtar Hospital, Multan (September, 2016 – January, 2017). The research sample comprised of hundred healthy overweight, obese and non-obese females and males in the age bracket of 20 – 50 years. The sample population was selected with the help of non-probability convenience technique. The formula of BMI calculation was (kilogram / height in m<sup>2</sup>): non-obese, overweight and obese subjects were defined as (18.5 – 23.0), (23.1 – 27.4) and obese (27.5 – 40) kilogram / m<sup>2</sup>. We measured serum glucose with the help of Glucose oxidase-phenol amino phenazone (GOD – PAP) technique and we measured serum leptin through sandwich enzyme-linked immunosorbent assay technique.

**Results:** The concentrations of the serum leptin were observed high in the obese participants (mean value 52.8 ± 24.6 ng / mL; range limit 28.2 – 77.4 ng / mL; P-value as < 0.001) in comparison to the non-obese participants (mean value 12.7 ± 6.1 ng / mL, range limit as 6.6 – 18.8 ng / mL). Obese group was noticed with a mean value of BMI as (31.7 ± 3.1 kg / m<sup>2</sup>) in the range of (28.6 – 34.8 kg / m<sup>2</sup>); whereas, in the non-obese participants it was observed as (21.2 ± 1.5 kg / m<sup>2</sup>) in the range of (19.7 – 22.7 kg / m<sup>2</sup>). There was a strong and positive association of the concentration of the serum leptin in the obese participants as (r = 0.59, P-value < 0.001) as observed in obese participants. The mean value of the concentrations of serum leptin were high in the healthy obese & non-obese females as respectively (64.4 ng / mL) and (8.7 ng / mL) than men respectively observed as (40.4 ng / mL) & (5.5 ng / mL). There was no significant association of the level of serum leptin with the age with a significant P-value of (0.416).

**Conclusions:** In our research sample the concentration of the serum leptin has a strong positive association with the BMI in the non-obese and healthy obese both males and females. Women were observed with higher levels in comparison to men; whereas the association of age with the levels of was not significant as we observed in this particular research.

**Keywords:** Body Mass Index (BMI), Serum leptin, Non-obese, Obese and Overweight.

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## INTRODUCTION:

There is a key role of the protein hormone (Leptin) in the regulation of metabolism and weight which was discovered back in 1994, its discovery made opened the doors of metabolic and obesity related issues research [1]. The molecule of the Leptin is approximately sixteen kDa and it is encoded by the gene of obesity. It is secreted and synthesized by adipocytes and concentrations of the serum reflect energy amount which is stored in tissue of adipose [2]. Leptin is bound with the receptors in hypothalamus which influences several neuropeptides expressions that are regulating intake of the energy, neuro-endocrine and energy expenditure functions, resultantly the weight of the body decreased. It is established that genetically in the obese mice the obesity gene mutations with resultant very low leptin levels. Similarly, in some of the persons there is a deficiency of the leptin and also possess extreme genetic obesity. However, in the extra obese cases with hyper leptinemia which is proportionate to the fat of the body and it also seems resistant to the leptin [2]. Leptin's physiologic role is not fully understood at present which needs more research work, it may help in the obesity determination with associated complications. There is a scarcity in the literature about the leptin concentration relation with BMI in local sample population [3 – 6]. BMI may have been affected by leptin. Few of the research studies have established certain relation of leptin with cord blood concentrations of leptin serum and disease as stated in few of the studies of Pakistan [7]. This research was carried out for the determination of the concentrations of the serum leptin from a selected sample population in the perspective of gender, age and BMI.

## SUBJECTS AND METHODS:

Our research design was comparative, observational which was carried out in Nishtar Hospital, Multan (September, 2016 – January, 2017). The research sample comprised of hundred healthy overweight, obese and non-obese females and males in the age bracket of 20 – 50 years. The sample population was selected with the help of non-probability convenience technique. The formula of BMI calculation was (kilogram / height in  $m^2$ ): non-obese, overweight and obese subjects were defined as (18.5 – 23.0), (23.1 – 27.4) and obese (27.5 – 40) kilogram /  $m^2$ . We measured serum glucose with the help of Glucose oxidase-phenol amino phenazone (GOD – PAP) technique and we measured serum leptin through sandwich enzyme-linked immunosorbent assay technique.

