

## Original Article

# Evaluation of serum lipase and amylase activities in normal pregnancy

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### ABSTRACT

**Introduction:** Complications of acute pancreatitis affect differently the mother and the fetus during pregnancy. Acute pancreatitis is usually diagnosed on the basis of the association of upper abdominal pain, nausea or vomiting, and elevated serum lipase and amylase activities.

**Aim:** The present study is aimed to evaluate the serum Lipase and serum Amylase activities in Normal Pregnancy.

**Material and Methods:** In this case-control study, a total of 262 subjects (131 Pregnant Women and 131 aged matched Non-Pregnant Women) aged between 20-40 years was recruited. The serum lipase and amylase activity were measured by using the commercially available kit on Siemens' RXL fully chemistry Auto-analyzer. For statistical analysis, ANOVA or unpaired t-test was used. A P value <0.05 was considered as statistically significant for all data analyzed.

**Results:** In the present study, the mean age of pregnant women was 25.56±3.61 years and non-pregnant women were 26.39±4.08 years. There was no significant difference in the mean age of pregnant women as compared to non-pregnant women (P=0.08). The mean serum Lipase activity was lower in pregnant women as compared to non-pregnant women, but statistically not significant (P=0.06). The mean serum amylase activity was also lower in pregnant women as compared to non-pregnant women, but statistically not significant (P=0.12).

**Conclusion:** Result showed that the mean serum lipase and amylase activity was lower in pregnant women as compared to non-pregnant women. However, due to restricted scope of the study further large-scale studies are warranted.

**Key words:** Lipase, Amylase, Pregnant women, Non-pregnant women, Pancreatitis

### INTRODUCTION

Pregnancy is the natural condition which occurred after the union of an ovum and spermatozoon and developing embryo or fetus in the uterus (1). It is well known that pregnant women experience physiological changes, which induce modifications in serum protein concentration and certain enzyme activities (2). Nausea and vomiting of pregnancy is the most common medical condition affecting pregnancy and is present in up to 85% of gestation (3).

Serum lipase is produced mainly from pancreatic acinar cells where it is stored in the form of granules. More than 99% of the stored lipase gets excreted from the apical poles of the acinar cells into the ductal system of the

pancreas (4). Gastric and lingual lipase hydrolyzed triacylglycerol by attacking the sn-3 ester bond and produced 1, 2-diacylglycerols and free fatty acids. Pancreatic lipase is secreted into the small intestine and requires a further pancreatic protein, Colipase, for activity (5). During acute pancreatitis, serum lipase increases within four to eight hours, peaks at 24 hours, and remains elevated for one to two weeks, with a half-life between 7 and 14 hours. It is excreted by the ductal system and kidneys. Thus, impaired renal function leads to an increased level of lipase (6).

Amylase is an enzyme that helps digest carbohydrates. It is either produced in the pancreas or salivary gland, which is secreted by salivary gland with saliva. When the pancreas is diseased or inflamed, amylase releases into the blood (7). The hydrolysis of starch is catalyzed by salivary and pancreatic amylases, which catalyze the random hydrolysis of alpha (1→4) glycosidic bonds, yielding dextrans, then a mixture of glucose, maltose, and maltotriose and small branched dextrans (5). Levels of amylase often start to increase by 6-24 h after the onset of acute pancreatitis, usually peak at 48 hours and typically over the period of next 5-7 days, tend to normalize (8). The levels of amylase also have a tendency to increase with age. Amylase levels are low in childhood and rise slowly and reach adult levels by the age of 10 years. The upper limit of normal amylase level increases by about 40% after the eight decades of life (9). Serum amylase level increases in mumps, pancreatitis, and intraperitoneal organ rupture, among other diseases conditions (10).

Pregnancy-related hematological and biochemical changes influence the interpretation of diagnostic tests and assessment of severity of acute pancreatitis. As in any other disease associated with pregnancy acute pancreatitis is associated with greater concerns as it deals with two lives rather than just one as in the non-pregnant population (11).

Acute pancreatitis in pregnancy, inflammation is triggered by the activation of pancreatic trypsinogen followed by autodigestion. It is characterized by cellular membrane disruption and proteolysis, edema, hemorrhage, and necrosis (12). Approximately, 20% have severe pancreatitis, and mortality rates in these patients reach up to 25% (13, 14).

In non-pregnant patients, acute pancreatitis is almost equally associated with gallstones and alcohol abuse. During pregnancy, however, cholelithiasis is almost always the predisposing condition. Other causes are hyperlipidemias, usually hypertriglyceridemia; hyperparathyroidism; congenital ductal anomalies; and rarely autoimmune pancreatitis (15). Non-biliary pancreatitis occasionally develops postoperatively, or it is associated with trauma, drugs, or some viral infections (16).

