Medical and Clinical Research: Open Access

Research Article

Evaluation of Some Pancreatic Enzymes in Apparently Healthy Individual in a Selected Population

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Received: May 01, 2022; **Accepted:** May 24, 2022; **Published:** May 30, 2022

Citation: Simeon GG, Timipa P. Evaluation of Some Pancreatic Enzymes in Apparently Healthy Individual in a Selected Population. Med Clin Res Open Access. 2022; 2(2):1-5.

ABSTRACT

The study evaluated the levels of Amylase; Lipase and Elastase-1 enzymes in apparently healthy individuals in a community setting. Variations in levels of these enzymes are known causes of some life threatening disorders. Amylase and Lipase were quantitated spectrophometrically while elastase-1 was evaluated using enzyme linked immunosorbent assay. Level of Amylase and Lipase were observed to be higher in children, reduces moderately at young adult and sustained to mature adult. Elaste-1 value however, show inconsistent pattern, as it was not detected in some children while adults show variable trend. Inclusion of these enzymes in our batteries of tests will enhance and strengthen diagnosis in pancreatic and related disorders.

Keywords

Pancreatic enzymes, Amylase, Elastase, Population.

Introduction

Salivary gland produce amylase, which are essential for digestion of starch in the gastrointestinal tract. Where the normal condition prevail, both the salivary and pancreatic amylase exist and can be distinguished electrophoretically.

Amylase is known to have increased activity in acute abdominal conditions, peptric ulcers, cholecystitis [1]. Amylase production in children is delayed especially in newborn where it appears after two months of age and increasing gradually in the first year [2]. The complex of amylase with immunoglobulin A (IgA) and immunoglobulin G (IgG) has been reported to form macroamylase and a condition that give rise to macroamylasaemia. The formation of these complexes reduces it's clearance from the kidney and could raise serum level of the enzymes although urine level may still be normal [3]. Lipase generally increase the hydrolysis of ester linkages of fat molecules through which alcohol and fatty acids are produced being a digestive enzyme secreted by the pancreas it is both water soluble and lypolytic and by this process enhancing the emulsification of fats [4]. The link between lipase and affinity, for glycerol triesters of naturally occurring fatty acid has earlier been elucidated [5]. Bile salts and colipase are known to enhance lipase activity as they act as co-factors. On comparative analysis, lipase in known to have a longer half-life than amylase and have longer activity. The activity of serum lipase has been documented to increase in conditions such as carcinoma of pancreas, acute pancreatitis, pancreatic trauma, necrosis and chronic billiary disease.

Elastase is classified as serine protease from the pancreas. It

has special affinity for the carboxyl group of three amino acids, Leucine, Valine and Alanine. The synthesis of human Elastase-1 takes place in the acinar cells of the pancreas acting in synergy with other digestive enzymes. Elastase-1 measurement in stool has been widely used in the pancreatic studies as it has the advantage of being non-invasive.

Material and Method

A total of one hundred Blood and stool (feacal) samples were collected from children and adults in the selected population of Okolobiri Community in Yenagoa Local Government Area of Bayelsa State who have met required criteria. Their consent was also obtained and were categorized into age groups; 1-5 yrs, 6-10yrs, 11-15yrs, 16-20yrs, 21-30yrs, 31-40yrs, 41-50yrs and 51-60yrs. Their blood samples were spun and separated to obtain serum for the analysis. Stools samples were stored at -20^{0}c pending assay.

Amylase was analyzed spectrophotometrically at a wavelength of 405nm using 2-chloro-4- nitropherol 3-maltotriose (CNPG3 methodology) a (product of Agappe diagnostics, Switzerland, GMBH) Lipase was assayed at a wavelength of 580nm by the methyl resorufin method (a product of Agappe Diagnostic Switzerland, GMBH).

Elastase-1 was assayed using Enzyme linked immunosurbent Assay (ELISA) which employed dual monoclonal antibodies binding to two unique epitopes of this enzymes (a product of Schebo® Tech, Glessen, Germany).

Results

Results of the assay for Amylase and Lipase are shown graphically using box plot. We compared Enzymes versus age and children versus adult for Amylase, Lipase, and age versus enzyme concentration in Elastase 1. See figures 1 and 2 for Amylase, figures 3 and 4 for Lipase and Table 1 for Elastase -1.

We observed higher values of amylase among children especially those in the age range of 6-10 years. This level was however not sustained as we noted a decline in concentration of the enzymes from age 11-30 yrs with a slight increase in enzyme level in later ages. A similar presentation was observed for Lipase but there was a plateau between age 10-30 yrs and a slight elevation in later years.

The observed pattern for Elastase-1 showed a departure from amylase and Lipase as the values for adults were consistently higher. Significantly some of the children had values below detectable limit (<10µg EI/g stool),

Table 1: Feacal elastase-1 (E1) level in subject in relation to age.

