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The Effect Of Gastric Sleeve Surgery On Physiological Parameters, Serum Iron, Serum Ferritin, And Other Physiological Parameters

Ahmed Jabbar Obaid[1], Ahlam A. Alwan[1], Omar Yasir Shakir[2]

Abstract

A common, minimally invasive bariatric treatment called a gastric sleeve, or sleeve gastrectomy, removes 60% to 80% of the stomach, leaving behind a thin "sleeve" that resembles a banana. It treats obesity by restricting food intake and reducing hunger-regulating hormones, typically leading to 50–70% excess weight loss within two years. In this study, 90 samples were collected from three groups to investigate the physiological and biological effects of gastric sleeve surgery on certain physiological and biological indicators and its impact on overall body metabolism. The participants, both men and women, ranged in age from (20-45) years. The first group consisted of individuals scheduled for gastric sleeve surgery, with samples taken before the procedure. The second group was tested one week after surgery, and the third group was tested several months post-surgery. The study found that physiological, biological, and metabolic indicators decreased as time passed following the surgery.

[1]Department of Applied Pathological Analysis, College of Science, Al-Nahrain University, Iraq
[2]National Diabetes Center, Mustansiriyah University, Baghdad, Iraq
Email: ahlam.abdullah@nahrainuniv.edu.iq

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1. Introduction

Obesity is becoming more common in Turkey every day. Turkey has the highest obesity incidence in all of Europe, at 32.1%, according to the World Health Organization (WHO) [1]. Obesity in individuals with a Body Mass Index (BMI) of 30.0 kg/m^2 or more is linked to multiple organ dysfunction [2]. Sedentary lifestyles, unhealthy eating habits, and increasing fast food consumption are among the most prevalent community circumstances that contribute to obesity globally [3]. The most successful method of treating obesity nowadays is bariatric surgery (BS) [4,6]. By lowering excess body weight, enhancing bodily functions, and lowering mortality, BS mitigates obesity-related problems [5]. Consequently, multiple surgical techniques have been reported over the past four decades. The ideal case is sleeve gastrectomy (SG), which has become the most widely performed bariatric surgical technique [6]. SG was approved by the American Society for Metabolic and Bariatric Surgery (ASMBS) as a single procedure in 2011 among other morbid obesity treatments [7]. There is ample evidence of the health advantages of various bariatric surgery techniques [5]. Nutritional hazards following SG, however, have not been well documented [8,9]. Among the potential side effects of bariatric surgery, nutritional deficits stand out. Even before surgery, a considerable percentage of individuals with morbid obesity have vitamin deficiencies, according to studies [11,12]. Patients with BS frequently have micronutrient deficits, which is detrimental. In particular, iron, folate, vitamin B12, and D deficits are common in BS after surgery [12]. Therefore, in order to prevent and treat nutritional deficits in these individuals, the participation of the dietician and a professional team is crucial. Nonetheless, a further benefit of SG is that patients who get it are less likely to experience vitamin and mineral shortages [9]. Nutrient status following SG has also been documented in a few studies. Investigating the dietary condition, body composition, and biochemical characteristics of SG patients was the goal of this study.

2. Materials and methods

2.1 Methodology

Three groups of ninety males, ages twenty to forty-five, were chosen:
Group 1: (30 male and female) One week before the sleeve gastrectomy surgery.
Group 2: (30male and female) One week after the gastrectomy surgery.
Group 3: (30 male and female) Three months after undergoing sleeve gastrectomy surgery.

2.2 Study design

The study design in this research was based on cross-sectional analysis, and we used the one-away ANOVA function of the SPSS statistical program and calculated the p-value as an indicator of the significant factor.

2.3 Patient and sample

A venous blood sample was taken from individuals aged 20 to 45 years old (males and female). The sample was centrifuged, and the serum was separated for use in the required measurements at a private laboratory in Baghdad, Iraq.

2.4 Measurements

Iron and ferritin levels were measured using a Cobas 411 analyzer, with a normal range of iron Male and Female (35-160) µg/dl, ferritin Male and Female (13.0-150.0) ng/ml.
Vitamin B12 and vitamin D (OH-25) levels were also measured using a Cobbas 411 analyzer, with a normal range of 200-835 PG/ML and (30-100)ng/ml. Other physiological, biological, and metabolic statistics.

