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Assessment of Serum Amylase pre and post Bariatric Surgery

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KEY WORDS:
amylase, bariatric surgery, obesity

ABSTRACT

Background: Bariatric surgery is prevalent worldwide, including in Iraq. Morbid obesity, on the other hand, has become a global epidemic in the 20th century. Until now, bariatric surgery has been the only effective treatment for this disease, leading to sustained weight loss and the improvement of comorbidities.

Aims of the study: To measure serum amylase pre and post bariatric surgery.

Study design: This study is a case-control flow-up study.

Method and Materials: We conducted the study in numerous obesity centers located in Mosul. The study commenced in December 2023 and concluded in May 2024. This study included 100 individual male and female who were over 18 years old, divided into two groups, 50 people control group BMI 18.5 – 24.9 kg/m^2 and bariatric group BMI ≥ 40 kg/m^2, and were ready to undergo bariatric surgery**.** Serum amylase, if above 100 U/L, would indicate exocrine pancreatic insufficiency.

Result: The mean serum amylase level in the bariatric group (pre-operative) compared to the control group was 56.58±11.53 vs. . 43.30±9.62 U/L (P = 0.0001), and between two independent means bariatric groups (pre- and post-surgery) were 56.58±11.53 vs. 61.64±14.24 U/L (p-value = 0.001).

Conclusions: In this study, 8% of the patients complained of increased serum amylase after surgery, and there was a risk of exocrine pancreatic insufficiency after sleeve surgery.

Key words: amylase, bariatric surgery, obesity.

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INTRODUCTION

Bariatric surgery is prevalent worldwide, including in Iraq. In the past, individuals who were obese would engage in numerous exercises and diets to lose weight, a process that often required several attempts to shed a few kilograms. Today, bariatric surgery is helping people lose more weight, which is why many obese people choose this type of surgery.

Obesity is the epidemic of the twenty-first century. Its high prevalence and effects on morbidity, mortality, quality of life , and healthcare costs have made it a serious public health concern. Obsessive or abnormal fat accumulation that concerns one's health is the definition of being overweight or obese [1,2].

People who are overweight or obese have a lower health-related quality of life because they are more likely to get heart disease, diabetes, colon cancer, breast cancer, ovarian cancer, prostate cancer, liver cancer, gallbladder cancer, kidney cancer, endometrial cancer, and musculoskeletal problems [1,3].

The primary cause of obesity and overweight is an energy imbalance caused by an increase in energy-dense foods high in fat and sugar, as well as an increase in physical inactivity brought on by a shift in society toward a more sedentary way of living [4,5].

Bariatric surgery or non-operative management are two alternatives for treating obesity. Recently, there has been confirmation of the superiority of surgical over nonsurgical approaches in treating morbid obesity, in the form of bariatric surgery operations [6].

The indications to undergo bariatric surgery are based on (BMI) as well as the presence of comorbidity. Patients with a BMI of 40 kg/m^2 or greater without coexisting medical problems and for whom bariatric surgery would not carry an excessive risk should be candidates for the surgery [7].

Patients with a (BMI) of 35 kg/m^2 or higher and at least one severe condition related to obesity could also be surgical candidates. These conditions include type 2 diabetes, high blood pressure, high cholesterol, Gastro Esophageal Reflex Disease (GERD), asthma, severe urinary incontinence, debilitating arthritis, or a significantly lower quality of life. Patients with a BMI of 30 to 34.9 kg/m^2 with diabetes or metabolic syndrome also may undergo weight loss surgery, although there is a lack of sufficient data to demonstrate long-term benefits in such patients [8,9].

Mosul City has limited data on the status of serum amylase in bariatric surgery patients. As a result, the present study is the first to evaluate the serum amylase levels in these patients in Mosul City. An assessment of serum amylase in these patients could provide us with a clear picture of the role of these enzymes in this type of surgery, and it could help us develop an idea about the treatment strategy for future complications of this operation.