Age (Years)	No. of subject	Concentration of Elastase (µg EI/g stool)
1-5	10	<10.4 ± 5.03
6-10	10	25.5 ± 10.22
11-20	10	52.8 ± 15.07
21-30	10	80.3 ± 20.05
31-40	10	140.6 ± 35.08
41-50	10	300.5 ± 40.09
51-60	10	470.3 ± 5.55

All values were triplicate measurement

Discussion

The objective of this study was to determine the level of some pancreatic enzyme in an apparently healthy individual in a selected population. Our observation and findings on this study has

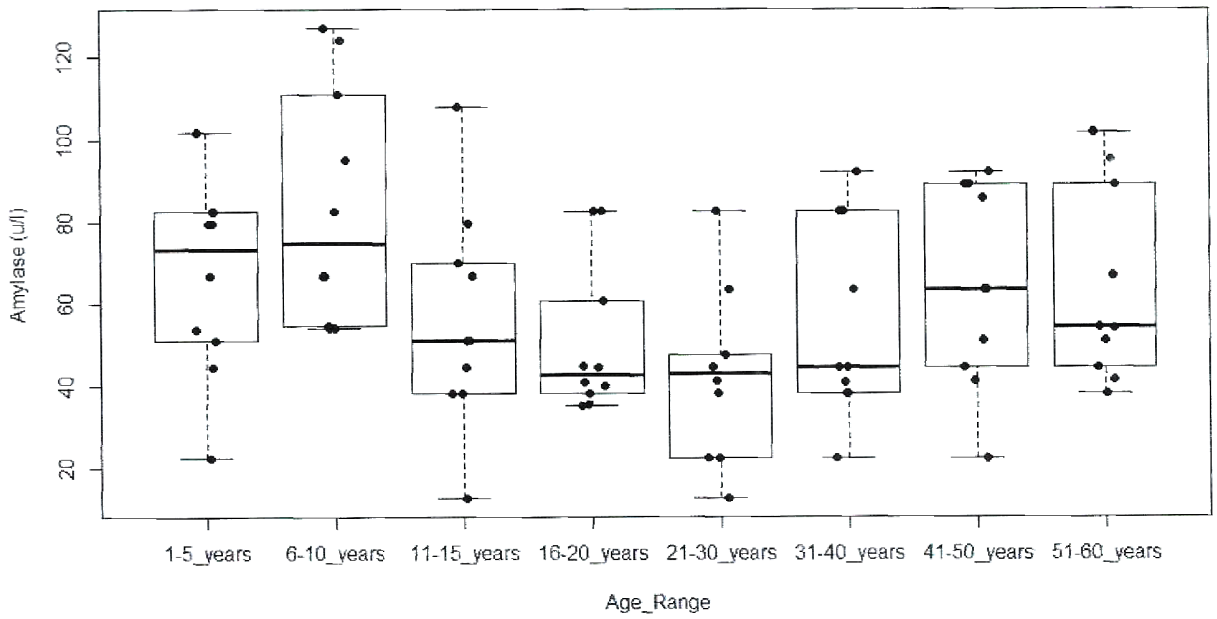
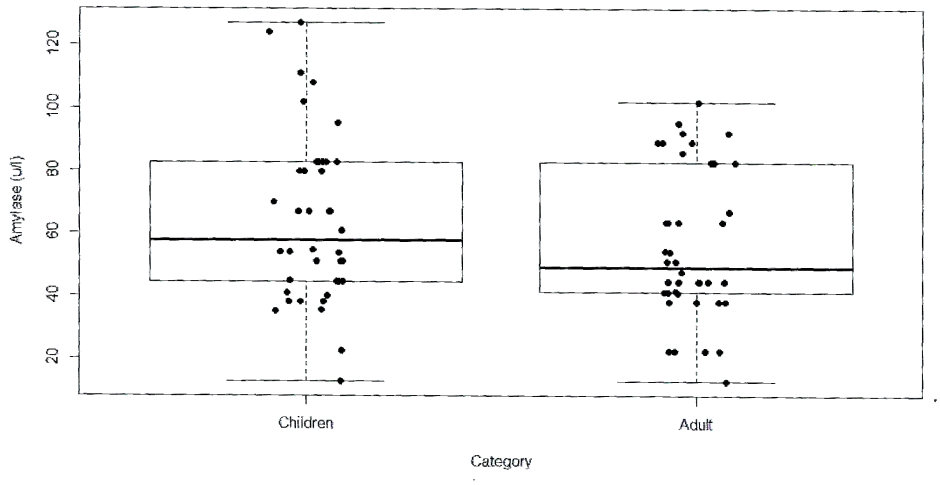
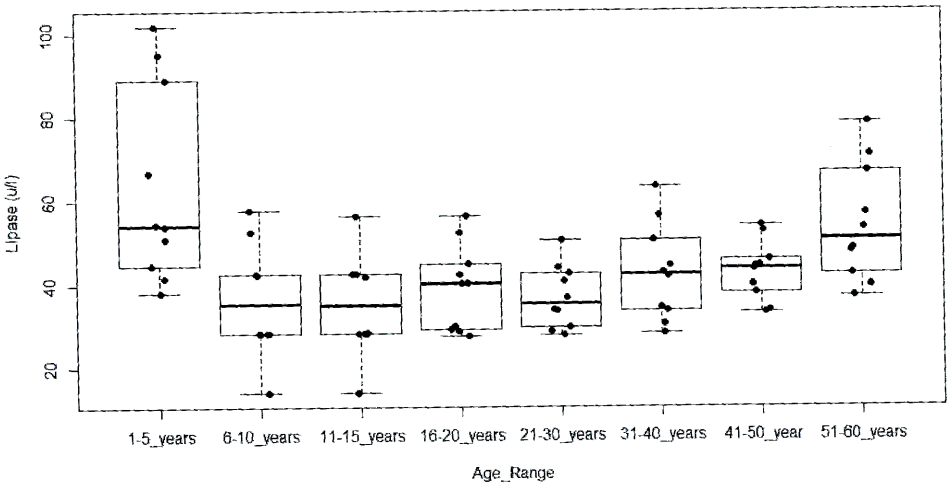


