Research Article

Correlation between Serum Visfatin, Blood Glucose, Lipid Metabolism and Nonalcoholic Fatty liver Disease in Simple Obese Children.

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Abstract

Background: Non-alcoholic fatty liver disease (NAFLD) it is one of the most common causes of liver disease worldwide. Visfatin is an adipocytokine hormone, which exerts an insulin-like effect by binding to the insulin receptor-1, we aim to investigate the correlation between serum Visfatin and NAFLD in Simple obese children. **Methods:** This prospective study included 62 children clinically evaluated as obese and 35 apparently healthy children, age and sex matched as controls. Patients were recruited from the pediatric department of EL-Mina University, children's hospital.While controls were collected from healthy school children between September, 2016 and October, 2017. Fasting Visfatin, glucose, hemoglobin$A_{1c}$and lipid levels were assayed and abdominal ultrasonography was done for detection of NAFLD. **Results:** There was a statistically significant correlation between serum Visfatin level and BMI ($p<0.01$), cholesterol levels ($p< 0.01$), triglycerides levels ($p< 0.01$), LDL levels ($p< 0.01$), HDL levels ($p< 0.01$) in both overweight and obese groups. **Conclusions:** Visfatin plays an important role in pathogenesis of NAFLD.

Key words: Non-alcoholic fatty liver disease; metabolic syndrome; Visfatin.

Introduction

Obesity is defined as either a body mass index (BMI) at or above the 95th percentile for children of the same age and sex specific BMI percentiles and overweight as a BMI at or above the 85th percentile but lower than the 95th percentile for children of the same age and sex.[1-3] Among primary school children, 6% were obese and 10.5% were overweight with higher percentage in girls [4].

NAFLD is considered as the hepatic presentation of metabolic syndrome Patient is considered to have metabolic syndrome when having central obesity plus any 2 of the following factors; triglyceride >150 mg/dL, HDL < 40 mg/dL in men and < 50 mg/dL in women, systolic BP >130 or diastolic BP> 85 mmHg, , fasting blood glucose (FBG) level100 mg/dL. [5-7] Visfatin binds and activates the insulin receptor, but not competing with insulin for its binding receptor.[8-12]

Methods

97 children were enrolled in this study, 62 were enrolled as patient while the other 35 children were enrolled as controls (age and sex matched) (group I). The enrolled patients were 2-17 years old fulfilled the following inclusion criteria: children with a BMI at or above the 85th percentile but lower than the 95th percentile were considered overweight and planned as group II, while children with a BMI exceeding the 95th were considered obese and planned as group III according to the Egyptian Growth Charts, [13]

Sample collection: 10 ml of venous blood samples were taken for, FBG, ALT, AST, urea, creatinine levels total cholesterol, LDL, HDL and triglycerides levels.

Ultrasound of liver right lobe for the evaluation of fatty liver was performed.

Statistical analysis

The numerical data were presented as means –

standard deviations while non-numerical data were presented as percentage. Two tailed t-tests were used to analyze differences between the control and patients groups.

Results

Significant difference between obese, overweight children and healthy ones regarding bodyweight Z-score centile (mean±SD 0.5 ± 1.1,0.05 ± 0.9,-0.35 ± 0.5 respectively) and *(p< 0.01)* and BMI Z-score centile (mean±SD 0.9 ± 0.7,0.1 ± 0.6,-0.97 ± 0.4 respectively) and *(p< 0.05*) while no significant difference between the three groups of children regarding height Z-score centile.(mean±SD 0.2± 1, 0.04 ± 1.1, -0.2± 0.9 respectively). (*Table 1*)

Mean diastolic blood pressure (DBP) values significantly higher in obese children compared to healthy ones *(p< 0.01). (Table 1)*

Significant higher incidence of NAFLD in obese and overweight children compared to healthy ones (*p< 0.01*) for both. 73% of obese children 26.3% of overweight ones were having NAFLD. *(Table.1)*

ALT,AST were higher in obese and overweight compared to healthy ones (mean±SD for ALT 71.3 ± 21.4, 41.3 ± 19.1, 30.3 ± 4.4 respectively and (mean±SD for AST 69.8 ± 24.5,36.8 ± 5.5, 30.0 ± 4.4 respectively) (*p< 0.01* and 0.05 respectively).