The pancreas includes the exocrine and endocrine components as well as other structures; the exocrine and endocrine structures make up about 98% and 2% of the pancreatic tissues, respectively, and are the two primary physiological divisions of the pancreas [10].

Exocrine enzymes include amylase. Two closely related loci on chromosome 1 produce amylase isoenzymes; one is pancreatic-derived and the other is not. The secretions and discharges of the reproductive systems (male and female), the muscular systems, and the respiratory systems can consist of non-pancreatic amylase. Amylase kind two is transported into the intestinal tract by acinar cells in the pancreas and accelerated by the pancreatic duct system. It has a perfect pH value of

around 6.7-7.0 to simulate the enzymatic effect of this activity [11].

Around 25% of plasma amylase goes away by the kidneys, whereas the rest is reabsorbed in the proximal tubules. The liver is considered to be the primary organ responsible for the clearing the amylase protein, it has around 10 hours to be removed [11].

Furthermore, the body carefully adjusts the rate of the enzyme generation and elimination by a complicated system. High amylase levels are a sign of insufficient pancreatic enzyme activity and may be caused by increased production or a decreased rate of clearance, either endogenous or exogenous to the pancreas [11].

AIMS OF THE STUDY:

This study is a case control follow-up study. It was done in many obesity centers in Mosul city. It was started in December 2023 until May 2024. A total of 100 people male and female was included in this study, divide into two groups their ages above 18 years old, 50 people control group BMI 18.5 – 24.9 kg/m^2 and bariatric group BMI ≥ 40 kg/m^2 and prepared to doing Bariatric Surgery. We collected information from their medical records, such as name, age, weight, height, and medical history, and collected blood samples for a serum amylase test 1-3 days before surgery and 3 months after surgery. The venous blood sample was obtained by using 5cc syringe. According to history, the following criteria were excluded from the study: The study excluded patients who had a history of gastrointestinal issues such as chronic diarrhea, Crohn's disease, ulcerative colitis, prior pancreatitis, hepatobiliary resection, exocrine pancreatic insufficiency before surgery, heavy alcohol consumption, and cystic fibrosis.

A sensitive COBAS C 111 kit measured the serum amylase level. This assay has enzymatic colorimetry, according to International Federation of Clinical Chemistry (IFCC). It had a serum measurement range of 3–1500 U/L. The reference range for adults (men and women) was from 30 to 110 U/L [12,13].

The collected data were coded, entered, presented, and analyzed by computer using the available data base software program statistical package of IBM SPSS-29 (IBM Statistical Packages for Social Sciences, version 29, Chicago, IL, USA). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range [14].

The significance of the difference of different means (quantitative data) was tested using the Student's t-test for the difference between two independent means, the paired t-test for the difference of paired observations (or two dependent means), or ANOVA test for the difference among more than two independent means. The significance of the difference of different percentages (qualitative data) was tested using the Pearson Chi-square test (χ2-test) with the application of Yate's correction or the Fisher Exact test whenever applicable. Statistical significance was considered whenever the P value was equal to or less than 0.05 [15].

RESULT:

The mean serum amylase level was significantly higher in the bariatric group (pre-operative) compared to the control group (56.58±11.53 vs. . 43.30±9.62) U/L (P=0.0001).(Table 1) However, there were significant differences between two independent means bariatric group (pre and post-surgery) (56.58±11.53 vs. 61.64±14.24) U/L (p-value = 0.001). (Table 2) As shown in Table 2, there was no data recorded regarding serum amylase above 90 U/L before surgery, in spite of there being 8% after surgery. Also, there is a significant difference among more than two independent means

between the weight reduction percent and postoperative serum amylase, as shown in (Table 3). Also, there are strong positive correlations with the preoperative serum amylase and post-operative, as shown in (figure 1).

