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Research Paper

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SERUM AMYLASE LEVELS IN METABOLIC SYNDROME

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Declaration

The Declaration of the author for publication of Research Paper in Asian Journal of Modern and Ayurvedic Medical Science (ISSN 2279-0772) Dokwal S[1], Bansal P[2], Ghalaut VS[3], Bhadra J[4], Mahor D[4], Kulshrestha MR[5] the authors of the research paper entitled Serum Amylase levels in Metabolic Syndrome , declare that ,we take the responsibility of the content and material of my paper as we ourself have written it and also have read the manuscript of our paper carefully. Also, we hereby give our consent to publish our paper in ajmams , This research paper is our original work and no part of it or it's similar version is published or has been sent for publication anywhere else.we authorise the Editorial Board of the Journal to modify and edit the manuscript. we also give our consent to the publisher of ajmams to own the copyright of our research paper.

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ABSTRACT

Background: Few recent studies have reported low serum amylase levels to be a risk factor of metabolic syndrome (MetS) with association of low amylase levels with worse lipid profile parameters, suggesting an endocrine-exocrine relationship in pancreas. However they also reported increasing prevalence of stroke and requirement for drug treatment for hypercholesterolemia with higher amylase levels. Other studies have reported elevated amylase levels in diabetes. The present study was thus designed to study the status of serum amylase levels in metabolic syndrome.

Methodology: Study group comprised of 200 subjects (25–75 yrs) with MetS. Persons with any other chronic and acute illness, renal dysfunction and drug intake (OCP, steroids, aspirin etc.) known to influence amylase levels, persons with high urea levels and those with amylase <30 IU/L &> 200 IU/L were also excluded. Control group comprised of 50 healthy controls.

Results: Amylase levels was significantly higher than in control group (71.80±29.06vs59.9±21.40 IU/L, p=0.010). Amylase levels positively correlated with serum triglycerides (r=0.210, p=0.032), ALT (r=0.223, p=0.023) and urea (r=0.209, p=0.039) and were negatively correlated with HDL-Cholesterol levels (r=0.267, p=0.006) in the study group.

Discussion: The study found higher amylase levels in MetS which were correlated significantly with higher triglycerides and lower HDL-Cholesterol levels. Hyperinsulinemia a feature of MetS is known to increase amylase secretion. Pancreatic tissue in Type 2 DM has been reported to have inflammatory hyper-cellularity, loss of cell adhesion and paracrine communication, apoptosis, ECM remodelling fibrosis in both islet (endocrine) and acinar(exocrine) tissues. This may be leading to increase release of amylase as a non-functional plasma protein, reflecting the slow continuous pancreatic inflammation and damage.

Keywords: Amylase, Metabolic Syndrome, Type-2 Diabeties Mellitus

INTRODUCTION

Metabolic syndrome is the most serious risk factor for developing diabetes mellitus and cardiovascular disease.[1] The root cause of metabolic syndrome is considered to be obesity which leads to insulin resistance and other features of metabolic syndrome due to the adipokines and pro-inflammatory cytokines secreted by the adipose cells.[2] The pancreas has dual functions as a digestive organ and as an endocrine organ, by secreting digestive enzymes including amylase and endocrine hormones including insulin.[3,4] Some early studies have revealed that serum amylase levels are lower in individuals with chronic pancreatitis, severe long-term type 2 diabetes or type 1 diabetes, which are often accompanied by atrophic pancreas tissue.[4,5] However, the association between serum amylase levels with metabolic syndrome remains poorly understood.[6] Recently Nakajima et al reported that, compared with highest quartile of serum amylase, lowest quartile was associated with increased risk for Metabolic Syndrome and Diabetes. They noted that subjects with lower amylase levels had higher incidence of DM and Metabolic syndrome 5 years later suggesting that low serum amylase levels preceded the overt metabolic abnormalities.[6,7]Lee et al also described that prevalence of Metabolic Syndrome decreased significantly in subjects in highest quartile for amylase levels as compared to those in the lowers quartile. They described negative correlation with BMI and Triglyceride levels and positive with HDL–Cholesterol, terming amylase a possible cardio-protective factor. However they also noted that prevalence of history of stroke was increased in subjects with higher amylase levels and; prevalence of treatment for hypercholesterolemia mostly with statins was higher in subjects with higher amylase levels.[8]However as there is a lack of studies comparing the levels of amylase in subjects with Metabolic Syndrome (Metabolic syndrome) and healthy controls. The present study was thus designed to compare thelevels of amylase in patients with metabolic syndrome with age and sex matched healthy controls and studies the associations between amylase levels and metabolic syndrome parameters in Indian patients.

