Research Article

Study Of Some Biochemical Variables In The Serum Of Obese Children And Adolescents

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Abstract

Obesity and high-fat diseases are serious conditions that lead to various biochemical changes; therefore, this study aimed to measure biochemical variables (cholesterol, triglycerides (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), MDA (malondialdehyde)). It also calculated BMI (body mass index).

The study included (70) cases in total, including (37) obese male patients whose ages ranged between (6-16) years and (33) blood samples from healthy non-obese males whose ages ranged between (6-16) years. The results showed an increase in the concentration of fats (cholesterol, LDL, HDL, VLDL, TG) for obese patients compared with the control group at a probability level of <0.05. The results also showed a significant increase in MDA (P > 0.001). BMI was also calculated using age- and Sex-specific tables, which showed a clear increase in its level.

Keywords: BMI (body mass index); cholesterol; triglycerides (TG); low-density lipoprotein (LDL);high-density lipoprotein (HDL); very low-density lipoprotein (VLDL); MDA (malondialdehyde).

1. Introduction

Childhood obesity is already well acknowledged as a serious health issue worldwide, and its incidence is steadily rising in both high-income and low-income areas.Undernutrition has traditionally been the most prevalent issue in these cultures. However, recent dietary changes, urbanisation, and decreased physical activity have led to a concurrent rise in the frequency of childhood obesity and overweight[1].

Childhood obesity is associated with several metabolic problems and pathologies of excess body weight. Hormonal dysregulation, dyslipidemia, and Insulin resistance exemplify changing metabolism that often commence in early life; these alterations may expose individuals to the risk of developing chronic conditions like diabetes (type 2), metabolic syndrome and cardiovascular problems. Consequently, the prompt identification of these indicators is crucial for swift action [2]. Leptin regulates appetite, neuroendocrine function, satiety, energy homeostasis, and inflammatory responses, among other systemic effects, through binding to its broadly spread receptor [3].

Elevated lipid levels and alterations in leptin synthesis and signalling are observed in children with obesity; leptin regulates energy balance. This dysregulation of leptin can lead to an increased appetite and decreased energy expenditure, contributing to the development and maintenance of obesity [4]. The TG levels are elevated in obese children. They might play a role in the onset of metabolic syndrome, a condition in obese children that increases the probability of heart disease, stroke, and type 2 diabetes. Therefore, monitoring TG levels in obese children is crucial in preventing the development of metabolic complications [5]. Elevated triglyceride levels have been associated with impaired insulin function in regulating blood sugar levels, along with elevated lipid levels and disruptions in leptin production and signalling. So, monitoring TG levels may serve as a good marker to guide the management of obesity-related metabolic complications in children and insulin resistance [6].

Shifting our emphasis to LDL, obese children tend to have increased levels of LDL, a form of cholesterol that plays a role in the development of atherosclerosis.

Many previous studies that show in early adulthood the obesity associated with lower levels of HDL-C compared to person with normal weight [9], an effect exacerbated by vascular inflammatory mechanisms and oxidative[7, 8]. Regular exercise improves lipid profiles by increased level of HDL-C and decreasing VLDL particles [10, 11], while a high-fat diet and low-carbohydrate are effective in lowering VLDL [12].

2. Material And Methods

This study employed diagnostic kits to measure various parameters including cholesterol, triglyceride (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), malondialdehyde (MDA), leptin, and very low-density lipoprotein (VLDL). Body mass index (BMI), calculated by dividing body weight (Kg) by the square of height (m), was used to classify individuals into three categories: normal weight, overweight, and obese. The unit of BMI is kilograms per square meter. According to the following Table 1;

Table 1: Average Ideal Weight for Boys

Age	Weight (kg)
6	16.3-27.2
8	20.8-35
10	24-46
12	30-59
14	38-72
16	47-84

2.1 Study Design

The total number of samples used in our study was 70 samples, (37) obese patients and (33) non-obese patients. The age range of all these patients was (6-16) years old. These samples were obtained from students in primary school and Secondary Schools in Tikrit, Iraq. The blood samples collected from the students were subjected to centrifugation to separate the serum. The resulting serum was subsequently utilised for conducting laboratory tests, enabling us to obtain insightful results.

