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The Impact of Obesity Surgery on Metabolic and Hormonal Changes in Iraqi Children

Dr. Mahdi Issa Ighrayyib [1], Dr. Abdulhussein Muhan Shukban [2], Dr. Mahdi Yasir Jabbar [3]

[1] M.B.Ch.B., D.M. \ (Internal Medicine), Iraqi Ministry of Health, Wasit Health Department, Al Zahraa Teaching Hospital, Wasit, Iraq

[2, 3] M.B.Ch.B., D.G.S. \ (General Surgeon), Iraqi Ministry of Health, Wasit Health Department, Wasit, Iraq

Abstract: Background: Obesity is associated with a significant risk of comorbidities, which affect the metabolism of patients with obesity.

Aim: This study was assessed changes of metabolic and hormonal for Iraqi children with obesity after post-operative.

Patients and methods: Our study was conducted assessment the outcomes of obesity surgery on Iraqi children and its impact on metabolic and hormonal changes across 88 cases of both male and female genders. The study used the SPSS program to analyse databases collected from different hospitals in Iraq between June 16th, 2022, and September 25th, 2023. Preoperative clinical, demographic outcomes were modelled for patients aged between 3 to 13 years with BMIs ranging from 35 to 40.8. We assessed the preoperative baseline characteristics, including comorbidities, age, and sex, among obese patients undergoing Laparoscopic sleeve gastrectomy (LSG).

Results and discussion: Our clinical outcomes indicated a higher incidence of obesity among males (58%) compared to females (42%). Preoperative findings revealed that 28 patients (31.8%) had hyperlipidemia, 20 (22.7%) had metabolic syndrome, and 15 (17.0%) had Type 2 diabetes. With regards to medical testing, the study analysed the pre-and post-operative test results of patients who underwent Laparoscopic sleeve gastrectomy (LSG). The findings indicate that preoperative Hemoglobin levels were (12.5 ± 2), which increased to (13.3 ± 1.8) post-operatively. Iron profile levels were recorded at (45.82 ± 20.1) and (51.4 ± 33.71) pre-and post-operatively, respectively. Vitamin B12 levels were (165 ± 55) prior to surgery and (175 ± 162) post-operatively. In the postoperative stage, it was observed that TSH levels decreased to (3.9 ± 2.65) in comparison to the pre-operative stage, where they had risen. Additionally, T4 levels were higher in the pre-operative stage (14.2± 3.3) compared to the post-operative stage (14.3± 2.5). Finally, PTH levels were (65.4± 18.89) in the pre-operative stage and (78.1± 43.8) in the post-operative stage. The HBA1C levels in males were 6.1 before surgery and 5.4 after surgery, while the levels in females were 5.9 before surgery and 5.27 after surgery.

Keywords: Obesity; HbA1c changes; and Laparoscopic sleeve gastrectomy (LSG).

Conclusions: Our study indicates the efficiency of Laparoscopic sleeve gastrectomy (LSG), where HbA1c levels dropped for both males and females after surgery when compared to respective levels before surgery.

Introduction

In recent years, there has been a rapid increase in the number of children and adolescents with overweight problems. Excessive deposition of adipose tissue in the body, that is, obesity, is a disease that needs to be treated [1-3]. Obesity in children can lead to serious health problems: diseases of the gastrointestinal tract (constipation, Diarrhea, cholecystitis, pancreatitis, etc.), the cardiovascular system (hypertension, heart disorders), atherosclerosis, insulin resistance, type 2 diabetes mellitus, disorders of sexual development, endocrine and metabolic disorders, arthrosis, sleep apnea. [4-8]

Obesity is an indisputable global health problem that has taken on epidemic forms in both developed and developing countries [9]. According to the World Health Organization (WHO), the prevalence of obesity in the world has almost tripled since 1975. The prevalence of obesity has doubled over the last twenty years since it went from 14% in 1997 to 26.2% in 2016. In addition to its ever-increasing prevalence, obesity provides many. Cardiovascular diseases dominate the comorbidities of obesity and are responsible for 49% of deaths in France [10-15].

