



Article

A comparative study between obese and gastric sleeve patients regarding the lipids levels

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Abstract

Obesity is one of the most prominent health challenges in the world as it is associated with many chronic diseases such as metabolic disorders and cardiovascular diseases. Bariatric surgery, especially laparoscopic sleeve gastrectomy, is one of the most effective interventions for treating obesity and losing weight, as the size of the stomach is reduced using the endoscope, which leads to significant weight loss in addition to feeling full and improving various metabolic processes, This surgery has also shown its role in improving obesity-related lipid disorders such as low good cholesterol and high triglycerides. Blood samples were collected from 75 individuals divided into three groups: the first group (control) healthy individuals (n = 25), the second group obese patients (n = 25), and the third are subjects treated by gastric sleeve (n = 25), The samples included males and females, aged between (20-60 years), The levels of total cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL) were determined among healthy

individuals, obese patients, and the gastric sleeve group. The results of The present study have shown

lower levels of total cholesterol, bad cholesterol (LDL), and good cholesterol (HDL) in both the obese and gastric sleeve groups compared to healthy individuals at the level ($P \leq 0.01$), and higher levels of triglycerides at the level ($P \leq 0.05$) in the obese group compared to the gastric sleeve group, as well as no statistically significant differences between the obese group and healthy individuals regarding triglycerides and very bad cholesterol (VLDL), The age group >40 years and blood group O+ were found to have statistically significant differences at the level ($P \leq 0.01$) in the obesity group, as it was the highest value compared to the gastric sleeve and healthy groups, and the Rh+ factor was higher at the same level in the obesity and gastric sleeve groups compared to healthy people, and the body mass index (BMI) was higher at the level ($P \leq 0.01$) in the obesity and gastric sleeve group compared to healthy people.

Keywords: Obesity, fat, gastric sleeve, cholesterol, blood type

1. Introduction

Over the past few decades, obesity has played a pivotal role through its significant impact on global economic and health systems due to its comorbidities, including cardiovascular, respiratory, musculoskeletal, oncological, mental and social consequences. Chronic inflammation is the most closely associated pathophysiological mechanism of obesity (1) Obesity is a complex, multifactorial and progressive condition, with far-reaching effects on overall health, quality of life and life expectancy. Although lifestyle and behavioural interventions are essential in the management of obesity, they often produce lasting outcomes in only a small proportion of individuals when used in isolation (2) In addition, medical treatment for weight management remains a primary treatment option for excess weight. Recent advances in obesity treatment have provided innovative approaches and

reshaped how this global issue is addressed (3) Obesity is often accompanied by dyslipidemia leading to atherosclerosis, a specific lipid state characterised by changes in the quantity and quality of plasma lipoproteins. The most notable changes in lipid levels are increased triglycerides, decreased high-density lipoprotein (HDL) cholesterol, and increased low-density lipoprotein (LDL) particles (4). Gastric sleeve surgery (GSG) has emerged as one of the most popular gastric sleeve surgeries worldwide among the various treatment options (5) ESG is effective when used as an alternative treatment for obesity, The beneficial effects are particularly evident in terms of the procedure's ability to ensure significant total body weight loss, Apart from the benefit of ensuring weight loss, ESG has been found to impair gastric emptying and exert metabolic effects essential for controlling obesity-related metabolic dysfunction and the ability to increase satiety (6)The study aimed to compare lipid levels with obese subjects who not underwent any surgery

2. Materials And Meyhods

2.1 Subjects

Blood samples were collected from (75) people, who were divided into three groups:

Group (1): Healthy people were used as a control group (n=25)

Group (2): Morbidly obese patients (n=25)

Group (3): Gastric sleeve group (n=25)

The comparative study was conducted in the Central Laboratory of Excellence during the period from 2024/8/2 to 2024/10/20, the samples were from males and females with age ranged within (20-60 years).

2.2 Samples Collection

Five milliliters of blood was drawn from the middle cubital vein of all subjects using single-use medical syringes, and the samples were placed in a gel-containing tube. Then, the samples were centrifuged at 3000 rpm for 10 min, resulting in separation of serum. The serum samples were stored at -20°C until required for examination. Before measuring the biochemical parameters

including total cholesterol (T.C), HDL, triglycerides (T.G), LDL, and VLDL, the necessary analyses were performed.

