

Levels of Leptin and IL-6 With Some Biochemical Parameters in Iraqi Obese Children

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Abstract

Obesity in children is attended by increased circulating leptin concentrations. Girls have higher leptin Concentrations than boys. IL-6 levels related positively with BMI and percent fat mass (PFM).

The Objective: Was to detect the serum IL-6 and levels of leptin among girls and boys as obese and other biochemical parameters related with obesity. **Methodology:** This study involved 60 children were classified into 2 groups; 30 obese ones (fifteen girls and boys fifteen) and 30 control (fifteen girls and fifteen boys) with years of seven- fifteen old who attended to the Obesity Research and Treatment Unit/ Al kindy Medical College, during the period January 2017 – July 2017. A clinical examination and diagnosis were done for each patient by the consultant medical staff and the biochemical laboratory examination results (FBS, blood urea, serum creatinine, lipid profile, serum GOT, serum GPT, SCa and uric acid) were as a routine work. They compared with 30 healthy children with approximate age with patients. The sera were assessed for IL-6 and leptin by an ELISA kit. **Results:** Showed no significant differences among obese children (boys and girls) except the GPT and GOT were both higher significantly ($P < 0.05$) in male (42.46 ± 34.27 and 33.3 ± 13.6) than in girls (53.6 ± 75.1 and 29.9 ± 14.1). Whereas, obese girls revealed a significant increasing in (STRIG 120.3 ± 26.7 $P \leq 0.01$, SLDL 89.3 ± 25.5 $P \leq 0.05$, GOT 33.1 ± 13.6 $P \leq 0.01$, GPT 29.9 ± 14.1 $P \leq 0.01$ and LIPTIN 2758.4 ± 539.1 $P \leq 0.001$) in comparison to the control girls. Similarly, for boys highly significant increasing appeared in (SLDL 90.92 ± 18.1 , GOT 42.46 ± 34.27 , GPT 53.6 ± 75.1 and LIPTIN 2883.93 ± 512.7 $P \leq 0.001$), as well as in STRIG $.69 \pm .13$ $P \leq 0.05$ then normal boys. Inversely, it has been shown that (BURIA 26.7 ± 5.3 $P \leq 0.05$, SREAT $.69 \pm .13$ $P \leq 0.01$ and SVLDL 20.15 ± 6.3 $P \leq 0.01$) were decreased significantly. In boys IL-6 showed significant positive correlation with BMI, while leptin revealed strong associated was with IL-6 **Conclusion:** Obesity associated with elevated blood leptin and IL-6 levels. Leptin and IL-6 play keys role as a biomarker for childhood obesity, and can help in the prediction of get weight in obese children as well as its important interrelationship with other parameters.

Keywords: Children obesity; Leptin; IL-6; Biochemical Parameters;

Introduction

Obesity represents one of the most important public health issues and increasing seriously in all the world parts, approximately two billion people are overweight and one third of them are obese ⁽¹⁾. It is one of the

most serious risk factors to many diseases like early onset metabolic syndrome asthma, fatty liver disease gastrointestinal diseases and Cardiovascular diseases. Growth and sexual development can also affect by obesity in children ⁽²⁾.

Leptin is protein produced by adipose tissue. Serum leptin concentrations are highly associated with body fat content in newborn infants, children and adults ⁽³⁾. It provides the first physiological evidence of regulate and controlling body weight, energy balance, fat and

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glucose metabolisms⁽⁴⁾. leptin levels are higher in obese girls as compared with obese boys even after losing weight showed convincing evidence about the variations between the two sexes⁽⁵⁾.

Adipose tissue from obese mainly releases cytokines as pro-inflammatory i.e. leptin, IL-6 & TNF- α ⁽⁶⁾. Tissues of liver, skeletal muscle and white adipose secrete interleukin- 6⁽⁷⁾. In obesity, high level IL-6 secreted by tissue of white adipose might involve in complications being metabolic. Researchers exhibit that signaling of IL-6 in adipocytes is convoluted in the obesity-associated development for resistance of hepatic insulin and steatosis of liver⁽⁸⁾. IL-6 produced by Adipose tissue might with metabolism influence via mechanisms being numerous, as well as gene expression of adipose tissue-specific, down-regulation of lipoprotein lipase, sensitivity of insulin, triglyceride release⁽⁹⁾.

This research was done to find out the level of serum leptin and IL- 6 among Iraqi obese boys and girls and other biochemical parameters related with obesity.