These observations underline the imperative of an early and adequate management of obesity by favoring hygienic and dietary measures [16]. However, the frequent failures of well-conducted medical treatment for six to twelve months justify the use of bariatric surgery in obese subjects with morbid or severe obesity associated with comorbidities. This therapeutic option is promising because of its not only weight but also metabolic benefits, which have led to the emergence of the concept of metabolic surgery. Indeed, numerous studies have demonstrated an improvement in insulin sensitivity accompanied by a better glycemic balance or even a remission of type 2 diabetes after surgical treatment of obesity. [17-20]

Laparoscopic sleeve gastrectomy can be defined as a restrictive technique that consists of restricting the gastric volume in 75% through resecting in the large curvature of the stomach. Although malabsorptive and mixed techniques seem to be the most effective in remission of type 2 diabetes. However, SGL remains the most widely practiced technique in the world. In Iraq, surgeons would perform SG as the most common surgical technique [21,22]. The only Iraqi study that looked at the evolution of metabolic parameters after bariatric surgery included obese people.

Patients and methods

Our study was conducted assessment the outcomes of obesity surgery on Iraqi children and its impact on metabolic and hormonal changes across 88 cases of both male and female genders. The study used the SPSS program to analyse databases collected from different hospitals in Iraq between June 16th, 2022, and September 25th, 2023. Preoperative clinical, demographic outcomes were modelled for patients aged between 3 to 13 years with BMIs ranging from 35 to 40.8. We assessed the preoperative baseline characteristics, including comorbidities, age, and sex, among obese patients undergoing Laparoscopic sleeve gastrectomy (LSG). To investigate possible comorbidities, tests were conducted for asthma, hyperlipidemia, hypertension, liver and kidney diseases, metabolic syndrome, sleep apnea, and Type 2 diabetes. Technical terms were defined when first used, and a logical structure was maintained throughout the text.

Our study analysed the medical tests of obese patients before and after Laparoscopic sleeve gastrectomy (LSG). The tests included nutritional biomarkers, glucose levels, hypothalamic-pituitary-adrenal axis function, and thyroid activity. Clinical tests also featured C-peptide, random blood glucose, and HbA1C (%). Additionally, vitamin groups were assessed, including hemoglobin, iron profile, vitamin B12 (pg/mL), 25-OH vitamin D, and calcium (mg/dl).

Clinical outcomes were established by constructing predicted models using linear regression. A classification model was then created to combine the outputs of metabolic and hormonal changes before and after Laparoscopic sleeve gastrectomy (LSG), focusing on the main factors of

triglycerides, cholesterol, LDL, and HDL. Our results demonstrate changes in HbA1C for both sexes through conducting an analysis of changes of HbA1C on male and female patients with LSG outcomes.

Results

Table 1: Preoperative clinical features for patients LSG surgery based on age.

		BMI	Age
N	88	88	88
	0	0	0
Me		38.5414	38.5414
Med		39.0100	39.0100
SD		1.82617	1.82617
Min		35.00	35.00
Max		40.80	40.80
S		3391.65	3391.65

Table 2: Distribution of obesity patients based on sex.

		Number of patients: 88	P (%)	VP (%)	CP (%)
V	F	37	42.0	42.0	42.0
	M	51	58.0	58.0	100.0
	T	88	100.0	100.0	

Table 3: Distribution of obesity patients based on comorbidities.