MATERIALS AND METHODS

The study group comprised of 200 patients (aged 25 – 75 years) of metabolic syndrome recruited from the medicine out-patient department of PGIMS Rohtak after taking informed and voluntary consent.Metabolic syndrome

was diagnosed as per the NCEP:ATPIII 2001 criteria which includes[9]:
Three or more of the following:

- Waist circumference >102 cm (M), >88 cm (F)
- Hypertriglyceridemia: Triglycerides 150 mg/dL or specific medication
- Low HDL cholesterol: <40 mg/dL (M) and <50 mg/dL (F) or specific medication
- Hypertension: Blood pressure 130 mm systolic or 85 mm diastolic or specific medication
- Fasting plasma glucose 100 mg/dL

Patients with any other chronic and acute illness, diabetes mellitus, renal dysfunction and drug intake (OCP, steroids, aspirin, diuretics etc.) known to influence amylase levels were excluded. Persons with abnormal urea levels (>40 mg/dL) and those with amylase <30 IU/L &> 200 IU/L (known criteria for pancreatic diseases) were also excluded.[10]The control group comprised of 50 age and sex matched healthy controls recruited after taking informed and voluntary consent. History, Physical examination and anthropometry were done in all cases and controls. 5mL of fasting morning venous sample was collected from the antecubital vein under all aseptic precautions. Serum was separated by centrifugation at 3000 rpm for 5 minutes. All samples were analyzed on the same day of collection within 4 hours. Urea, Lipid profile parameters, fasting blood sugar and amylase were estimated on autoanalyser using commercially available kits from Randox and Seimens. Appropriate QC were also included in all runs. Ethical clearance was obtained from the Institutional Ethical Committee for scientific studies.

RESULTS

Amylase levels was significantly higher in study group than in control group (71.80±29.06 vs 59.9±21.40 IU/L, p=0.010, Fig 1). Amylase levels in the study group positively correlated with serum triglycerides (r=0.210, p=0.032, Fig 2). Amylase levels in the study group negatively correlated with HDL-Cholesterol levels (r= -0.267, p=0.006, Fig 3). Amylase levels in the study group positively correlated with ALT (r=0.223, p=0.023, Fig 4). Amylase levels in the study group also positively correlated with urea (r=0.209, p=0.039, Fig 5).

DISCUSSION

We found higher amylase levels in Metabolic syndrome. Amylase levels correlated significantly with higher triglycerides and lower HDL-Cholesterol levels. The association with dyslipidemia is consistent with previous reports.[11]. Obesity, characterized by increased adipocyte size and number is responsible for the insulin resistance and other features of Metabolic Syndrome. Metabolic Syndrome is characterized by insulin resistance and consequent hyperinsulinemia.[12]Animal and cellular studies regarding the relationship between the endocrine and the exocrine pancreas have consistently showed that insulin affects basal and stimulatory amylase secretion via the islet-acinar axis.[10,13] Insulin binds to its receptor on acinar cells and stimulates amylase secretion through various pathways (Henderson's hypothesis).[10] Insulin resistance (defects in insulin signaling pathway) controlling gluconeogenesis prevents suppression of hepatic glucose production in face of high blood glucose levels, while a more responsive insulin signaling pathway controlling fatty acid

synthesis and esterification leads to overproduction of triglycerides leading to the impaired fasting glucose and dyslipidemia characteristic of Metabolic syndrome.[13]Pancreatic tissue in Type 2 DM and metabolic syndrome has been reported to have inflammatory hyper-cellularity, loss of cell adhesion and paracrine communication, apoptosis, ECM remodelling fibrosis in both islet(endocrine) and acinar (exocrine) tissues. This may be leading to increase release of amylase as a non-functional plasma protein and may reflect the slow continuous pancreatic inflammation and damage.[14,15] Also alterations in gut hormones like ghrelin, incretins and adipokines like adiponectin may be involved as they are known to influence amylase secretion.[16-18] The association with urea is due to the renal clearance of amylase.[19]

Nakajima et al. argued that low serum amylase levels in patients developing metabolic syndrome later were believed to be due to deficient insulin activity. However they also noted that low amylase levels preceded the onset of metabolic disturbances.[6,7]Previous studies have shown positive correlations between amylase secretion and circulating C-peptide or 24-hr urinary C-peptide excretion in diabetic patients, principally in type 1 diabetes, suggesting that low circulating amylase may reflect low insulin secretion.[17]Also some studies have reported lower amylase levels in obese people compared with lean individuals.[20]Nevertheless, obese people with Metabolic syndrome tend to show hyperinsulinemia to compensate for insulin resistance.[2]