3. Result and Discussion

The statistical results show us that the gastric sleeve procedure affected physiological and biological indicators, as we will observe a noticeable decrease in their levels.
The statistics for the patients sampled before and after surgery were described below. The percentage of females was 75%, and the percentage of males was 25%, with ages ranging from 20 to 45 years. The results of the research statistics will be explained below.

Table 1: Characteristic Statistics.

	Minimum	Maximum	Mean		Std. Deviation
Variables	Statistic	Statistic	Statistic	Std. Error	Statistic
G1 IRON LEVEL	33	99	68.00	2.980	16.324
G2 IRON LEVEL	21	29	24.90	.513	2.808
G3 IRON LEVEL	11	23	15.07	.516	2.828
G1 FERETTIN LEVEL	21	99	61.07	3.945	21.609
G2 FERETTIN LEVEL	12	18	14.73	.287	1.574

G3 FERETTIN LEVEL	6	23	10.60	.672	3.682
G1 VIT B12 LEVEL	222	578	371.17	21.619	118.411
G2 VIT B12 LEVEL	111	200	176.13	4.637	25.397
G3 VIT B12 LEVEL	9	119	100.83	3.676	20.136
G1 VIT D LEVEL	31	55	39.27	1.258	6.893
G2 VIT D LEVEL	12	25	18.30	.692	3.789
G3 VIT D LEVEL	4	15	8.70	.541	2.961

Table 2: This illustrates the comparison between the first group before surgery and the other groups after surgery regarding iron levels.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
G2 FERETTIN LEVEL	Between Groups	46.867	14	3.348	2.009	0.096
	Within Groups	25.000	15	1.667		
	Total	71.867	29			
G3 FERETTIN LEVEL	Between Groups	151.033	14	10.788	0.668	0.771
	Within Groups	242.167	15	16.144		
	Total	393.200	29			

Table 2: This illustrates the comparison between the first group before surgery and the other groups after surgery regarding ferritin levels.

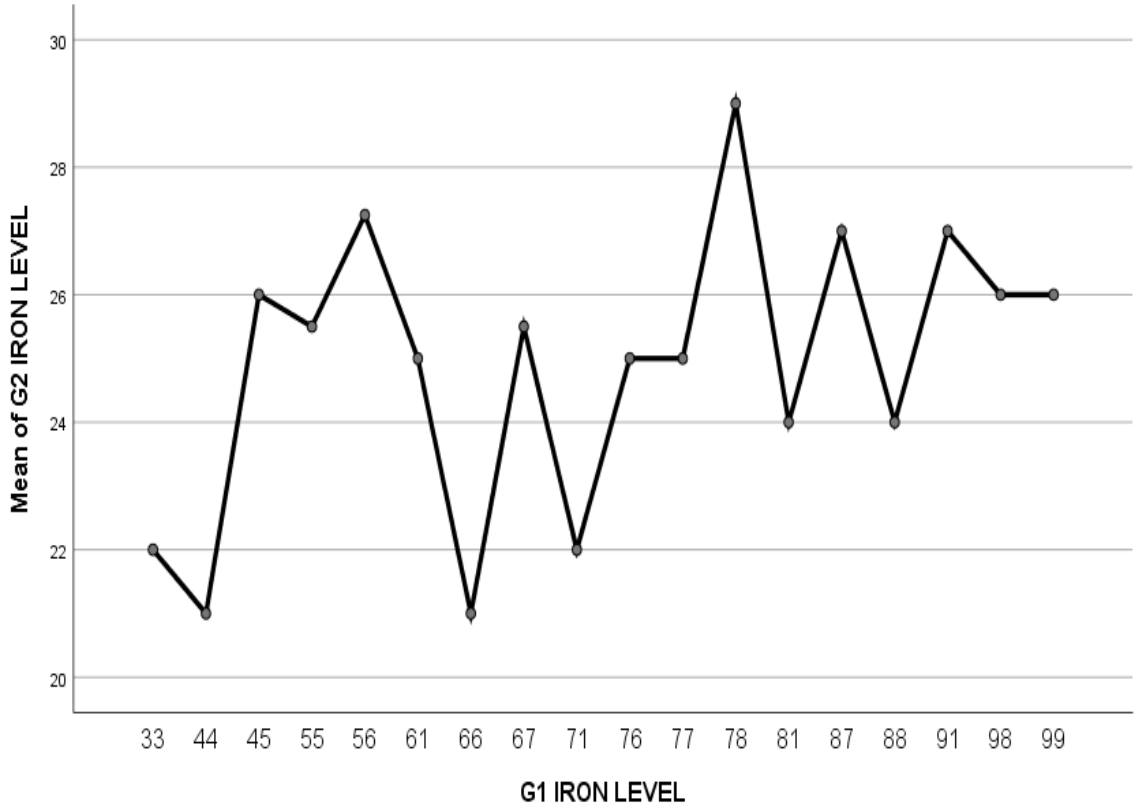
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
G2 FERITTIN LEVEL	Between Groups	46.867	14	3.348	2.009	.096
	Within Groups	25.000	15	1.667		
	Total	71.867	29			
G3 FERITTIN LEVEL	Between Groups	151.033	14	10.788	.668	.771
	Within Groups	242.167	15	16.144		
	Total	393.200	29			