		Number of patients: 88	P (%)	VP (%)	CP (%)
V	***asthma***	5	5.7	5.7	5.7
	hyperlipidemia	28	31.8	31.8	37.5
	hypertension	6	6.8	6.8	44.3
	liver and kidney diseases	6	6.8	6.8	51.1
	metabolic syndrome	20	22.7	22.7	73.9
	sleep apnea	8	9.1	9.1	83.0
	Type 2 diabetes	15	17.0	17.0	100.0
	T	88	100.0	100.0	

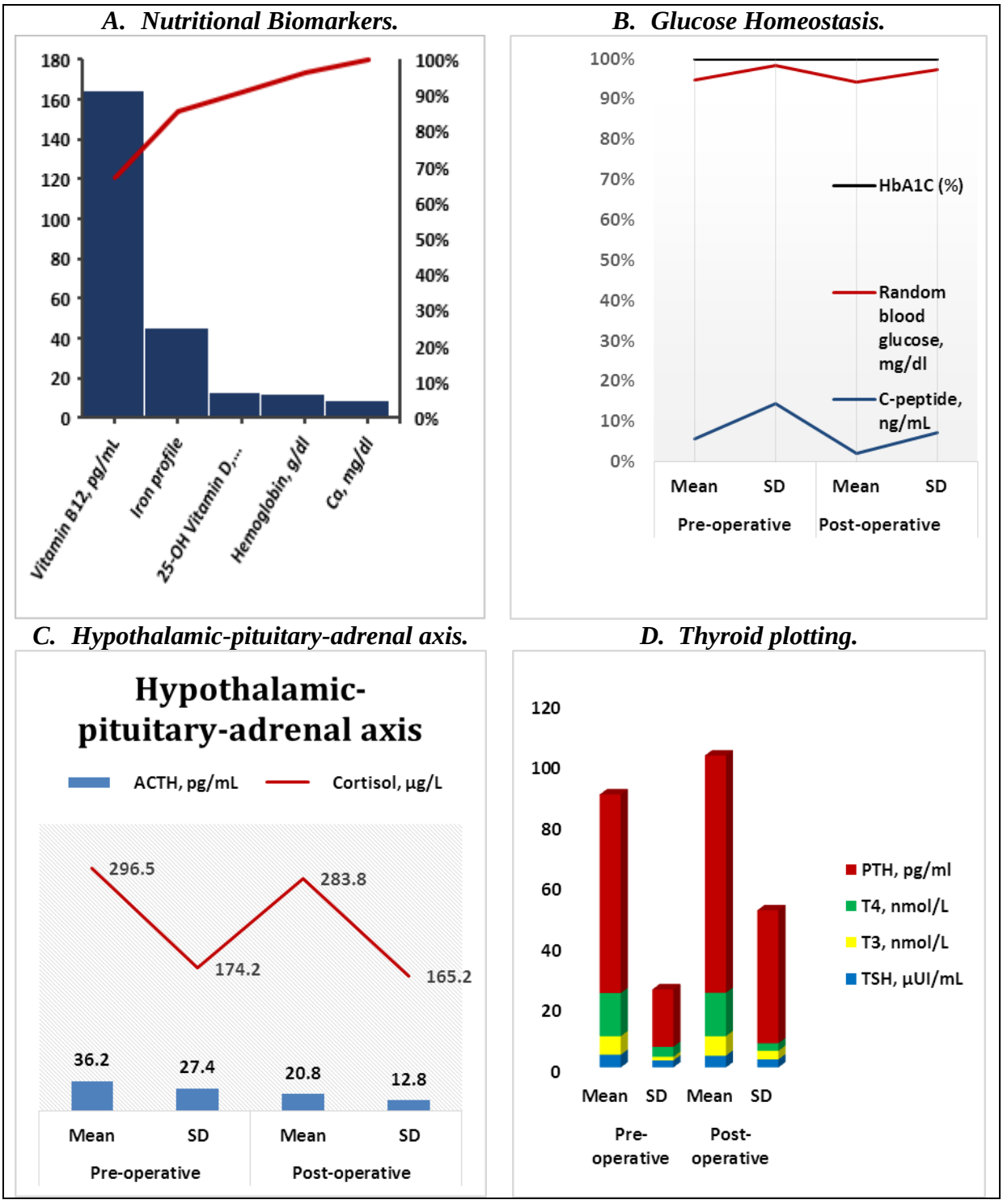
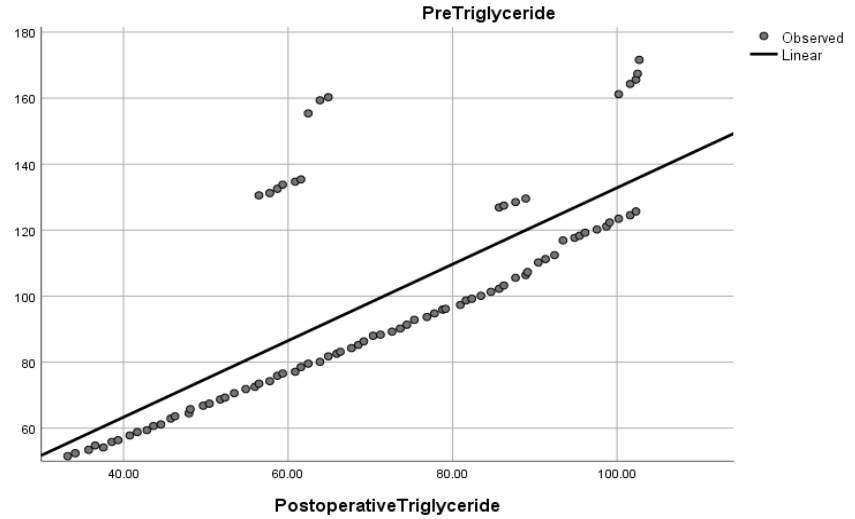
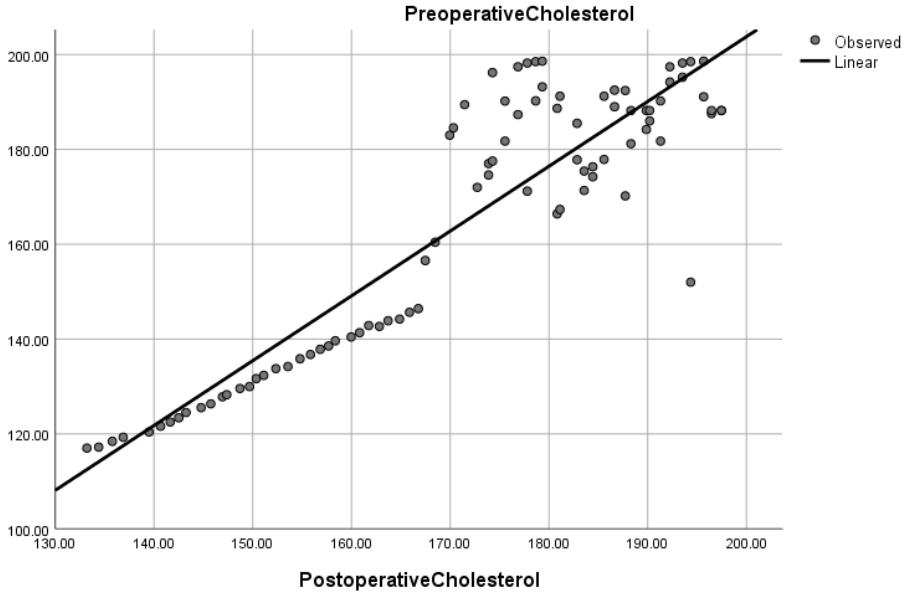