Patients and Methods

The study was carried out at the Alkindy Medical College. During the period January 2017 – July 2017, 30 obese (15 boys and 15 girls) were referred to the Obesity Research and Treatment Unit, their age rang 7- 15 years old. A clinical examination and diagnosis were done for each patient by the consultant medical staff and the biochemical laboratory examination results (FBS, blood urea, serum creatinine, lipid profile, serum GOT, serum GPT, serum calcium and uric acid) were as a routine work. They compare with 30 healthy children (15 boys and 15 girls) with approximate age with patients.

Laboratory methods

Serum isolated from five milliliters vinous blood for each participant. The sera were assessed for IL-6 and leptin by an ELISA kit (Elabscience, USA). The instructions of manufacturer were followed to assess the two variables.

Statistical Analysis

The results were tabulated in a data sheet of the statistical package SPSS version 20, which was used to carry out the analysis. The significant differences mean \pm SD were assessed by ANOVA. The correlation between IL-6, leptin and other biochemical parameters were estimated by Person’s correlation. A probability (**P**) value ≤ 0.05 was considered significant.

Results

The results of present study showed no significant differences ($P > 0.05$) between obese children (boys and girls) except the GPT and GOT were both higher significant differences ($P < 0.05$) in boys (42.46 ± 34.27 and 33.3 ± 13.6) than in girls (53.6 ± 75.1 and 29.9 ± 14.1) Table 1. Whereas, obese girls revealed a significant increasing in (STRIG 120.3 ± 26.7 $P \leq 0.01$, SLDL 89.3 ± 25.5 $P \leq 0.05$, GOT 33.1 ± 13.6 $P \leq 0.01$, GPT 29.9 ± 14.1 $P \leq 0.01$ and LEPTIN 2758.4 ± 539.1 $P \leq 0.001$) when compare to the control girls Table 2. Similarly, in boys highly significant increasing appeared in (SLDL 90.92 ± 18.1 , GOT 42.46 ± 34.27 , GPT 53.6 ± 75.1 and leptin 2883.93 ± 512.7 $P \leq 0.001$), as well as in STRIG $.69 \pm .13$ $P \leq 0.05$ then normal boys. Inversely, it has been shown that (BURIA 26.7 ± 5.3 $P \leq 0.05$, SCREAT $.69 \pm .13$ $P \leq 0.01$ and SVLDL 20.15 ± 6.3 $P \leq 0.01$) were decreased significantly in obese boys Table 3.

Table 1: Comparison of parameters between genders in obese children.

Parameters	Obese boys N= 15	Obese girls N= 15	P value
	Mean \pm SD	Mean \pm SD	
BM1 (kg/m ²)	36.5 \pm 9.1	35.3 \pm 4.7	NS
FBS (mg/dL)	84.2 \pm 6.9	85.7 \pm 6.2	NS
BUREA (mg/dL)	26.7 \pm 5.3	23.6 \pm 3.3	NS
SCREAT (mg/dL)	.69 \pm .13	.66 \pm .11	NS
SCHOLES (mg/dL)	157.2 \pm 18.03	164.8 \pm 20.3	NS
STRIG (mg/dL)	101.5 \pm 30.7	120.3 \pm 26.7	NS
SVLDL (mg/dL)	20.15 \pm 6.3	24.1 \pm 5.3	NS

Cont... Table 1: Comparison of parameters between genders in obese children.

SHDL (mg/dL)	44.2±5.70	44.1±4.4	NS
SLDL (mg/dL)	90.92±18.1	89.3±25.5	NS
SGOT (u/L)	42.46±34.27	33.1±13.6	0.05
SGPT (u/L)	53.6±75.1	29.9±14.1	0.05
SCa (mg/dL)	9.16±.56	9.1±.44	NS
SURICacid (mg/dL)	4.79±.77	4.3±.8	NS
IL-6(pg/mL)	8.5±8.3	8.4±6.9	NS
LEPTIN(pg/mL)	2883.93±512.7	2758.4±539.1	NS

BMI, body mass index; FBS, fasting blood sugar; BUREA, blood urea; Screat,(serum creatinine); SCHOLES, (serum cholesterol); STRIG (serum triglycerid); SVLDL, (serum very low-density lipoproteins); SLDL, (serum low-density lipoproteins); SHDL, (serum high-density lipoproteins); SGOT, (serum glutamic oxaloacetic transaminase); SGPT, (serum glutamic pyruvic transaminase); SCa, (serum calcium); SURIC acid, (serum uric acid); IL-6, (interleukin-6) and leptin, N= number, NS= not significant, SD= standard deviation