The research sample had healthy obese (50) and healthy non-obese (50) in the age bracket of 20 – 50 years. Obese group was noticed with a mean value of BMI as ( $31.7 \pm 3.1 \text{ kg / m}^2$ ) in the range of ( $28.6 – 34.8 \text{ kg / m}^2$ ); whereas, in the non-obese participants it was observed as ( $21.2 \pm 1.5 \text{ kg / m}^2$ ) in the range of ( $19.7 – 22.7 \text{ kg / m}^2$ ). Values of BMI were as per the (Asian populations, 2000) and (WHO, International Obesity Task Force) guidelines [8, 9]. We did not include all the cases who had BMI above  $40 \text{ kg / m}^2$  (very obese category) and female pregnant cases. Hospital's ethical committee approved the protocols of the research and informed written consent was also taken by the research participants. We gathered related laboratory and clinical information from both non-healthy and healthy obese participants. All the information was entered in a Performa. Research also noticed any previous history of clinical features including hypertension, diabetes mellitus, acute or chronic disease and depression for further dismissal from the research sample. Subsequently, all the cases with a value of fasting plasma glucose as ( $126 \text{ mg / dl}$ ) were not made a part of the research. Research sample was restricted to a total of ninety participants. We measured height to calculate BMI and calculated weight of the participants.

After collecting samples of overnight fasting from 0800 – 0900 hrs. in the morning they were monitored in the pathology laboratory. Plain tubes were used for the storing of blood samples, clotting was carried out at room temperature. We separated leptin serum at the interval of twenty minutes through centrifuge process (@ 2000 – 3000 G) for a period of ten minutes. We aliquoted and frozen them at ( $- 20^\circ \text{ C}$ ) for later analysis.

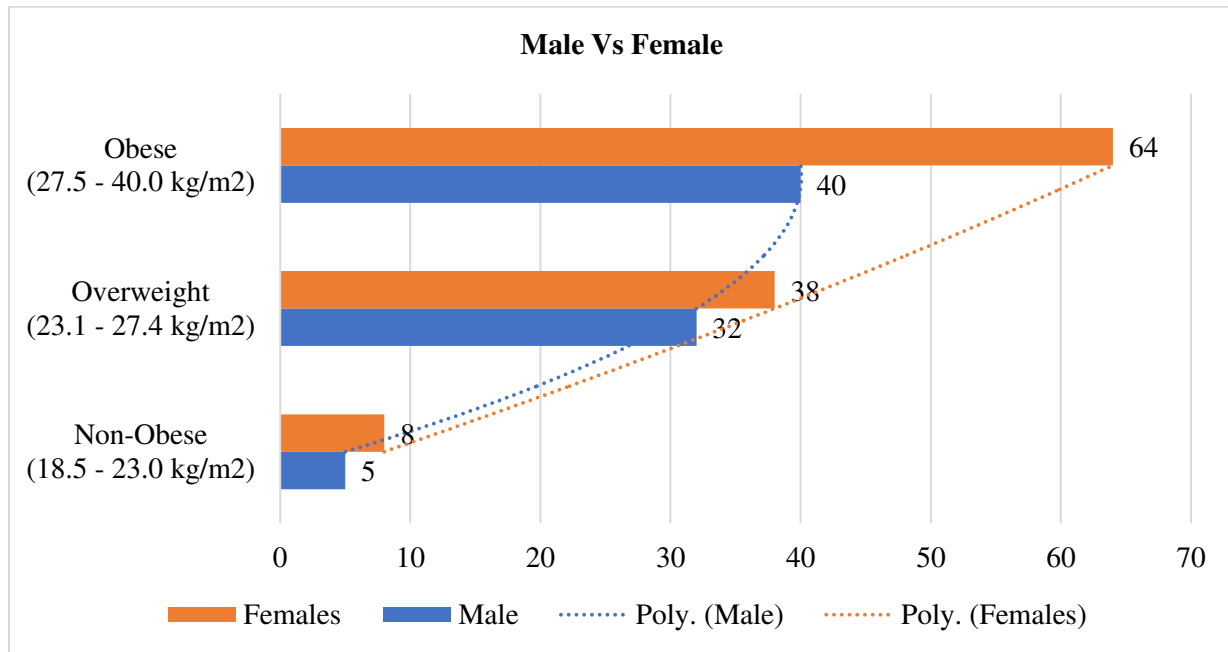
SPSS software was used for the data entry and analysis. Every variable such as SD, mean and range was also measured. For the comparison of the P-values we determined the level of serum leptin level in non-obese and obese participants P-value ( $< 0.05$ ). To correlate BMI and level of serum leptin in healthy non-obese and obese participants, values of "r" were determined through Pearson's correlation test.

## RESULTS:

We made a baseline characteristics comparison which involved age, weight, height, fasting plasma glucose, level of serum leptin and BMI as shown in (Table – I). The mean age in 40 obese cases and 50 non-obese cases was respectively as ( $34.8 \pm 4.6$ ) years in the range of (30.2 – 39.4) years and ( $32.7 \pm 6.1$ ) years in the range of (26.6 – 38.8) years.