Figure 1: Pre-and post-operative clinical outcomes of Laparoscopic sleeve gastrectomy (LSG) in patients with obesity.

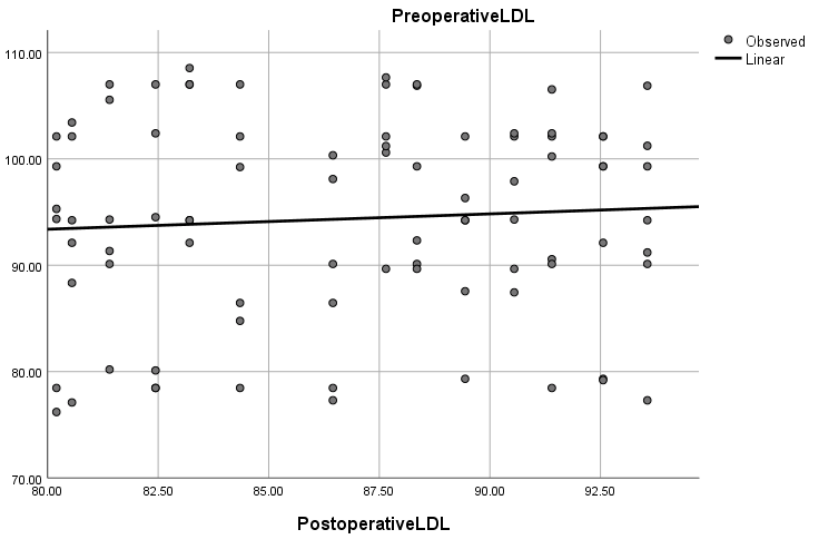
A. Triglyceride



B. Cholesterol



C. LDL



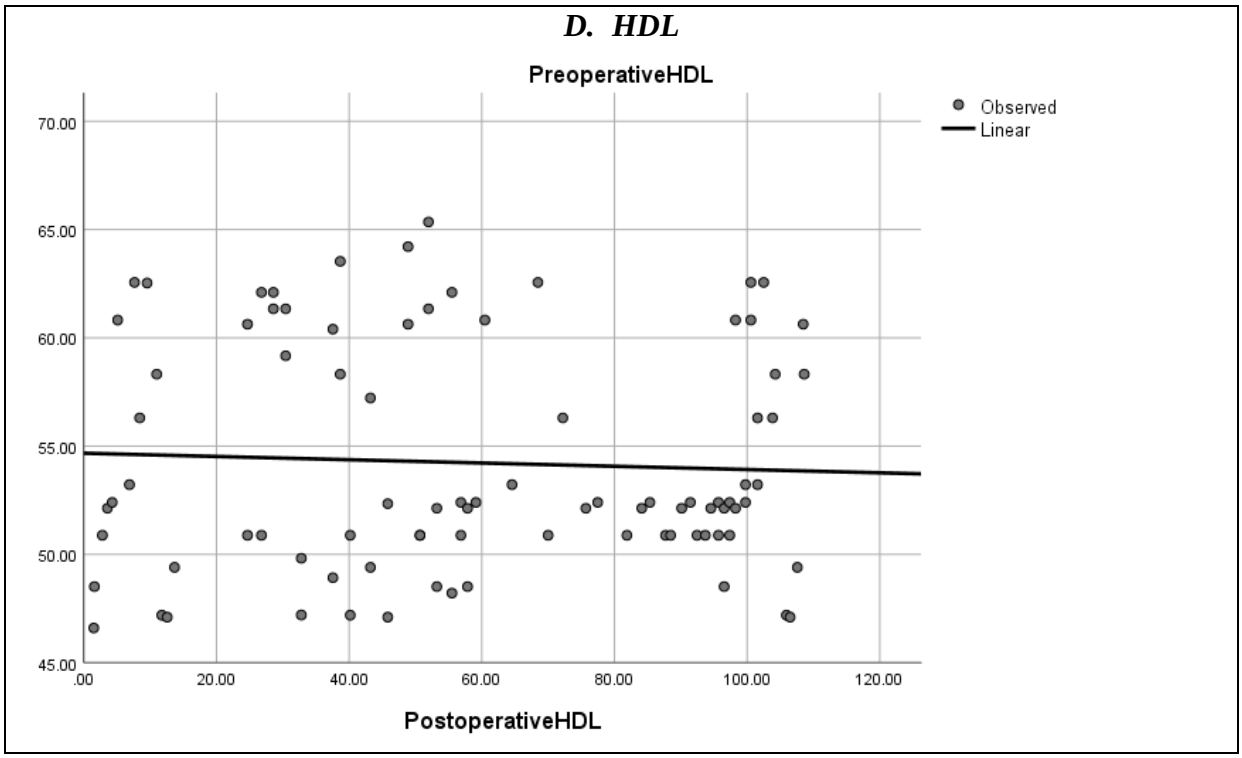


Figure 2: Modelling the outcomes using linear regression for the outcomes of patients with obesity before and after surgery.