Table 3: This illustrates the comparison between the first group before surgery and the other groups after surgery regarding vitamin B12 levels.

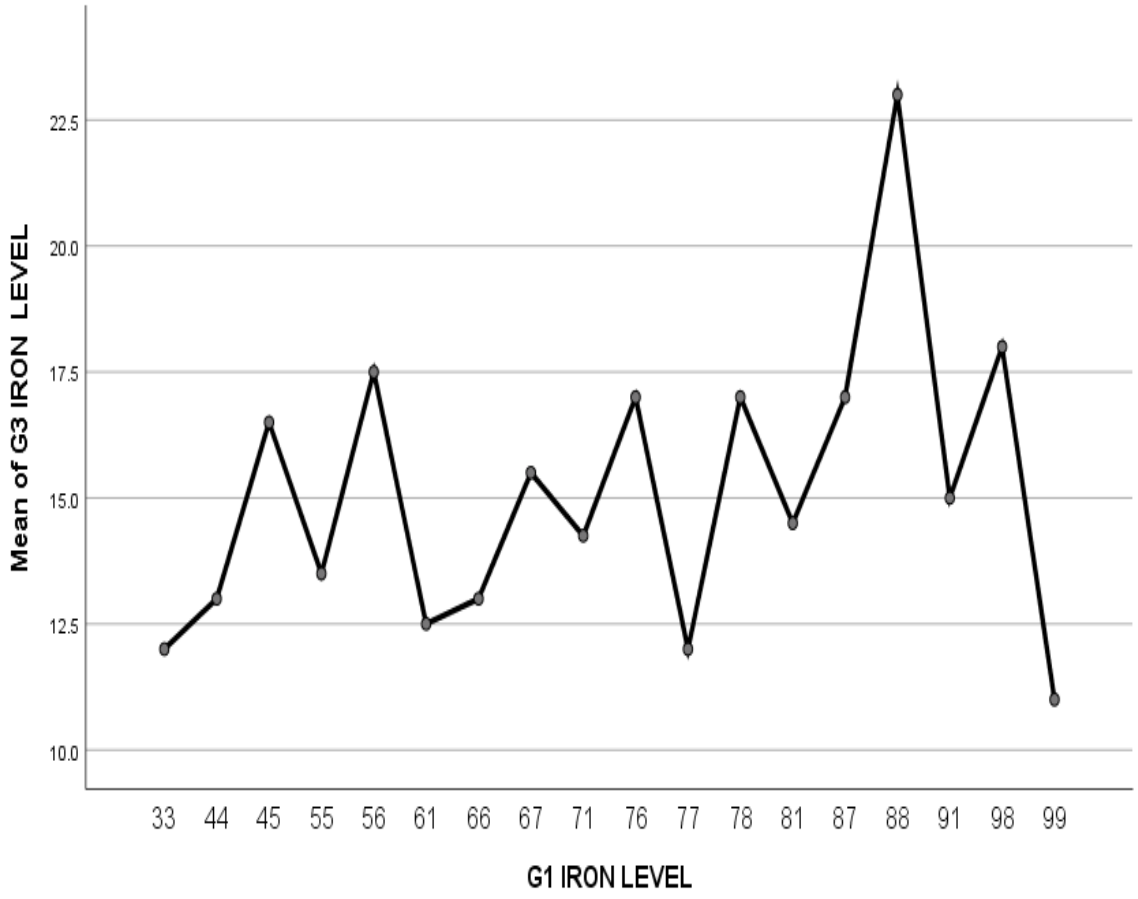
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
G2 VIT B12 LEVEL	Between Groups	7383.883	11	671.262	1.067	.436
	Within Groups	11321.583	18	628.977		
	Total	18705.467	29			
G3 VIT B12 LEVEL	Between Groups	9927.083	11	902.462	8.871	.000
	Within Groups	1831.083	18	101.727		
	Total	11758.167	29			

Table 4: This illustrates the comparison between the first group before surgery and the other groups after surgery regarding vitamin D (25-OH) levels.