Table 2: Comparison parameters between obese and control girls

Parameters	Obese girls N= 15	Control girls N= 15	P value
	Mean±SD	Mean±SD	
BMI (kg/m ²)	35.3±4.7	18.2±4.6	0.01
FBS (mg/dL)	85.7±6.2	76.1±10.6	NS
BUREA (mg/dL)	23.6±3.3	30.6±6.3	NS
SCREAT (mg/dL)	.66±.11	.72±.6	NS
SCHOLES (mg/dL)	164.8±20.3	153.4±45.6	NS
STRIG (mg/dL)	120.3±26.7	89.65±16.8	0.01
SVLDL (mg/dL)	24.1±5.3	20.76±4.8	NS
SHDL (mg/dL)	44.1±4.4	43.8±8.9	NS
SLDL (mg/dL)	89.3±25.5	78.6±16.4	0.05
SGOT (u/L)	33.1±13.6	16.86±13.3	0.01
SGPT (u/L)	29.9±14.1	15.06±10.6	0.01
SCa (mg/dL)	9.1±.44	10.3±.3	NS
SURICacid (mg/dL)	4.3±.8	5.62±1.1	NS
IL-6(pg/mL)	8.4±6.9	8.76±6.5	NS
LEPTIN(pg/mL)	2758.4±539.1	1796.26±950.5	0.001

Table 3: Comparison parameters between obese and control boys.

Parameters	Obese boys N= 15	Control boys N= 15	P value
	Mean±SD	Mean±SD	
BMI (kg/m ²)	36.5±9.1	15.70±3.2	0.001
FBS (mg/dL)	84.2±6.9	77.33±12.2	NS
BUREA (mg/dL)	26.7±5.3	34.20±8.1	0.05
SCREAT (mg/dL)	.69±.13	2.76±7.5	0.01
SCHOLES (mg/dL)	157.2±18.03	154.8±23.9	NS
STRIG (mg/dL)	101.5±30.7	85.76±18.9	0.05
SVLDL (mg/dL)	20.15±6.3	29.7±7.9	0.01
SHDL (mg/dL)	44.2±5.70	42.7±13.66	NS
SLDL (mg/dL)	90.92±18.1	55.6±11.3	0.001
SGOT (u/L)	42.46±34.27	15.57±7.86	0.001
SGPT (u/L)	53.6±75.1	17.06±14.2	0.001
SCa (mg/dL)	9.16±.56	10.38±.45	NS
SURICacid (mg/dL)	4.79±.77	5.09±1.66	NS
IL-6(pg/mL)	8.5±8.3	7.99±6.59	0.01
LEPTIN(pg/mL)	2883.93±512.7	596.35±735.27	0.001

Correlations results show no significant association between IL-6 and leptin with biochemical parameters in girls. Whereas, in boys IL-6 showed significant positive correlation with BMI, while leptin revealed strong associated correlation was with IL-6 Table 4.

Table 4: Correlations between IL-6, Leptin and other biochemical parameters for both genders.

Parameters	Obese boys		Obese girls	
	IL-6(pg/mL)	Leptin(pg/mL)	IL-6 (pg/mL)	Leptin(pg/mL)
BMI (kg/m ²)	0.585*	0.477	-0.081-	0.029
FBS (mg/dL)	0.012	-0.378-	-0.174-	-0.053-
BUREA (mg/dL)	0.342-	-0.374-	-0.284-	-0.063-
SCREAT (mg/dL)	-0.270-	-0.239-	0.307	-0.062-
SCHOLES (mg/dL)	-0.072-	0.199	0.098	0.455
STRIG (mg/dL)	0.311	0.096	0.018	0.173
SVLDL (mg/dL)	0.328	0.094	0.018	0.173
SHDL (mg/dL)	-0.106-	0.111	0.224	0.276
SLDL (mg/dL)	-0.092-	0.157	0.057	0.231
SGOT (u/L)	0.020	-0.090-	0.270	0.391
SGPT (u/L)	-0.108-	-0.191-	0.114	0.461
SCa (mg/dL)	-0.048-	-0.117-	-0.223-	0.046
SURICacid (mg/dL)	0.229	0.131	-0.085-	0.091
IL-6(pg/mL)	1.000	0.729**	1.000	0.195
LEPTIN(pg/mL)	0.729**	1.000	0.195	1.000

All values are Pearson's correlation coefficients. BMI, (body mass index); FBS, (fasting blood sugar); BUREA, (blood urea); SCREAT, (serum creatinine); SCHOLE, (serum cholesterol); STRIG, (serum triglyceride); SVLDL, (serum very low-density lipoproteins); SHDL, (serum high-density lipoproteins); SLDL, (serum low-density lipoproteins); SGOT, (serum glutamic oxaloacetic transaminase); SGPT, (serum glutamic pyruvic transaminase); SCa, (serum calcium); SURICacid, (serum uric acid); IL-6, interleukin-6 and leptin, * $p \leq 0.05$; ** $p \leq 0.01$.