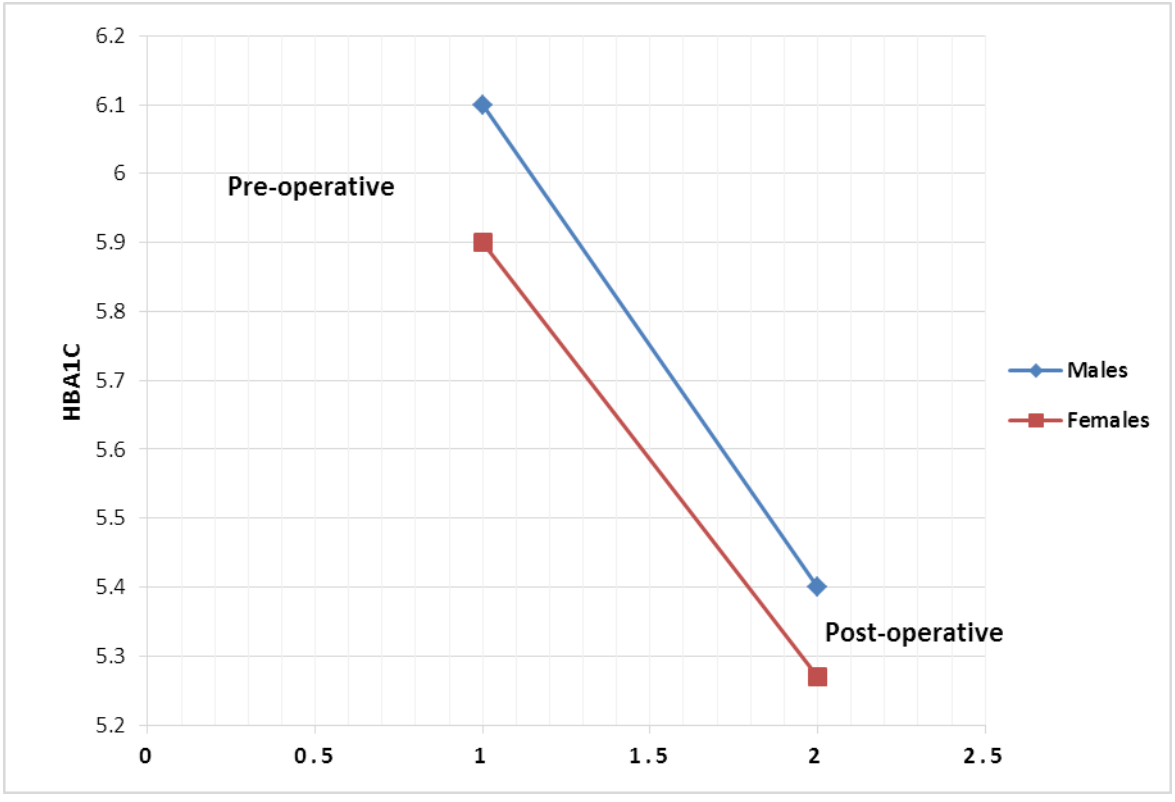


Figure 3: Determine changes in HBA1C for both sexes pre- and post-laparoscopic.

Discussion

Our study was conducted analysing LSG surgery affected on metabolic and hormonal changes for children's Iraqi patients. We presented the basic demographic characteristics of 88 cases, including age, sex, BMI, and comorbidities. Our clinical outcomes indicated a higher incidence of obesity among males (58%) compared to females (42%). Preoperative findings revealed that 28 patients

(31.8%) had hyperlipidemia, 20 (22.7%) had metabolic syndrome, and 15 (17.0%) had Type 2 diabetes.