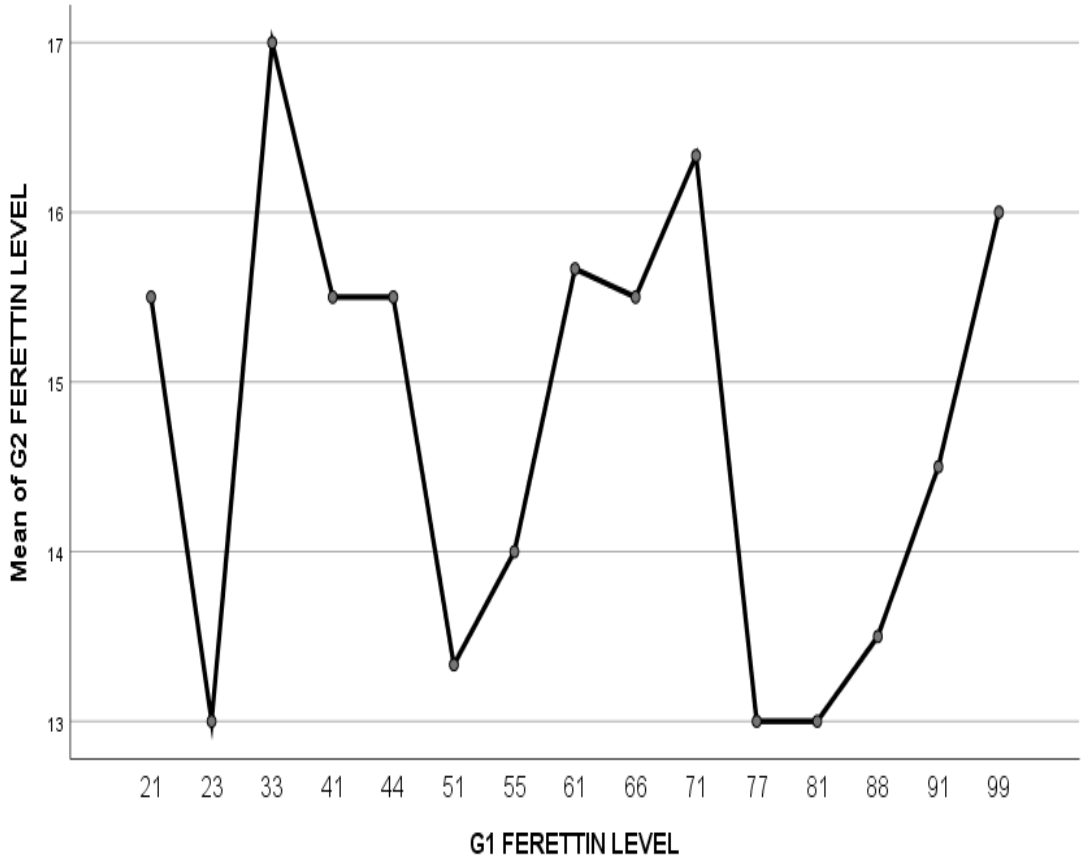
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
G2 VIT D LEVEL	Between Groups	171.967	14	12.283	.754	.698
	Within Groups	244.333	15	16.289		
	Total	416.300	29			
G3 VIT D LEVEL	Between Groups	151.250	14	10.804	1.573	.197
	Within Groups	103.050	15	6.870		
	Total	254.300	29			