It is essential to evaluate the serum lipase and amylase activities in pregnant women for the diagnosis and treatment of pancreatitis. In addition, alterations in the activities of these enzymes indicated the abnormal function of the renal and hepatic system in pregnant women.

## **MATERIAL AND METHODS**

### **Subject Selection**

In this case-control study, a total of 262 subjects (131 Pregnant Women and 131 aged matched Non-Pregnant Women) aged between 20-40 years was recruited in the study from outpatient Department of Obstetrics & Gynecology Clinic of IIMS&R, Integral University, Lucknow (India). The study was conducted out from January 2017 to June 2017. The study was ethically approved by the ethical committee of the institution. This study adhered to the principles of the Declaration of Helsinki (17). Written informed consent was taken from each subject recruited for the study.

Inclusion for the pregnant and non-pregnant women was done by pregnancy tests and regulatory investigations. Subjects with diabetes, ischemic heart disease, angina, Myocardial Infarction (MI), electrocardiogram abnormalities, those with other concurrent sicknesses like the chronic liver disease, hypothyroidism or those on drugs like diuretics were excluded for both (Pregnant and Non-pregnant women) groups. Detailed medical history was taken from each subject.

#### **Laboratory investigations**

3ml venous blood was taken from each subject after overnight fasting for the estimation of lipase and amylase activities. Serum amylase activity was measured by a chromogenic method (18) and serum lipase activity was measured by a turbidimetric method (19) by using the commercially available kit on Siemens' RXL fully chemistry Auto-analyzer. The upper limits of normal enzyme activity values recommended by the manufacturer were 53 IU/L for amylase and 190 IU/L for lipase.

#### **Statistical Analysis**

Data analysis was performed using IBM SPSS software version 20.0 (Armonk, NY, USA). All the data were compared between the two groups by using ANOVA or unpaired t-test. Values were represented as mean  $\pm$  SD (Standard Deviation). A P value  $<0.05$  was considered as statistically significant for all data analyzed.

#### **RESULTS**

In the present study, the mean age of pregnant women was  $25.56 \pm 3.61$  years and non-pregnant women were  $26.39 \pm 4.08$  years. There was no significant difference in the mean age of pregnant women as compared to non-pregnant women ( $P=0.08$ ). The mean serum Lipase activity was lower in pregnant women as compared to non-pregnant women, but statistically not significant ( $P=0.06$ ). The mean serum amylase activity was also lower in pregnant women as compared to non-pregnant women, but statistically not significant ( $P=0.12$ ) (Table 1, Fig. 1).

#### **DISCUSSION**

The result showed that the mean serum Lipase activity was lower in pregnant women as compared to non-pregnant women, but statistically not significant ( $P=0.06$ ). The mean serum amylase activity was also lower in pregnant women as compared to non-pregnant women, but statistically not significant ( $P=0.12$ ). Various studies were supported by our findings. Karsenti et al. said that serum amylase activity was similar in pregnant women and non-pregnant women, during all trimesters of pregnancy and serum lipase activity was significantly lower during the first trimester of pregnancy compared to non-pregnant women and compared to the third trimester (3). According to Ordorica et al., there were no significant differences were observed in lipase and amylase activity in pregnant women and non-pregnant women, in all trimesters of pregnancy (20).

However, Kaiser et al. reported the serum amylase activity in 200 pregnant women in various stages of pregnancy and concluded that: (1) serum amylase activity rises gradually during pregnancy till the twenty-fifth week and thereafter falls slightly, (2) serum amylase values may be found normal in pregnant women during the second and third trimesters that exceed those in normal women and non-pregnant women; (3) alteration may be observed in serum amylase activity during the second trimester of pregnancy in the relative distribution of the pancreatic and salivary-type isoamylases with the salivary type tending to dominate (21).

The usual symptoms of acute pancreatitis are abdominal pain, anorexia, nausea, vomiting, dyspepsia, low-grade fever, tachycardia, and fatty food intolerance. Symptoms of acute pancreatitis in pregnancy do not differ from the non-pregnant state. Hence there was a need to investigate the biochemical markers of acute pancreatitis in

pregnancy. We found that there were no significant changes in serum lipase and serum amylase activity during pregnancy as compared to non-pregnant women.