**Table – I:** Mean serum leptin levels (ng/mL) in females and males with reference to BMI

Gender	Non-Obese (18.5 - 23.0 kg/m <sup>2</sup> )	Overweight (23.1 - 27.4 kg/m <sup>2</sup> )	Obese (27.5 - 40.0 kg/m <sup>2</sup> )
Male	5	32	40
Females	8	38	64



Female proportion was as that there were 33 obese females and overweight (66%); whereas, 32 females (64%) females in non-obese group with a significant P-value as (0.834). Non-obese and obese group was observed with a factor of mean height as (167 ± 6.7) cms in the range of (156.3 – 173.7) cms and (163 ± 6.7) cms in the range of (156.3 – 169.7) cms respectively.

The concentrations of the serum leptin were observed high in the obese participants (mean value 52.8 ± 24.6 ng / mL; range limit 28.2 – 77.4 ng / mL; P-value as < 0.001) in comparison to the non-obese

participants (mean value 12.7 ± 6.1 ng / mL, range limit as 6.6 – 18.8 ng / mL).

There was a strong and positive association of the concentration of the serum leptin in the obese participants as (r = 0.59, P-value < 0.001) as observed in obese participants. The mean value of the concentrations of serum leptin were high in the healthy obese & non-obese females as respectively (64.4 ng / mL) and (8.7 ng / mL) than men respectively observed as (40.4 ng / mL) & (5.5 ng / mL). There was no significant association of the level of serum leptin with the age with a significant P-value of (0.416).

**Table – II:** Baseline characteristics

Parameters	Unit	Obese Mean ± SD (40)	Non-Obese/Controls Mean ± SD (50)	P-values
Age	Years	34.8 ± 4.6	32.7 ± 6.1	0.416
Height	cms	163 ± 6.7	167 ± 6.7	0.004
Weight	kg	80 ± 9.7	59 ± 6.6	0.001
BMI	kg/m <sup>2</sup>	31.6 ± 3.1	21.2 ± 1.5	0.001
FP Glucose	mg/dl	90 ± 19.8	88.2 ± 16.2	0.001

S leptin	ng/ml	52.8 ± 24.6	6.3 ± 3.1	0.001
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Table – I compares the serum leptin levels of obese, non-obese and overweight subjects in detail and. Detailed baseline characteristics with reference to mean and SD values with reference to serum leptin, fasting plasma glucose, BMI, weight, height and age have been shown in Table – II (respective p-values are given against every variable). There is a significant association of BMI with the serum leptin “r” as 0.59 and P-value as (0.001). Level of the mean leptin serum was observed in the overweight participants in between the range as in the non-obese and obese participants and it was also compared with the values of BMI.

### DISCUSSION:

We observed that a strong relation was present between level of leptin serum and BMI in the group of obese participants. In comparison to the non-obese subject's higher level of serum leptin was found in the obese group, which is same as previously stated in numerous research studies [5, 10]. According to Maffei the measurement of serum leptin in weight-reduced and obese subjects. We found the same in the non-obese and apparently healthy subjects [10]. Considine also performed a research on normal-weight and obese subjects and found BMI in men and women respectively ( $> 27.3$ ) and ( $> 27.8$ ). We used Sandwich ELISA method for the measurement of serum leptin in non-obese and obese subjects. Our study has plus because of its specific approach as cross-reactivity chance to related human origin biological products were nil. A negligible cross-activity was observed as (0.2%) with mice leptin. Level of the mean serum in the obese and normal weight subjects was respectively ( $31.3 \pm 24.1$  ng / mL) and ( $9.3 \pm 7.5$  ng / mL) with a significant P-value as ( $< 0.001$ ).

Concentrations of the leptin were higher than the outcomes observed by Considine, which may be attributed to variation in population or methods employed [2]. We observed a significant low serum leptin level, which signifies accuracy at low assay values, which is same in the high leptin levels. This speaks for the accuracy of our employed technique as it can detect high and low levels in the range of (0 – 100 ng / mL).

There was no relation of age group of 20 – 50 years with concentrations of serum leptin (P-value = 0.416). However, females were observed with higher leptin serum concentrations than males when the BMI and age was same. Panarotto states the same for a given weight of the body [11]. We may attribute this to the fact of higher body fat mass percentage in the women or estrogen-progesterone inducing effects when combined to the androgens suppressive effects on serum leptin [12]. International studies also state the same as we observed in the outcomes of this particular research [5, 13 – 15].

### CONCLUSIONS:

In our research sample the concentration of the serum leptin has a strong positive association with the BMI in the non-obese and healthy obese both males and females. Women were observed with higher levels in comparison to men; whereas the association of age with the levels of was not significant as we observed in this particular research.

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