With regards to medical testing, the study analysed the pre-and post-operative test results of patients who underwent Laparoscopic sleeve gastrectomy (LSG). The findings indicate that preoperative Hemoglobin levels were (12.5 ± 2), which increased to (13.3 ± 1.8) post-operatively. Iron profile levels were recorded at (45.82 ± 20.1) and (51.4 ± 33.71) pre-and post-operatively, respectively. Vitamin B12 levels were (165 ± 55) prior to surgery and (175 ± 162) post-operatively. Similarly, 25-OH Vitamin D levels were (13.1 ± 5.8) pre-operatively and (12.9 ± 5.3) post-operatively. According to the findings of glucose homeostasis, our results indicate that the HbA1C levels of patients were higher (6 ± 0.7) in the preoperative stage than in the post-operative stage (5.5 ± 0.5). Additionally, the random blood glucose levels were (101.2 ± 34.8) in the pre-operative stage and (86.9 ± 17) in the post-operative stage. 2) In the post-operative stage, it was observed that TSH levels decreased to (3.9 ± 2.65) in comparison to the pre-operative stage, where they had risen. Additionally, T4 levels were higher in the pre-operative stage (14.2± 3.3) compared to the post-operative stage (14.3± 2.5). Finally, PTH levels were (65.4± 18.89) in the pre-operative stage and (78.1± 43.8) in the post-operative stage.

Furthermore, our study utilised linear regression modelling to examine the outcomes of obese patients before and after surgery. Our results demonstrate a significant decrease in four key risk factors following surgery compared to pre-operative outcomes. Specifically, we observed a decline in Triglyceride levels from (52-172) mg/dl preoperatively to (33.2-102.7) mg/dl postoperatively. Similarly, our study found rates of high-density lipoprotein (HDL) and low-density lipoprotein (LDL) within the ranges of 46.6-65.3 and 76.2-108.5, respectively, during the preoperative period. Furthermore, we predicted the final outcomes regarding changes in hemoglobin A1C (HBA1C) levels for both males and females before and after Laparoscopic sleeve gastrectomy (LSG). The HBA1C levels in males were 6.1 before surgery and 5.4 after surgery, while the levels in females were 5.9 before surgery and 5.27 after surgery.

According to recent studies, Laparoscopic sleeve gastrectomy (LSG) led to significant reductions in C-peptide levels, HbA1C levels, random blood glucose, and triglycerides, as well as adrenocorticotropic hormone levels. However, cholesterol components, thyroid hormones, and nutritional biomarkers showed no significant changes [23]. In light of these findings, Laparoscopic sleeve gastrectomy (LSG) was deemed a safe and effective early treatment strategy for children with morbid obesity. Furthermore, the implementation of Laparoscopic sleeve gastrectomy (LSG) in children has resulted in considerable reductions in weight, as well as improvements in cardiovascular and metabolic risk factors and overall quality of life. Additionally, Laparoscopic sleeve gastrectomy (LSG) has been identified as an effective method for satisfactory weight loss and BMI reduction, alongside amelioration in comorbidities like diabetes mellitus [24]. Laparoscopic sleeve gastrectomy (LSG) significantly decreased HbA1C levels in paediatric patients with type 2 diabetes mellitus. Additionally, preoperative HbA1C levels had no impact on postoperative morbidity and length of stay after LSG [25].

Conclusion

LSG surgery was indicated as a perfect treatment option for patients with obesity that is related to comorbidities; the following factors are diabetes mellitus, hypertension, hyperlipidaemia, and obstructive sleep apnea. This surgery was contributed to enhance abnormal glucose homeostasis for most patients, making it particularly effective for children. Additionally, our study indicates the efficiency of Laparoscopic sleeve gastrectomy (LSG), where HbA1c levels drop for both males and females after surgery when compared to respective levels before surgery. Overall, our findings suggest that bariatric surgery may have advantageous enduring health impacts on metabolic and hormonal alterations in children with morbid obesity and related comorbidities.

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