Regarding lipid profile in obese and overweight compared to healthy ones, mean total cholesterol (mean±SD 238.1 ± 49.1, 160.7 ± 56.6,147.1 ± 44.9, respectively), LDL (mean±SD137.9± 18.8,123.4 ± 14.2, 102.6 ± 17.4, respectively), HDL (mean±SD 33.2±13.4, 48.4 ± 19.2, 62.2 ± 16.3, respectively) and TG values (mean±SD143.1 ± 23.9, 35.2 ± 16.0, 88.4 ± 21.4, respectively) all were significantly higher in obese, overweight children compared to healthy children (*p*<0.01 for all) except for HDL level which was higher in healthy children (*p*< 0.01).

Higher mean FBG and Hb_{A1C},were found in overweight (mean± SD for FBS 99.5 ± 22.5 and Hb_{A1C} 6.19 ± 1.91) and obese (mean±SD for FBS 148.5 ± 39.7 and Hb_{A1C}7.49 ± 2.18) compared to healthy ones (mean±SD 86.7 ± 14.9 and Hb_{A1C}5.13 ± 0.64 respectively) (*p*< 0.01 for both).

Visfatin level was higher in obese children (mean ±SD 301.3 ± 64.5) overweight children (mean±SD 136.4± 24.1) compared to healthy children (mean±SD114.8 ± 23.7) (*p*< 0.01 for all). *(Figure.2)*

There were significant positive correlation between BMI, weight, cholesterol, TG and ALT and serum Visfatin levels. (*p*<0.01 for all).

Significant ultrasongraphic differences between obese, overweight and healthy children regarding the degree of hepatic steatosis (*p*< 0.01). *(Figure 1)*

ROC analysis of serum viosfatin level showed an area under the curve (AUC) of 0.82 at cut off value for serum Visfatin of > 126.5 ng/ml. showing the sensitivity (78.1%) and specificity (61.4%) of serum Visfatin as a predictor of fatty liver disease in obese children.

Table 1. Correlations between serum Visfatin and other Laboratory variables

Serum Visfatin	Age	Weight	BMI	FBS	Hb_{A1C}	Cholesterol	TGA	LDL	HDL	AST	ALT
r	-0.6	0.84	0.53	0.74	0.69	0.7	0.64	0.66	0.64	0.80	0.83
***p*-value**	0.59	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*