DISCUSSION:

The mean serum amylase level was significantly higher in the bariatric group (postoperative) compared to the control group, confirming the effect of surgery on pancreatic exocrine enzymes, and there was also statistically a big difference between the two means in the bariatric group (pre and post-surgery), so the bariatric surgery decreased the effectiveness of the pancreatic exocrine enzymes. Also, there are strong positive correlations between serum amylase pre- and post-bariatric surgery (R = 0.729, P value = 0.0001) and between serum amylase postoperative and weight reduction percent that mean the patients that lost more weight percent complained from high levels of serum amylase post-operative. (R = 0.368, P value = 0.009, 70.67±17.86).

The current results of this study are supported by the study of Bingsheng Guan et al. (2020), which improved the increase of serum amylase and superoxide dismutase after bariatric surgery on 299 patients after collecting the samples preoperatively and after 6,12 months after surgery. Another study by Lucia Romano et al. (2021), on 167 patients who underwent sleeve gastrectomy and the measurement of drain amylase levels was a routine investigation, confirms the increase in serum amylase after bariatric surgery and indicates a gastric leak after surgery [16,17].

On the other hand, the study by Igor Braga RIBEIRO et al. (2018) on 170 patients who underwent bariatric surgery shows the results of increased serum amylase on the 1st and 4th days post-operatively were related to complications of bariatric surgery and may not be found if there are no complications [18].

Thus, bariatric surgery may cause an increase in serum amylase after surgery, which indicates exocrine pancreatic insufficiency. Therefore, exocrine pancreatic insufficiency is one of the main complications of bariatric surgery.

CONCLUSIONS:

This is the first study to investigate the exocrine pancreatic insufficiency-sleeve surgery association in Mosul City. In this study, 8% of the patients complained of increased serum amylase after surgery. The obesity itself did not affected the pancreatic functions in spite of it's effect on the general situation and cardiac functions. These results in this study reveal that there was a risk of exocrine pancreatic insufficiency after sleeve surgery.

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TABLES:

Table 1: The pre-operative serum amylase (U/L) distribution for both bariatric and control groups.

	Bariatric surgery	Control	P value
	No %	No. %	
Pre-Op. Serum Mean±SD **Amylase(U/L)** (Range)	56.58±11.53 (38.0-82.0)	43.30±9.62 (28.0-70.0)	0.0001#
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.			

#Significant difference between two independent means using Students-t-test at 0.05 level.

Table 2: The pre-operative and post-operative serum amylase (U/L) distribution for bariatric group.

Bariatric surgery	Before surgery	After surgery	P value
	No. %	No. %	
Serum Mean±SD **Amylase(U/L)** (Range)	56.58±11.53 (38.0-82.0)	61.64±14.24 (42.0-98.0)	0.001^
*Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.			

^Significant difference between two dependent means using Paired-t-test at 0.05 level.

Table 3: Relation of S. Amylase post-op and post-op weight, weight reduction and BMI.

		No.	Post-op Serum Amylase (U/L)
Weight Reduction Percent	10---14.9%	10	56.50±8.76
	15---19.9%	23	57.61±10.39
	20---24.9%	15	70.67±17.86
	25---29.9%	2	66.00±22.63
	P value		0.020@

#Significant difference between two independent means using Students-t-test at 0.05 level.

@Significant difference among more than two independent means using ANOVA-test at 0.05 level.

FIGURE:

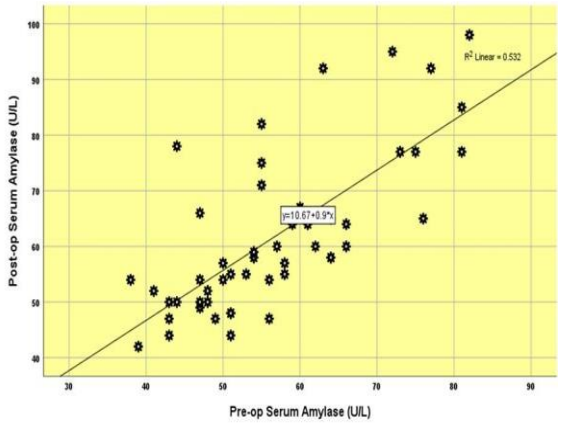

Figure 1: Correlation between the serum amylase pre and post-op.