However it may be pointed out that the chronic elevation of enzymes of pancreatic origin in asymptomatic patients (non-pathological hyperamylasemia), even though found rarely needs to be carefully distinguished from the elevation in serum amylase due to metabolic syndrome.[21,22] The association between amylase and metabolic syndrome needs to be evaluated in a larger sample size with further detailed evaluation of association of amylase with insulin resistance and C-peptide levels may be useful as a further study. Further Distinction between Salivary (S) and Pancreatic (P) type amylase in metabolic syndrome and diabetes may also help to refine the role of serum amylase as biomarker for metabolic syndrome.

CONCLUSIONS

Higher amylase levels were detected in patients with Metabolic Syndrome in the present study along with significant correlations with higher triglycerides and lower HDL-Cholesterol levels. Amylase levels may be a possible marker of the characteristic pancreatic pathology of metabolic syndrome reflecting a relation between endocrine & exocrine pancreas. Larger studies are needed to evaluate the status amylase levels in metabolic syndrome.

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Figure 1: Amylase levels in the study and control groups.

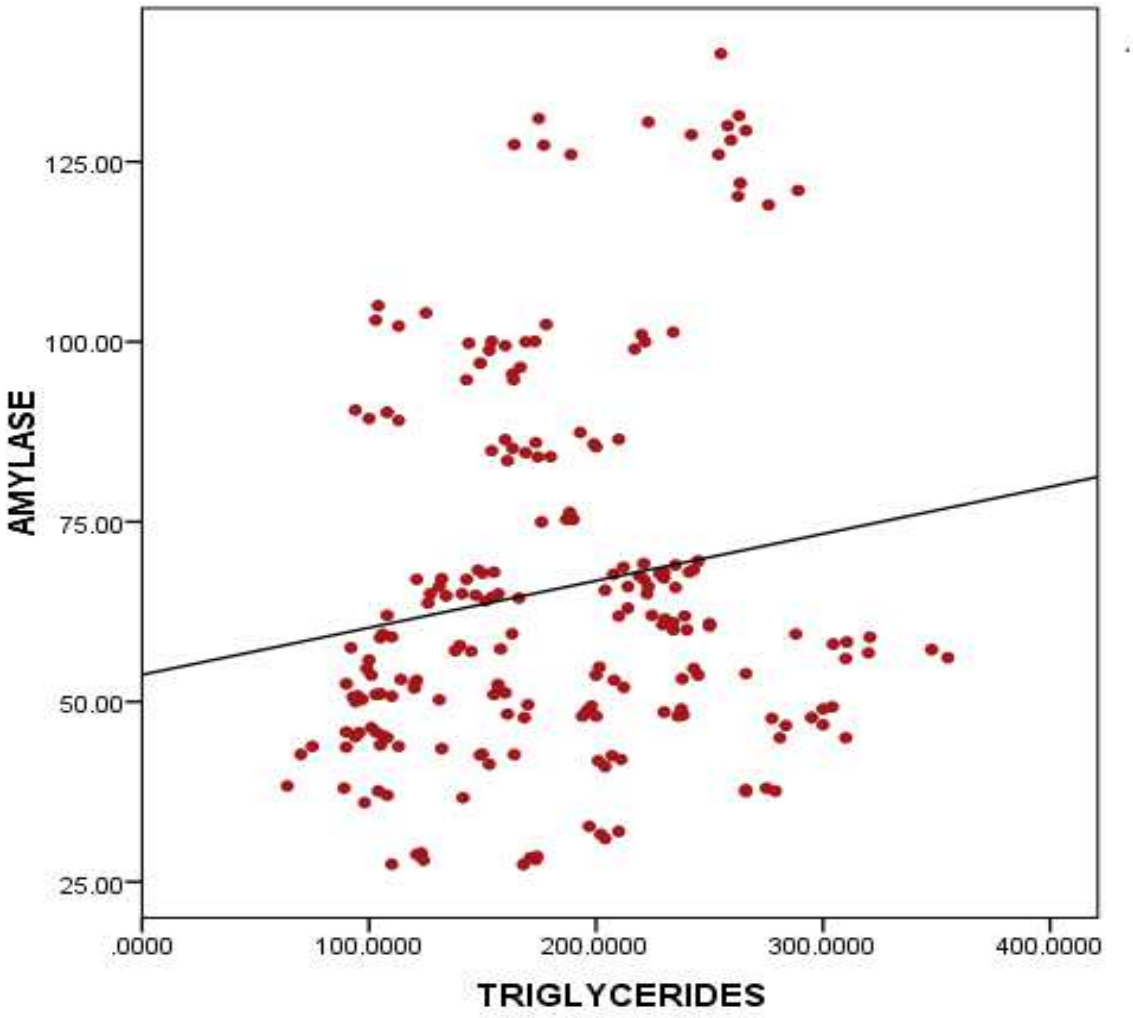

Figure 2. Correlation between serum amylase levels and serum triglyceride levels in the study group ((r=0.210, p=0.032).

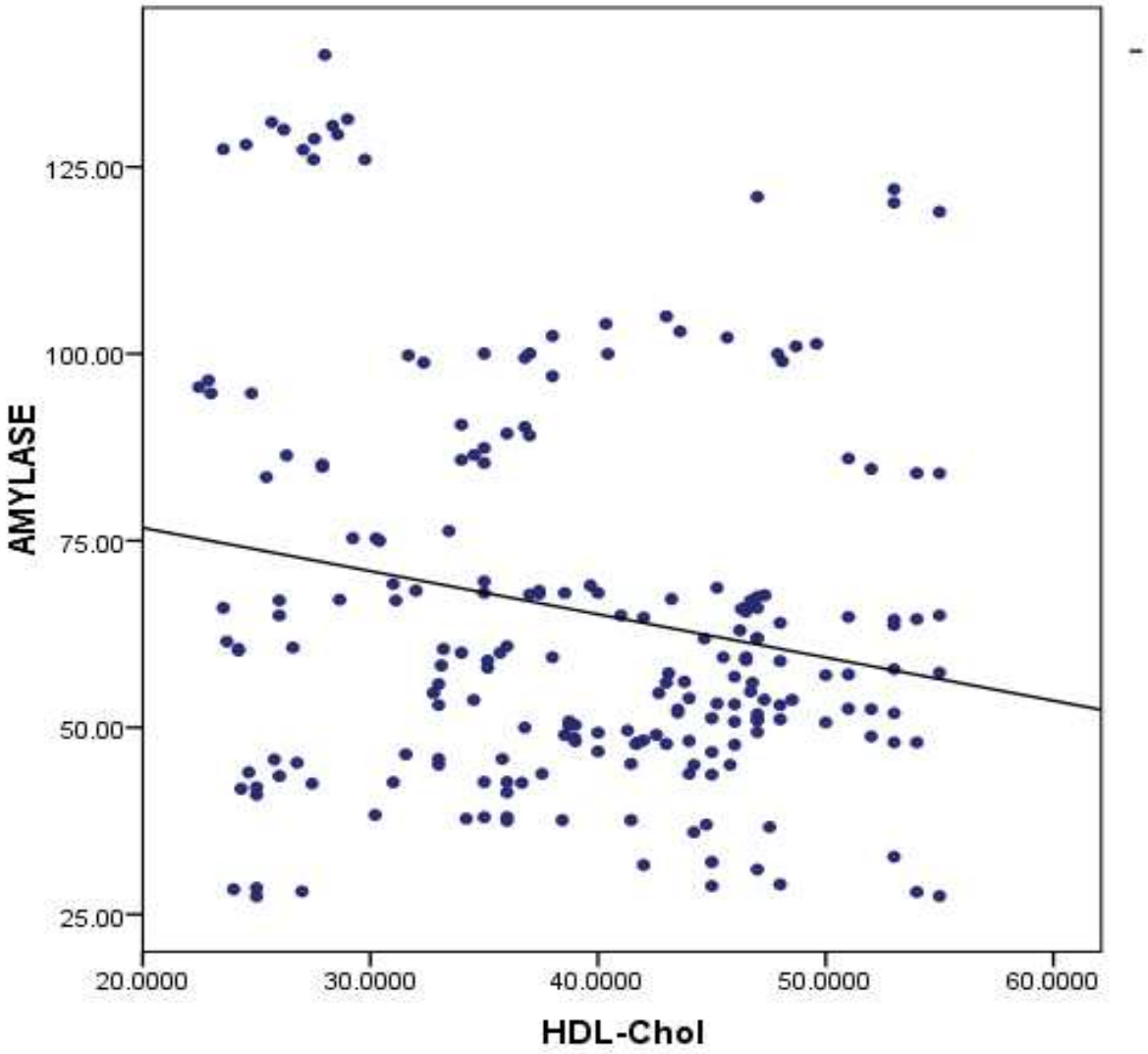

Figure 3: Correlation between serum amylase levels and serum HDL-Cholesterol levels in the study group (r= -0.267, p=0.006).