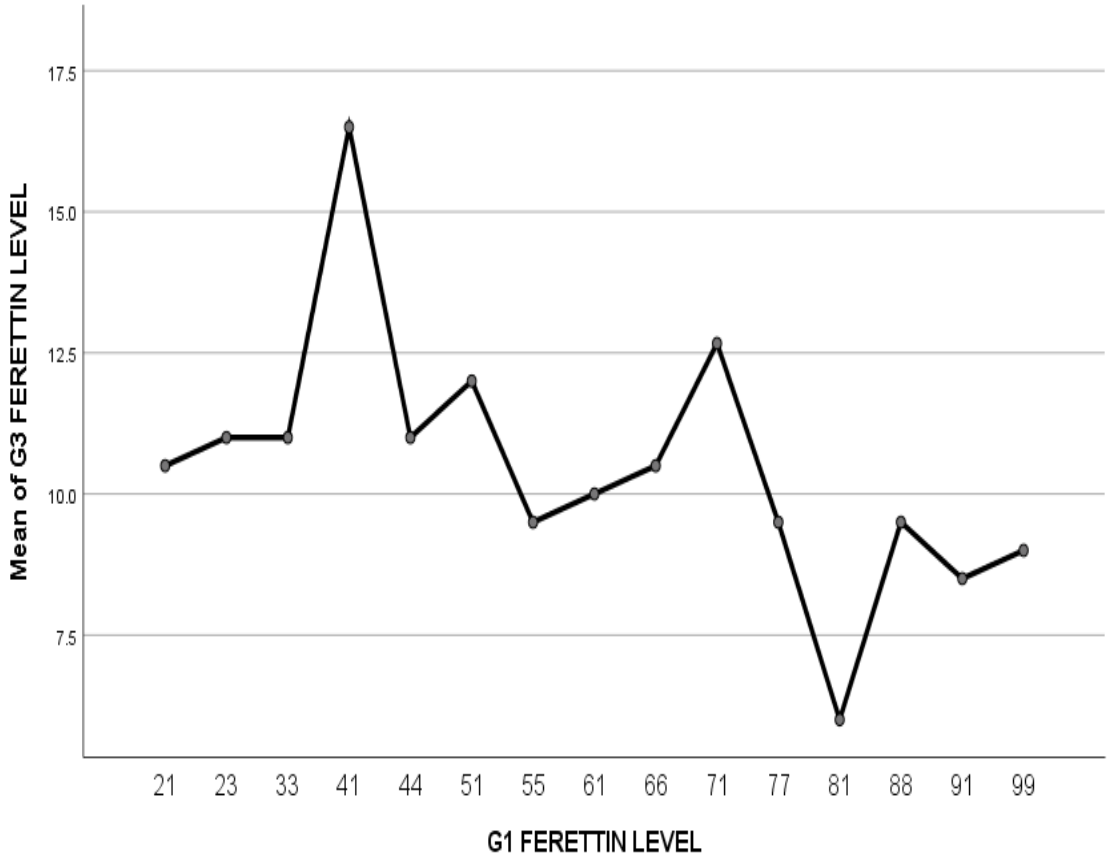
Graph1: explain relationship between G1 and G2 of iron level.



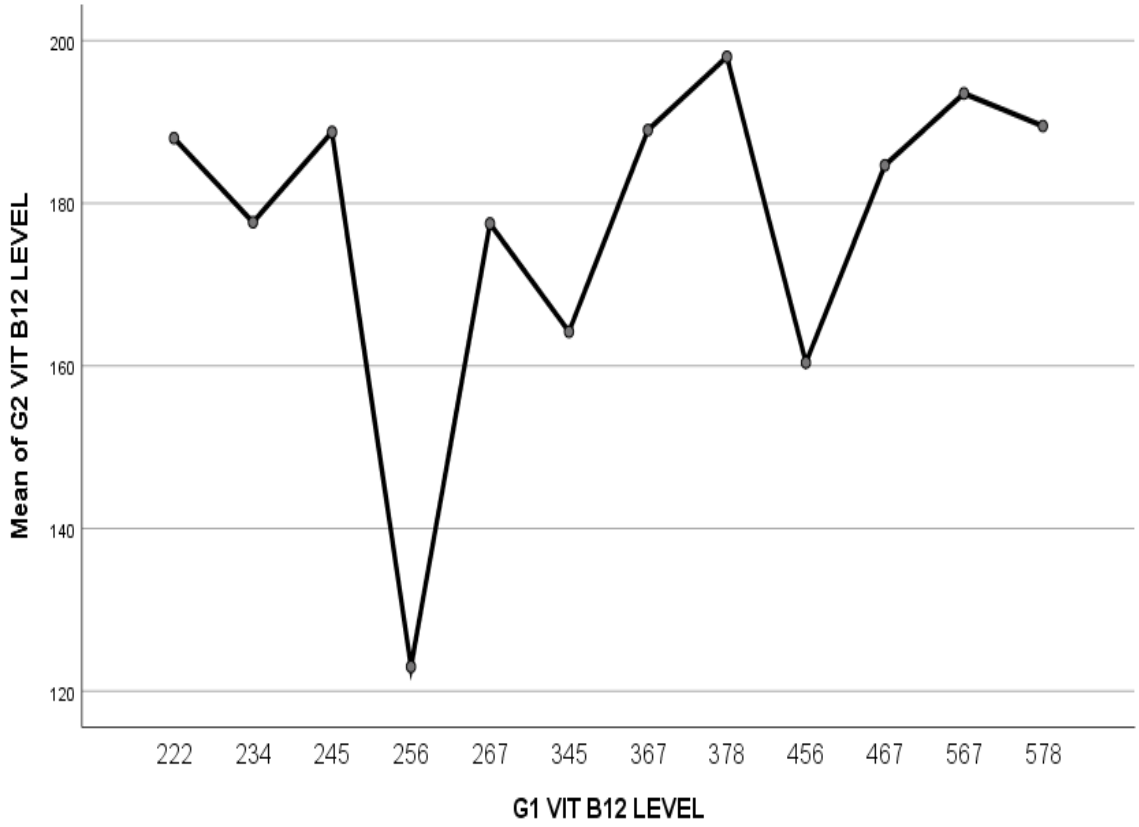
Graph 2: explain relationship between G1 and G3 of iron level.