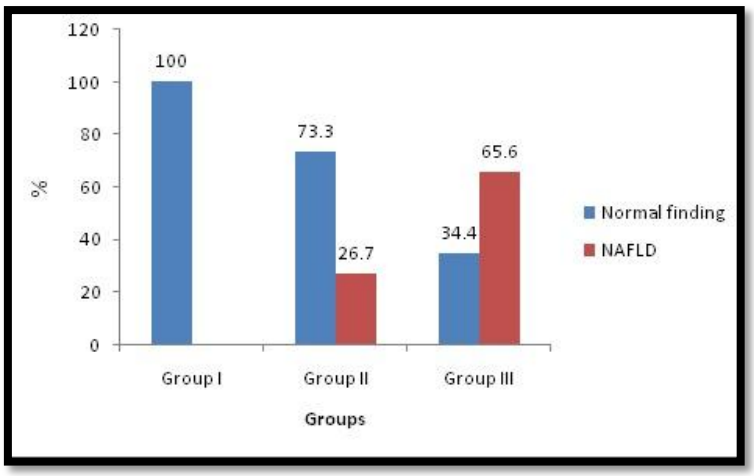

Figure 1: Abdominal sonar findings among studied groups

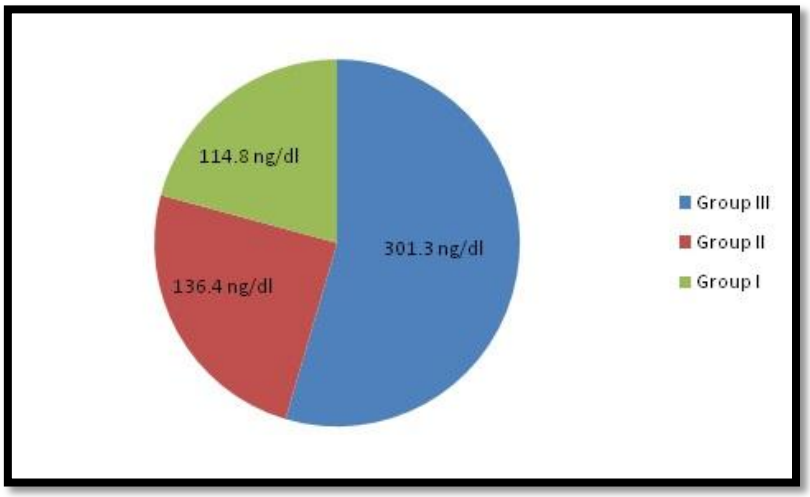

Figure 2: Serum visfatin among studied groups

Discussion

The synthesis and secretion of Visfatin is regulated by Interleukin-6 (IL-6),growth factors, glucocorticoids, and TNF-α [15,16] and down regulated by insulin, somatostatin and statins.[14,16]

In the present study, the BMI correlates closely with total body fat (TBF), which is in previous studies estimated using dual-energy x-ray absorptiometry (DEXA) scanning.[17]

DBP it was significantly higher in obese children, obesity likely contribute to the increase levels of insulin-like growth factor I which may increase blood pressure. [18,19]

Nageswari et al., [19] found higher DBP values in the obese group children. However, Divković. et al.,[20] proved that overweight/ obese children had significantly higher systolic blood pressure compared to eutrophic children.

In the present study, NAFLD was significant higher in the obese children compared with overweight & healthy children, Ludwig et al.,[20-23] proved that, rarely, physical examination reveals hepatomegaly.

Our results showed mild to moderate elevations in transaminases two to five times the upper limits of normal in overweight and obese agreeing with the results of [24, 25]

Higher total cholesterol, LDL and TG were detected in obese and overweight children compared with control groups and also in the obese children was higher than overweight ones. While HDL was higher in healthy

children who show normal levels of HDL which has a cardiovascular protective function, this is in agreement with Holst-Schumacher et al., [26,27]

Higher mean fasting blood glucose level (FBG) and Hb_{A1C}were found in overweight and obese compared to healthy ones, this is similar to that described by Elghaffar et al., [28,29]
Serum Visfatin was higher in obese & - patients compared with controls. Also it was higher in patients who develop metabolic syndrome. The presence of NAFLD itself is a significant predictor of serum Visfatin levels as reported by Dahl et al., [30-34]

However, they found no difference of serum Visfatin levels between the healthy and overweight children. [35,25]

In our study there was a significant difference between the obese children and healthy ones in the ultrasonographic findings of NAFLD and between the obese children and overweight ones with the frequency of 65.6% and 26.7%, respectively. Lipid accumulation in the liver leads to hepatic inflammation and cytokine production. [36-40]
Our results showed the ROC for serum Visfatin as a predictor of fatty liver in obesity, with sensitivity of 78.1% and specificity of 61.4% .

Limitation of the study:
The smaller sample size which due to refusal of many patients to share in this study.

List of Abbreviations
BMI: Body mass index, LDL: Low density lipoprotein, HDL: High density lipoprotein, Bp: Blood pressure, FBG: Fasting blood glucose, TNF-α:Tumor necrosis factor-α, ALT: Alanin aminotransferase, AST: Aspartate aminotransferase, DBP: Diastolic blood pressure, CHD: Coronary heart disease, IL-7: Interleukin-7, IL-6: Interleukin-6,TBF: Total body fat, DEXA: Dual-energy x-ray absorptiometry, IR: Insulin resistance, VLDL: Very-low density lipoprotein, FFA: Free fatty acid**.**

Patients known diabetes, under treatment for chronic diseases and under steroids therapy all were excluded. The study conducted according to the principles of Helsinki and agreed by the faculty of medicine, Minia university, Ethical committee (No: 116-5-2016).Informed written and verbal consents from the patient's caregiver were obtained

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