3. Tools And Apparatus

Table 2: The tools and materials used in our study.

N	Tools and material	Company
6.	Bottle washing water	China
1.	Disposable syringes	Türkiye
3.	Disposable tips	Spain
2.	Micropipette	Japan
4.	Plane tubes	France
5.	Test tubes	China

Table 3: Used apparatus in our study.

N	Apparatus	Company
1.	Centrifuge	Germany-Dupont
2.	Incubator	Türkiye – Elektromag
3.	Ultraviolet & Visible Spectrophotometer	Cecil Instrument Limited. USA

4. Results And Discussion

The study includes 37 cases of males diagnosed with obesity. They are aged between 6 and 16 years old. Furthermore, 33 cases of controls. They are males ranging from 6 to 16 years of age.

Parameter	Control group	Obesity group
Leptin (ng/ml)	6.83±11.3	54.32±30.78
Cholesterol (mg/dl)	162.9±32.8	180.2±35.5
HDLc	59.4±10.8	62.2±15.4
LDLc	87.7±25.6	94.8±29.6
VLDLc	15.6±8.9	23.1±10.6

TG	78.2±44.5	115.6±52.8
BMI (kg/m^2)	16.8±3.1	27.5±4.22
MDA	2.92±0.76	9.11±2.64

This research concluded the following points, all of which included a level of probability of (P<0.05);
The findings indicate that the normal range of leptin concentration in healthy blood serum is (6.83±11.3 ng/ml). This range varies depending on the individual's body mass index, with a significant gradual increase in leptin concentration as body mass increases. In obese patients, the leptin level reaches (54.32±30.78 ng/ml).
In terms of total cholesterol levels in blood serum, obese patients exhibited a significant increase compared to the control group. The total cholesterol level in obese patients was (180.2±35.5 mg/dl), while it was (162.9±32.8 mg/dl) in the control group.
The TG levels also showed an elevation in obese patients compared to the control group. Obese patients had a level of (115.6±52.8 mg/dl), whereas the control group had a level of (78.2±44.5 mg/dl).
Obese patients demonstrated higher levels of bad cholesterol (LDLc) compared to the control group. The level of LDLc in obese patients was (94.8±29.6 mg/dl) compared to (87.7±25.6 mg/dl) in the control group. Additionally, obese patients had higher high-density lipoprotein (HDL) levels (62.2±15.4 mg/dl), while the control group had (59.4±10.8 mg/dl).
The results indicate an increase in very low-density lipoprotein cholesterol (VLDLc) levels among obese patients compared to the control group. Obese patients had levels of (23.1±10.6 mg/dl), while the control group had levels of (15.6±8.9 mg/dl).
There was a significant and notable increase in the level of malondialdehyde (MDA) among obese patients (P<0.001). The MDA level in obese patients was (9.11±2.64), while it was (2.92±0.76) in the control group.
Measurements of BMI revealed a significant increase in obese patients. The BMI measurement in obese patients was (72.5±4.22 kg/m2) compared to (16.8±3.1 kg/m2) in the control group. The results of this study showed that the obese group had significantly higher levels of leptin, cholesterol, LDLc, VLDLc, TG, BMI, and MDA than the control group. the high weight group showed elevated levels of LDL; VLDL; cholesterol; and triglycerides is reflecting impaired lipid metabolism. This lipid disorder is primarily attributed to the excessive accumulation of adipose tissue and represents important key indicator of metabolic risks associated with obesity, these findings highlight the importance of early diagnosis and effective intervention for obesity and its associated metabolic disorders to reduce the risk of cardiovascular disease and metabolic complications [13&14].

5. References:

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