2.3 Determination of lipid profile in sera

Serum lipid levels including TC , TG and HDL was measured using a Smart-150 chemical analyzer according to the instructions supplied with the test kit provided by the Italian company GIESSE, HDL concentration was calculated according to the following equation: $HDL (mg/dl) = (Ax - Abx)/(AC - Abc) \times \text{Calibrator value}$ (7) VLDL concentration was calculated according to the following equation: $VLDL (mg/100ml) = T.G(mg/100ml)/5$ (8)

2.4 Ethics approval

The present study was carried out according to the ethical principles outlined in the Declaration of Helsinki. The study was performed following the acquisition of both verbal and written consent from the patients before collecting the samples, this case-control study was approved by University of Anbar.

2.5 Statistical Analysis

The Statistical Packages of Social Sciences-(SPSS 2019) (9) program was used to detect the effect of difference among groups in study parameters. Least significant difference-LSD and T-test were used to compare the significance among the studied groups. Chi-square test was used to compare the significance between percentage (0.05 and 0.01 probability). The correlation coefficient between variables was conducted in this study..

3. Results And Discussion

3.1 Evaluation of lipid levels among the studied groups

The results of the study shown in Table (1) have shown a comparison of lipid functions among the study groups ,The following were observed:

- **Total Cholesterol**

Its level was highly significant decreased ($P \leq 0.01$) in the obesity and gastric sleeve groups compared to healthy individuals, No statistically significant differences were observed at the same level ($P > 0.05$) between the obesity and gastric sleeve groups.

- **High density lipoprotein (HDL)**

A significant decrease was observed at the significance level ($P \leq 0.01$) in the obesity and gastric sleeve groups compared to healthy individuals, No statistically significant differences were observed at the same level between the obesity and gastric sleeve groups.

- **Bad Cholesterol (LDL):**

Its value was decreased significantly at the significance level ($P \leq 0.01$) in the obesity and gastric sleeve groups compared to healthy individuals, No statistically significant differences were observed at the same level between the obesity and gastric sleeve groups.

- **Triglycerides:**

Its value was increased significantly at the significance level ($P > 0.05$) in the obesity group compared to the gastric sleeve group, No significant differences were observed at the same level between the obese group and healthy individuals, No significant differences were observed at the same level between the sleeve gastrectomy group and healthy individuals.

- **Very bad cholesterol (VLDL):**

No significant differences were observed at the significance level ($P \leq 0.05$), between the obese group and healthy individuals, as well as between the sleeve gastrectomy group and healthy individuals, A significant increase was observed at the significance level ($P \leq 0.05$), in the obese group compared to the sleeve gastrectomy group.

Table(1): Comparison between difference groups regarding Lipid profile

Group	Mean ±SE (mg/dl)				
	Total cholesterol .	Triglyceride	HDL	LDL	VLDL
Control	187.52 ±3.22 a	134.28 ±7.79 ab	52.72 ±3.35 a	107.94 ±3.76 a	26.85 ±1.56 ab
Obesity	155.64 ±5.46 b	159.80 ±13.06 a	41.60 ±1.55 b	82.08 ±3.41 b	31.96 ±2.61 a
Gastric	148.92 ±5.84 b	114.08 ±13.41 b	42.20 ±1.70 b	83.90 ±4.62 b	22.81 ±2.68 b
LSD	14.039 **	33.002 *	6.630 **	11.184 **	6.601 *
P-value	0.0001	0.0262	0.0016	0.0001	0.0262

Means having with the different letters in same column differed significantly, * (P≤0.05), ** (P≤0.01). When the means have different letters like (a, b), it means that there is a significant difference between them, However, if the means have the same letter or a group of common letters like (ab), it means that they are not significantly different from each other, For example, if the mean has the letter (a), it represents the highest value, and if it has the letter (ab), it is not significantly different from the mean that has the letter (a) or (b).