Figure 1: Assay value of concentration of amylase collected from subjects against age ranges.



Plot 2: Amylase vs Category; No outlier observed

Figure 2: Assay value of amylase concentration against Age.



Plot 4: Lipase vs Age_Range; No outlier observed

Figure 3: Assay value of concentration of lipase collected from subjects against age ranges.

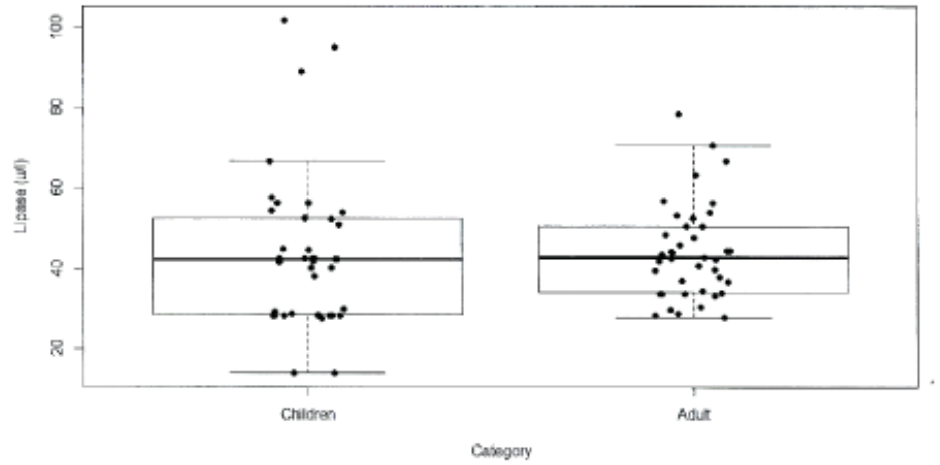


Figure 4: Assay value of lipase concentration against Age.

elucidated the fact that there is a marked variation in levels of these enzymes within and among age groups. The general overview of the result show that level of Amylase and Lipase are higher in children than in adult. This finding correlates with the findings of [6] whose study on lipase observed significant difference in individuals aged between 20-70 years old for both male and female. Our current work corroborate the findings of [7], which reported a decrease in lipase activity with age.

When considerations are made as to the pre-requisite for diagnosis of acute pancreatitis, certain issues that will come to mind would include previous abdominal pain suggestive of acute onset of inherent epigastric pain, unique finding similar to symptoms of pancreatitis and sometimes when lipase and Amylase levels are markedly raised 3-4-fold above the reference range.

Previous reports have epitomized the fact that most subjects with type 2 diabetes are prone to have elevated values of Amylase and Lipase activity. This has been further validated by the fact that using logistic regression analysis worsening estimated glomerular filtration rate (eGFR) has been incriminated with elevated serum lipase and amylase [8,9].

There are varied sources of lipase and Amylase in the body. Amylase is known to exist in two isoforms, P-amylase and S-amylase. Organs such as spleen, testes, liver and fallopian tube produce these enzymes. Lipase and Amylase are also known to be synthesized in pancreatic acinar cells which are aggregated in the zymogen granules and are currently considered to enter the blood stream through damage [10,11]. There is now evidence to suggest that high intake of fat and carbohydrates have effect on the synthesis and production of lipase and Amylase [12,13] although the population under study are exposed to other normal diet there is a preponderance of fat and carbohydrate as source of food for the this population. Literatures supporting this assertion could be found in [14,15].

An understanding gleamed from the study was to the effect that although these subjects were apparently healthy some has Elastate-1 values that suggests the presence or subnormal level of some level of pancreatic. For instance, the reference value for lipase is 38 U/L at 37°C but we observed values three to four folds from some of the apparently healthy subject. It is enough to suggest that pancreatic lesions exist at subnormal level or a malabsorption syndrome may be coming up. There has been earlier report by [16-18] on decline in Elastate 1 in cystic fibrosis children from 100 µg Ei/g stool to undetectable level as a follow up to detection and management.

We conclude that the triad of Amylase, Elastase and lipase when included in our diagnostic protocol could enhance early detection and management of patients with gastrointestinal challenges.

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