The frequent incident of acute pancreatitis during the third trimester of pregnancy is increased intra-abdominal pressure on the biliary ducts. Cholelithiasis is the most common cause and accounts for 67–100% of cases, followed by alcohol abuse (22). Other causes may be abdominal surgery or trauma, infections (viral, bacterial, parasitic), penetrating duodenal ulcer, connective tissue diseases, and hyperparathyroidism. Hyperlipidemic pancreatitis accounts for 4–6% of acute pancreatitis during pregnancy (23). It frequently occurs during in the second or the third trimesters of primipara women who have hyperlipoproteinemia. This condition may be led to a high rate of fetal mortality (up to 37%), primarily due to premature birth. Most cases of hyperlipidemic pancreatitis in pregnancy are associated with either type I or V familial hyperlipoproteinemia (24). Hyperlipoproteinemia may be associated with an increase of as much as 2.5-fold in very low-density lipoprotein triglycerides over pre-gestational levels in the middle of the third trimester of pregnancy (25).

An important observation is that pancreatic abnormalities typically appear after hepatic and renal dysfunction and that laboratory evidence of renal dysfunction peaked after the worst hepatic enzyme abnormalities for most patients. It is also important to bear in mind this entity because maternal mortality of this pathology is as high as 17% and fetal mortality reaches 25% (26). So, assessment of serum lipase and amylase during pregnancy is essential to prevent the mother and fetus from pancreatitis and its severity.

## CONCLUSION

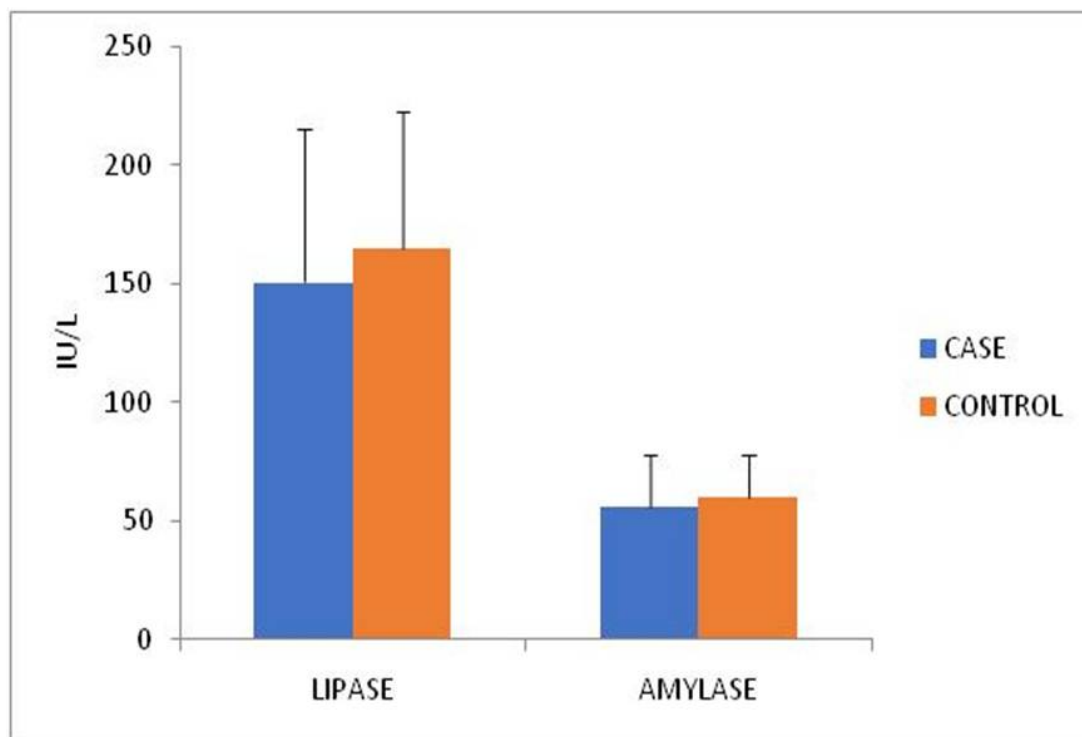
The result showed that the mean serum lipase and amylase activity was lower in pregnant women as compared to non-pregnant women. However, due to the restricted scope of the study further large-scale studies are warranted.

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**Figure 1:** Comparison of mean level of lipase and amylase in pregnant (Case) and non-pregnant (control) women



**Table 1:** Mean activity of Lipase and Amylase in pregnant (Case) and non-pregnant (Control) women

Parameters	Pregnant Women (n=131)	Non-Pregnant Women (n=131)	P value
Age (years)	25.56±3.61	26.39±4.08	0.08
Lipase (IU/L)	150.82±64.28	165.23±57.17	0.06
Amylase (IU/L)	56.24±21.56	60.04±17.76	0.12

*Values are expressed as Mean ± Standard Deviation*

*\*Significant considered as P<0.05.*