3.2 Comparison of statistical differences regarding age, gender, blood type, and Rh factor among the studied groups.

The results of Table (2) showed that there were no statistically significant differences between the studied groups regarding gender, but regarding the age there were statistically significant differences at the level of (P≤0.01), for subjects less than 40 years among the groups of morbid obesity, sleeve gastrectomy and healthy individuals, while the percentage was higher in the group, of gastric sleeve gastrectomy compared to healthy individuals. On the other hand , the results also showed statistically significant differences at the level of (P≤0.01), With regard to blood type O+ between the same groups, where the percentage was higher in the group of morbid obesity compared to healthy individuals. In addition, statistically significant differences were observed at the level of (P≤0.01) According to the Rh +

factor between the three groups, the percentage was higher in the groups of morbid obesity and sleeve gastrectomy compared to the healthy group.

Table (2): Distribution of the studied groups according to gender , age , blood groups and Rh factor.

Factors		Control No (%)	Obesity No (%)	Gastric No (%)	P-value
Gender	Male	13 (56.00%)	13 (56.00%)	13 (56.00%)	0.907 NS
	Female	12 (44.00%)	12 (44.00%)	12 (44.00%)	
Age groups (year)	<40 yr.	8 (32.00%)	10 (44.00%)	13 (56.00%)	0.0074
	40-50 yr.	11 (44.00%)	12 (44.00%)	6 (24.00%)	**
	>50 yr.	6 (24.00%)	3 (12.00%)	6 (24.00%)	
Blood groups	A	4 (16.00%)	1 (4.00%)	3 (12.00%)	0.0001
	B	6 (24.00%)	0 (0.00%)	1 (4.00%)	**
	AB	2 (8.00%)	1 (4.00%)	1 (4.00%)	
	O	13(56.00%)	23.00 (92.00%)	20 (80.00%)	
Rh	+	22 (88.00%)	24 (96.00%)	24 (96.00%)	0.0001
	-	3 (12.00%)	1 (4.00%)	1 (4.00%)	**
** (P≤0.01).					

3.3 The statistical differences in body mass index among different study groups

The results of the current study, as shown in Table (3), showed no significant differences between the studied groups regarding the age, but significant differences were observed at the significance level ($P \leq 0.01$) for the body mass index (BMI) among the different groups, as the morbidly obese group showed a significantly higher BMI value compared to the gastric sleeve and healthy groups, and the gastric sleeve group in turn recorded a significantly higher BMI value compared to the healthy group.

Table (3): Comparison between difference groups in Age and BMI

Group	Mean ±SE	
	Age (year)	BMI (kg/m ²)
Control	43.60 ±1.96	27.67 ±0.46 c
Obesity	41.60 ±1.97	41.18 ±0.74 a
Gastric	40.08 ±2.29	32.39 ±0.94 b
LSD	5.765 NS	2.086 **
P-value	0.478	0.0001
Means having with the different letters in same column differed significantly, ** (P≤0.01).		

Fats are organic compounds insoluble in water but dissolve easily in organic solvents such as alcohol and ether, Unlike proteins, carbohydrates and nucleic acids, fats are not polymers but are composed of small units. In plasma, more than 90% of fatty acids are in the form of fatty acid esters, especially triglycerides and cholesterol esters, Fat sources are divided into two sources: an external source, which includes fats obtained from food, and an internal source, which includes fats biosynthesized by the body, especially in the liver. Because fats are difficult to dissolve in water, they are transported in the blood by lipoproteins, which are complexes of fats and proteins (10), A minimum level of body fat is necessary for normal physiological functions that control body temperature and generate energy for all physical activities and protection of body organs, Stored body fat includes the accumulated fat in adipose tissue. The percentage of body fat is regarded as one of the most accurate percentages for assessing obesity presently (11), Several studies have shown that eating a lot of fat, expending energy from fat, and a diet rich in fat are positively associated with increased body weight, higher body mass index, and the risk of overweight and obesity (12), as the recent study (13) indicated that obese people are more likely to have higher levels of blood cholesterol, triglycerides, low-density cholesterol (LDL), and very low-density cholesterol (VLDL) than non-obese people, another recent study (14) showed that obesity leads to the depletion of HDL

