Diabetology

Extended Abstract

Serum Trypsinogen and Lipase as Biomarkers of Exocrine Pancreatic Function in Newly Diagnosed Children and Adolescents with Type 1 Diabetes Mellitus - Eman M Sherif - Ain Shams University, Cairo, Egypt

Eman M Sherif

Abstract

Type 1 diabetes mellitus (T1DM) in literature has usually been associated with laboratory decrease in pancreatic exocrine enzymes levels. Nevertheless, the exact onset of decreased pancreatic enzymes levels in sera of patients is still unknown. We measured pancreatic serum levels of trypsinogen and lipase in Egyptian children and adolescents with newly diagnosed T1DM to reveal their role in diagnosis and their relation to HbA1c as a marker of glycemic control, lipid profile and fasting c-peptide as a marker of endocrine pancreatic insufficiency. T1DM results from disruption of pancreatic function as a result of autoimmune destruction of pancreatic tissue. The period of development of the autoimmune process and the evidence of overt clinical picture of DM varies greatly and remains unclear [1]. However, as the stage of overt clinical type 1 DM is reached, associated destruction of the exocrine pancreatic cells usually result in decreased serum pancreatic enzymes such as serum trypsinogen and serum lipase [2,3]. Accordingly, measurement of serum concentration of pancreatic trypsinogen and/or lipase can be an early clue for pancreatic disruption. The usage of pancreatic enzyme; serum trypsinogen and lipase levels as a predictive biomarker of type 1 diabetes has been evaluated [2,4]. It is suggested that analysis of pancreatic enzymes in diabetic patients could be an early marker of disease diagnosis as well as being a useful parameter in assessing the progress of illness [1]. To our knowledge, only one study [2] assessed the level of serum trypsinogen in a mixed group of pediatric and adults with T1DM and therefore, the current study assesses the levels of trypsinogen and lipase in the sera of children and adolescents with newly diagnosed T1DM and the results were correlated to demographic data, clinical history/examination, HbA1c and the level of fasting c-peptide.

Methods

Fifty Egyptian children with newly diagnosed T1DM were compared to age and sex matched 50 healthy controls. Full clinical history was taken including history of diabetic ketoacidosis (DKA) and that of pancreatitis. All subjects underwent full clinical examination. Anthropometric measurements were taken including weight, height and body mass index. Laboratory data of HbA1c, lipid profile and fasting c-peptide of patients with newly diagnosed T1DM were collected. Serum trypsinogen and serum lipase were collected from both patients' and control groups. Patients diagnosed as T1DM in Diabetes Clinic according to ISPAD diagnostic criteria of diabetes [5]. Also, all patients had low fasting c-peptide levels. All patients included was diagnosed with T1DM within 90 days of data collection.

Eman M Sherif
Ain Shams University, Cairo, Egypt , E-mail: emansherif@auth.gr

Patients' ages ranged from two to eighteen years. This study did not include patients with type 2 diabetes mellitus nor other types of diabetes. Also, patients with gastrointestinal diseases such as Celiac disease, inflammatory bowel diseases, malabsorption syndromes and GIT infections were not included. The control group included fifty (50) age and sex matched healthy children and adolescents. They were recruited from Outpatient Clinic at Ain Shams University Hospitals.

Written informed consent was taken from the care givers in ages below 16, and from participants in ages equal or more than sixteen. The procedures applied in this study were approved by The Ethical Committee of Human Experimentation of Ain Shams University, and are in accordance with the Helsinki Declaration.

Data collected from all patients in the study included detailed medical history taking with special stress on: Demographic data: Name, age, sex, family history of diabetes, disease duration, history of DKA development, symptoms suggestive of pancreatitis e.g. epigastric pain radiating to the back associated with nausea and vomiting and symptoms of pancreatic insufficiency

Results

Serum trypsinogen and lipase were significantly decreased in patients with newly diagnosed T1DM compared with control group ($p = 0.00028$). There was no relation between the pre-mentioned pancreatic enzymes and fasting c-peptide nor with disease duration ($p = 0.42$). Serum trypsinogen and serum lipase were found to be significantly decreased in our patients ($p = 0.00028$) Figure 1. None of our patients suffered symptoms of exocrine pancreatic insufficiency. Also, only four of our patients suffered from symptoms suggestive of pancreatitis at the time of diagnosis. Similarly, studies with wider scope showed similar low levels of pancreatic enzymes without clinical symptoms of malabsorption [2,3]. There was no relation between the pre-mentioned pancreatic enzymes and fasting c-peptide nor with disease duration. The Odds ratio for serum trypsinogen and serum lipase in patients with newly diagnosed T1DM showed that decreased serum lipase levels denotes higher risk for development of T1DM than decreased serum trypsinogen shown in Table 1. ROC curve analysis for diagnostic performance of serum trypsinogen and serum lipase in patients with T1DM in Figure 2 revealed that serum trypsinogen and serum lipase cut off value ≤ 40 ng/dl and ≤ 14.9 U/L respectively could differentiate between children with newly diagnosed and those without T1DM with a sensitivity of 96.00% and 69.39% respectively and specificity of 100% for both. The efficacy of trypsinogen and lipase are 98.9% and 90.1%, respectively. Comparison between patients with newly diagnosed T1DM and control group is shown in Table 2; patients' group had lower Z score for weight and BMI than healthy controls ($p = 0.026$). This can be attributed to the loss of weight which occur due to polyuria and vomiting presenting just before diagnosis due to hyperglycemia, osmotic diuresis and the development of DKA (56% of our patients developed DKA at presentation), but unfortunately weight loss measurements were not accurately available in the DKA presentation history of our patients. Correlation studies in Table 3 between lipid profile and both demographic and laboratory parameters in patients with type 1 diabetes showed significant positive correlation between serum cholesterol and BMI Z score ($p = 0.018$). Several studies in literature had similar results indicating a strong link between blood levels of lipid profile and BMI Z score which later correlates to increased risk of atherosclerotic cardiovascular diseases

Conclusion

Almost all children and adolescents with newly diagnosed T1DM had low levels of exocrine pancreatic enzymes. Nevertheless, more studies are needed to follow-up both pancreatic enzyme levels as well as exocrine pancreatic autoantibodies searching for correlations with disease development and progression.

Eman M Sherif
Ain Shams University, Cairo, Egypt , E-mail: emansherif@auth.gr