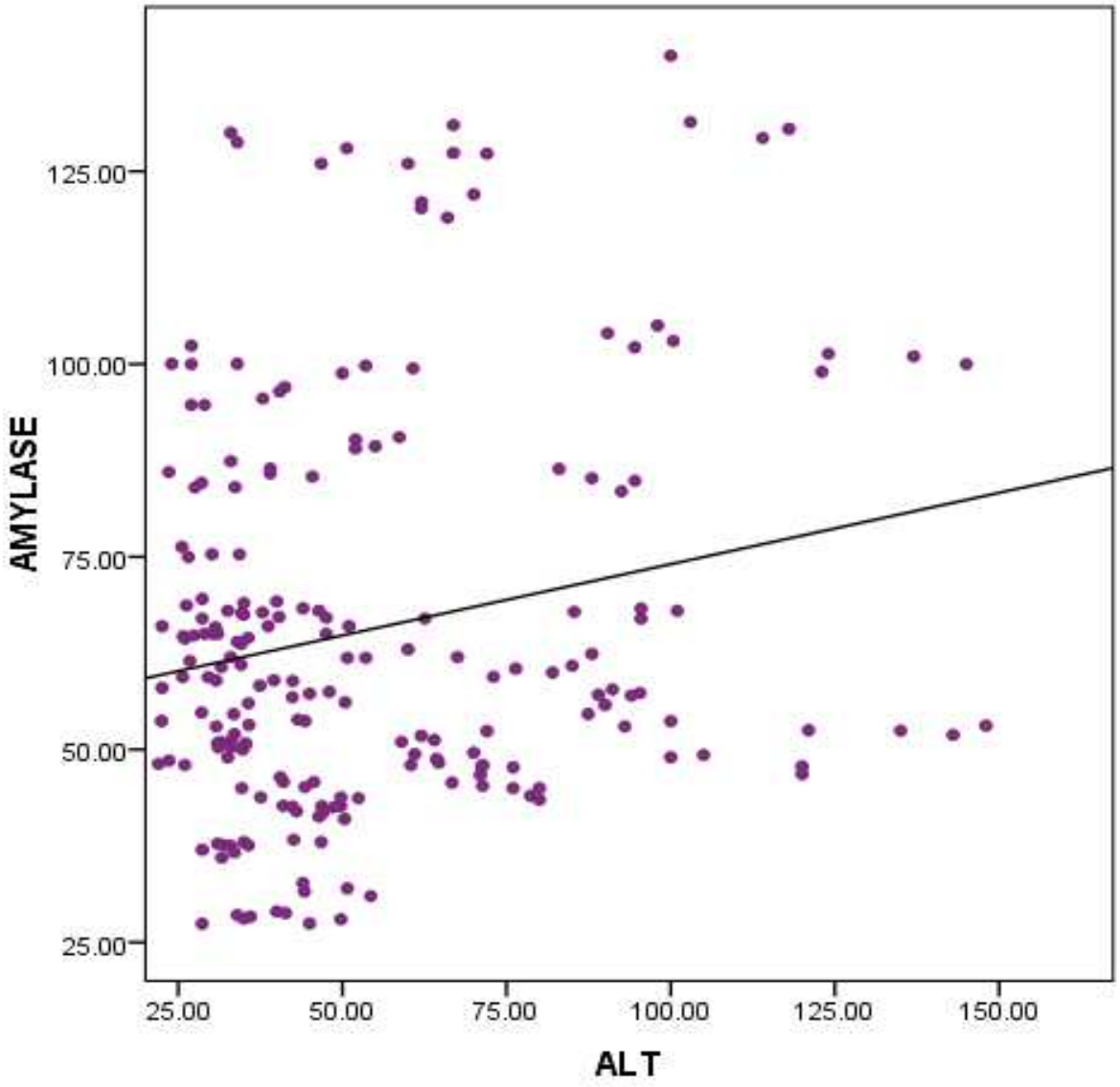

Figure 4: Correlation of serum amylase levels in the study group with serum ALT (r=0.223, p=0.023).