molecules as a result of their transformation from molecules rich in cholesterol esters to small, dense molecules rich in triglycerides, and confirmed that bariatric surgery is the most effective treatment for raising HDL levels and improving its functions. Moreover, a recent study (15) indicated that bariatric surgery improves high-density cholesterol (HDL) levels, with the largest increase in its levels observed two years after surgery, and showed that HDL levels before surgery and the type of surgery have a significant impact on determining the level of this increase, as the Mina study 2022 (16) showed a significant improvement in lipid indicators such as total cholesterol (TC), LDL cholesterol, triglycerides (TG), and HDL cholesterol during a period of 9 to 12 weeks after surgery, especially in non-diabetic patients. Additionally, a recent study (17) confirmed that gastric sleeve surgery is an effective way to treat obesity and improve lipid levels in obese patients.

These studies indicate that people with severe obesity are more likely to have high blood cholesterol, triglycerides, and low-density cholesterol (LDL), and that gastric sleeve surgery is an effective way to improve lipid levels and high levels of high-density lipoprotein (HDL).

Obesity is an ever-growing global pandemic, with the World Health Organization (WHO) 2016 statistics showing that 13% of the world's adult population is obese, This health problem poses a serious threat to public health, as it is associated with an increased risk of cardiovascular disease, diabetes, and metabolic syndrome (18).

Gastric sleeve surgery, as one of the advanced surgical techniques for treating obesity, has gained wide popularity due to its success in achieving significant weight loss in short periods of time, this surgery is a prominent option among metabolic treatments, making it one of the most effective surgical options for treating obesity (19).

Recent studies indicate that multiple factors such as body mass index (BMI), gender, age, and body fat percentage play key roles in understanding obesity and evaluating the outcomes of surgical procedures designed to treat it, For example, Varban 2020 (20) found that patients with a relatively low BMI were more likely to have hypertension, diabetes, and hyperlipidemia (>50%), and showed higher rates of

achieving a healthy weight after surgery, In contrast, Li 2020 (21) confirmed that body fat percentage is a more accurate indicator of obesity assessment than BMI, as the latter cannot accurately estimate visceral adipose tissue (VAT). This recent study showed that measuring body fat percentage has a clinical importance when selecting patients for metabolic surgery and evaluating their outcomes, Furthermore, Wahabi 2023 (22) found that the prevalence of obesity and overweight among the age group ≤ 25 years was approximately 30%, The rate was higher among young males (40%) than females (25%). However, the study showed a decrease of more than 40% in the obesity rate among young people between 2012 and 2021. According to a recent study (23), it was found that the prevalence of obesity increases with age, with the highest rates of obesity and overweight recorded among individuals over 40 years of age. Moreover, another recent study (24) showed that laparoscopic sleeve gastrectomy achieved positive and promising results in weight loss in patients with morbid obesity, this study also indicated a possible relationship between blood types and the success rate of this surgery, which opens new insights for understanding the factors of success in surgical treatment of obesity. Hence the recent study (25) showed a positive association between blood types and obesity indicators, such as body mass index (BMI), waist-to-hip ratio (WHR), and waist circumference. In contrast, Another recent study (26) showed that people with blood type O and a positive Rh factor were more likely to have an increased BMI, In contrast, a Previous study (27) found no statistically significant association between blood types and BMI.

4. Conclusion

The present study has reported that gastric sleeve surgery is an effective way to improve body fat levels and reduce the risks associated with obesity as shown in improving the levels of TC, HDL and LDL with no significant impact regarding TG and VLDL. On the other hand, no statistically significant differences were observed between the groups in terms of gender, but significant differences appeared in the age group less than 40 years, as their percentage was higher in the obesity group

compared to the healthy group, significant differences were observed in blood type O+, as the percentage was higher in the obesity group compared to the healthy group. Lastly, the Rh+ factor was more evident in the obesity and sleeve gastrectomy group compared to the healthy group.

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Conflicts Of Interest

The author declares no conflict of interest.

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