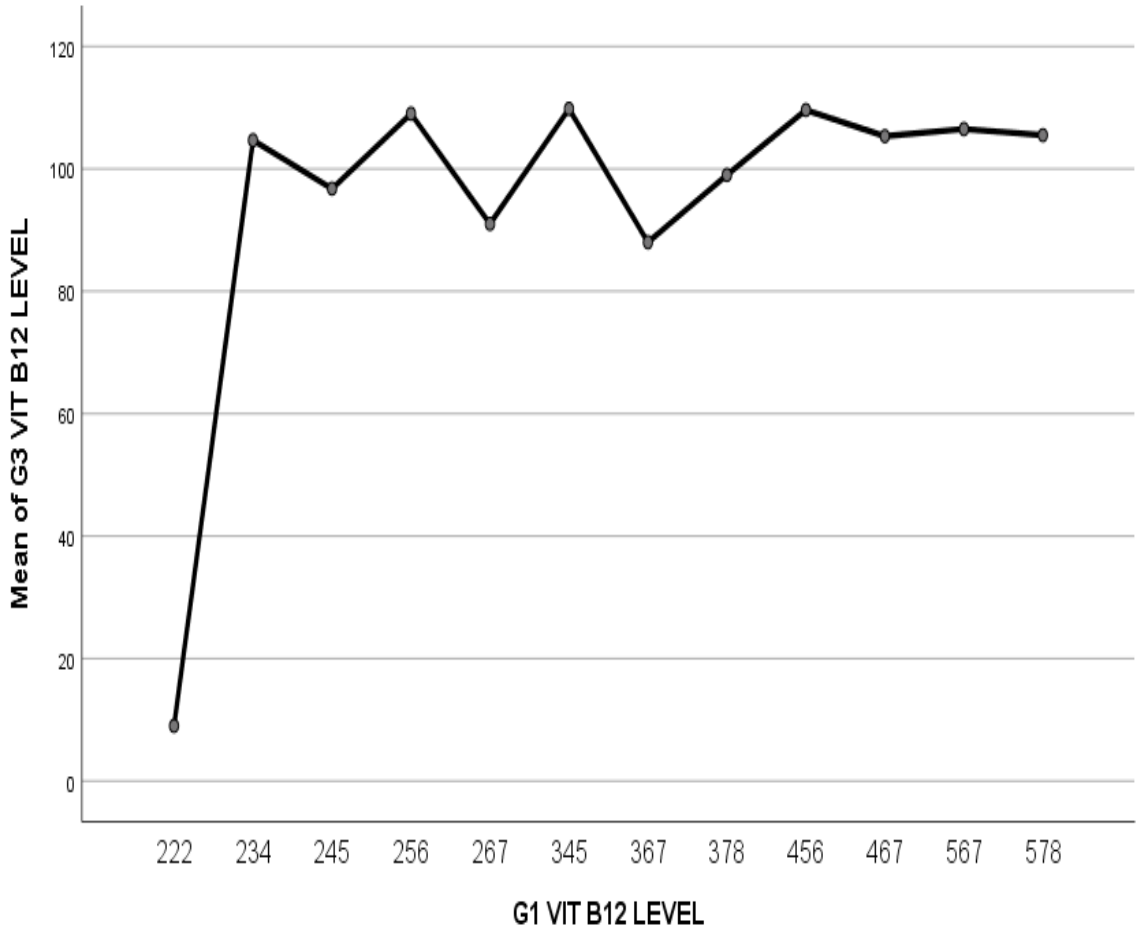
Graph 3: explain relationship between G1 and G2 of ferritin level.