Discussion

The current study revealed significant elevation for SGOT and SGPT in both genders, and higher for boys ($p \leq 0.001$) than in girls ($p \leq 0.01$). Similar results have been found in study with Korean children⁽¹⁰⁾. Increased levels of hepatic enzymes are the most important characters of fatty liver disease. In obesity, they are well-known where expansion progressively increases with BMI increasing⁽¹¹⁾. In overweight and obese patient liver enzyme associated with metabolic risk factor⁽¹²⁾ and BMI⁽¹³⁾. Whereas,⁽¹⁴⁾ proved an abdominal height independent role, central adiposity measure being a predictor of increased levels of (GPT) as well (GOT), un-recognized fatty liver possible expression. Association of increasing enzymes of liver and excess echogenicity of liver with males and age of adolescent may explained by a pubertal androgen increase that affecting pathogenesis for obesity⁽¹⁵⁾. Androgen receptor signaling plays an important role in the development and advancement of several liver diseases including fatty liver disease⁽¹⁶⁾. According to the study conducted by⁽¹⁷⁾ frequent eaten fast food and sugar sweetened beverages and fruits and playing computer games more than 2 hours a day increased the risk of elevated liver enzymes.

The current study has demonstrated that there is a very strong relationship between obesity boys and girls table (2,3) with abnormal lipid profile including hyper triglyceridaemia and a high LDL Lipid levels depend on many factors, e.g. age, gender, nutritional status, nutritional intake and environmental factors. These data are compatible with previous studies in Qatar obese schoolchildren (6-11years) that show hypercholesterolemia, hypertriglyceridemia and elevated LDL levels⁽¹⁸⁾.

Two serum biomarkers, serum creatinine and blood urea are commonly used to discover kidney toxicity do not change quickly during the presentation of acute conditions⁽¹⁹⁾. In study conducted by⁽²⁰⁾ and⁽²¹⁾ no significant differences in creatinine revealed between normal and obese children these differences with our results may be due to the difference in localities, sample size, cultural and/or socioeconomic causes.

Leptin is an important cell-signaling hormone vital hormone that involve appetite, food intake and weight control. It is play a critical role as a biomarker in obese children's. Central effects of leptin on specific tissues and metabolic pathways suggest that leptin operates both directly with the hypothalamus for energy balance regulation⁽⁴⁾. In both gender a significant increasing appeared in (Leptin) and IL-6 than control groups, this is consistent with the study that confirm an early role of leptin in childhood obesity and Lower leptin levels were independently correlated with higher physical fitness⁽²²⁾ another study on obese asthmatic children show the same significant increasing when compare with lean asthmatic children⁽²³⁾.

Serum concentrations of IL-6 was significantly correlated with BMI illustrated in Table 3. increased circulating levels of many inflammatory markers including C-reactive protein (CRP), IL-8, IL-6, macrophage migration inhibitory factor (MIF) and monocyte chemoattractant protein 1 (MCP-1) in obese individuals, and were correlated positively to BMI and waist perimeter⁽²⁴⁾. In male highly significant increasing appeared in IL-6 than control groups because adipose tissue is known to be the main source of serum IL-6, at approximately 25% of total serum IL-6. Thus, higher IL-6 levels may be due to the increased adipose tissue⁽²⁵⁾.

Concentration of leptin is significantly correlated with IL-6 in boys illustrated in table (4) this may be due to that leptin linked to adiposity strongly, where levels are involved by size of adipocyte and mass of fat amounts. Via its core actions it is controlling intake of food and balance of energy indirectly. However, the IL-6 levels as high in obesity are not appetite repressing, which may attribute due to leptin resistance state⁽⁵⁾. Also, it has features as pro-inflammatory, stimulating cytokines secretion i.e. tumor necrosis factor alpha (TNF- α) and IL-

6 where all are influencing obesity patho-physiological process⁽²⁶⁾. The differences in correlation between boys and girls may due to sex hormonal differences.

Recommendation: Further studies are needed in larger number samples to investigate if other immunomarkers or biomarkers could be used to elucidation obesity and overweight among children and adolescents in Iraq.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: Non

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