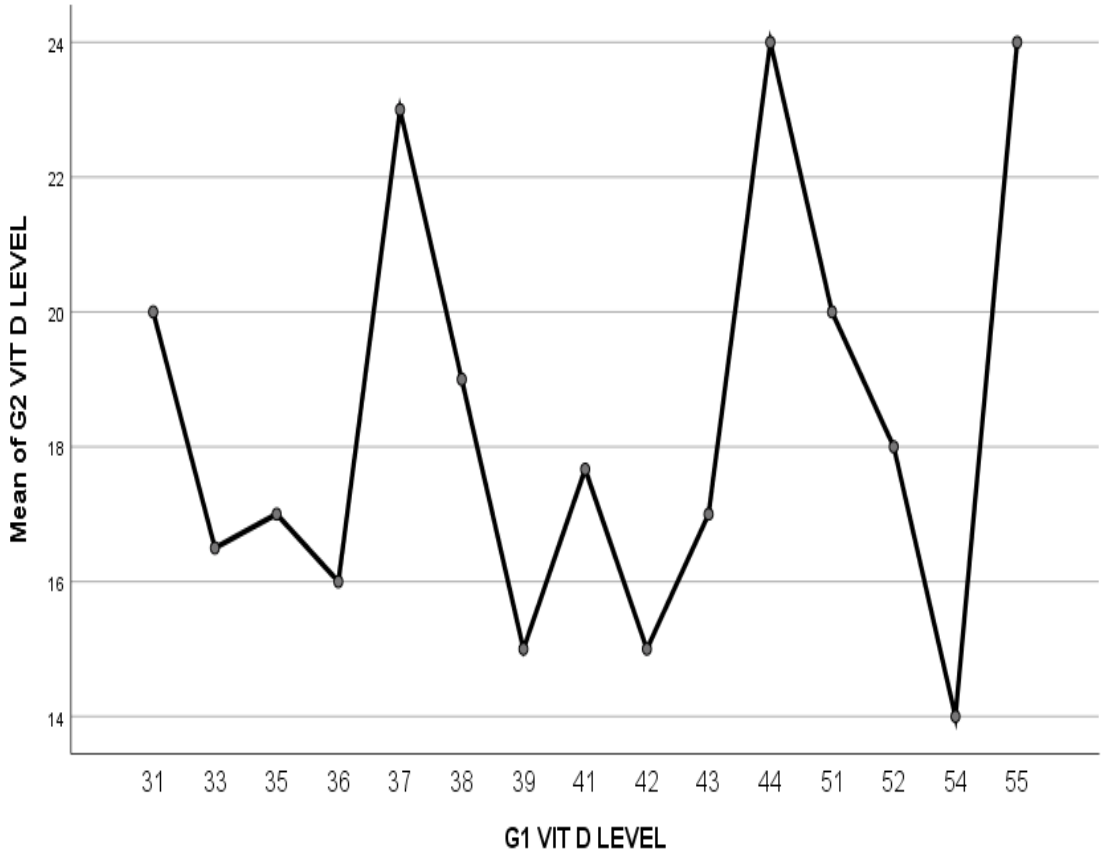
Graph 4: explain relationship between G1 and G3 of ferritin level.



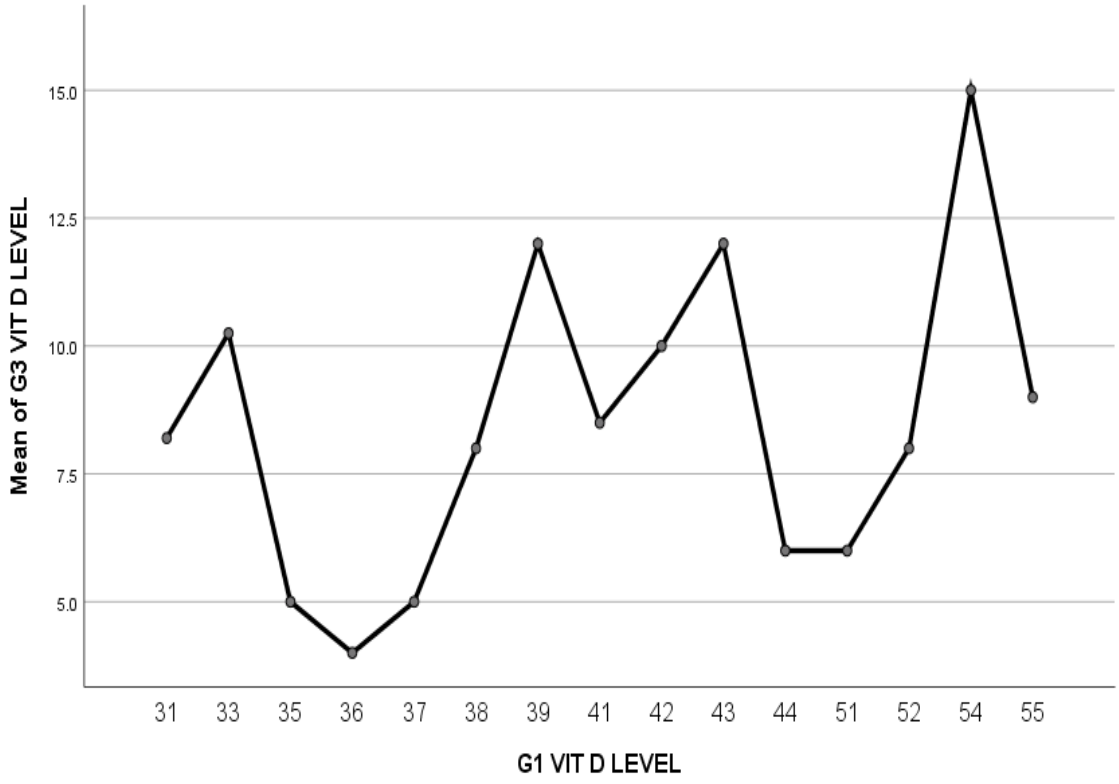
Graph 5: explain relationship between G1 and G2 of vitamin B12 level.



Graph 6: explain relationship between G1 and G3 of vitamin B12 level.



Graph 7: explain relationship between G1 and G2 of vitamin D level.



Graph 8: explain relationship between G1 and G3 of vitamin D level.

Statistical results show that the levels of physiological and biological indicators decreased in the third group, i.e., three months after gastric sleeve surgery. This indicates that the body's absorption rate decreased, as individuals suffered from hair loss, severe salt deficiency, and irregular functioning of internal organs.

Due to the increasing prevalence of obesity and its comorbidities, there has been a marked increase in incidence and prevalence of morbid obesity [4]. Because the procedure is effective in these patients, this number who will have bariatric surgery in the future is certainly going to increase. As a result, it must understand how to make up for any nutritional deficits that may arise following bariatric surgery. Background Nutritional deficiencies after gastric bypass surgery have been frequently reported to result in substantial long-term morbidity [9,13,14]. The ideal nutritional treatment strategy and nutritional status following SG remain poorly understood. Patients are unable to achieve their nutritional needs from food alone due to reduced dietary intake and some degree of micronutrient malabsorption. Therefore, to avoid or correct vitamin shortages after surgery, adherence to micronutrient supplementation is crucial [15]. However, in this study the majority of SG patients had adhered to prescribed multi-vitamin & mineral supplementation but yet many nutritional deficits were prevalent. With regards to mean energy, protein (except for the first-month), fiber, vitamin A, E, C, B1, B2 (except for the first-month), niacin, B12, folate as well as calcium (except for the first month), magnesium and iron together with zinc, phosphorus and iodine respectively at least exceeded DRI guidelines.

Conclusion

Our study concludes that gastric sleeve surgery can have complications that may be dangerous to the physiological and biological indicators and the physiological function of the body's organs and the health of individuals who have undergone such surgery, and they may develop serious illnesses over time.

4. Recommendations

We recommend against performing gastric sleeve surgery except in medically recommended cases where patients are compelled to undergo such surgery and resort to changing their lifestyle or routine related to nutrition and exercise to maintain the physiological and biological function of the human body's organs.

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