RELATIONSHIP OF SGPT (ALT) LEVELS WITH INSULIN RESISTANCE IN OVERWEIGHT AND OBESE PERSONS

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INTRODUCTION

A number of studies have shown relationship between gamma-GT or SGPT/ALT levels and insulin resistance, suggesting that these parameters can be used as markers for the insulin resistance state.

Gamma-GT and SGPT/ALT levels, even within the normal range, correlate with increasing intrahepatic fat. It has been suggested that the elevation of the hepatic enzymes could be the expression of excess deposition of fat in the liver, which is closely related to obesity and other metabolic disturbances such as dyslipidaemia or diabetes mellitus.

AIM

of our study was to investigate the relationship between SGPT/ALT levels and insulin resistance indices in overweight and obese persons who are invariably insulin resistant.

SUBJECTS-METHODS

We studied retrospectively 219 male and 382 female (total 601) overweight and obese persons who attended the outpatient clinic of Diabetes-Obesity-Metabolism Department of our Hospital, in order to reveal any trend between ALT and insulin resistance.

Subjects with overt liver disease were excluded from the study.

Subjects were also classified as “non-diabetic” and “diabetic” according to reported personal history or considering HbA1c (cutoff point: 6.2%) and fasting plasma glucose levels (cutoff point: 110mg/dl).

Fasting glucose and insulin levels as well as ferritin, SGOT, SGPT, ALP and gamma-GT levels were measured after overnight fasting.

Anthropometric measurements were performed: BMI, waist circumference, WHR, sagittal abdominal diameter, % total body fat (BIA method).

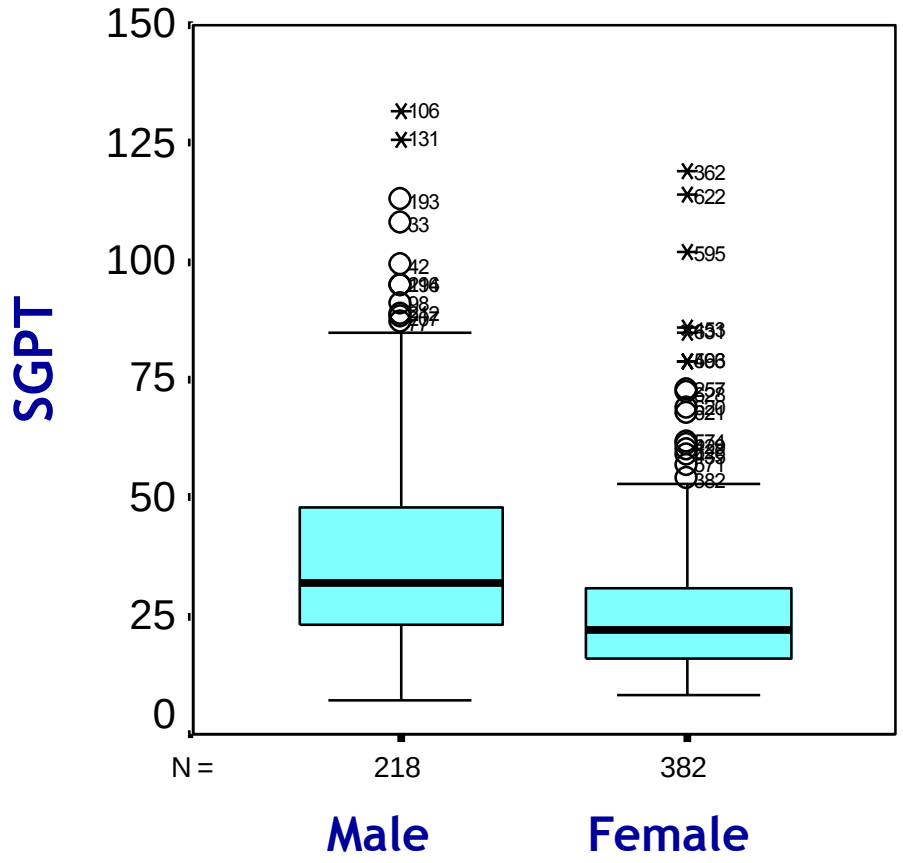
Insulin resistance (HOMA model) and insulin sensitivity (Quicki) were calculated as well as “Insulinogenic” Index which was defined as the ratio of fasting insulin to fasting glucose.

Subjects were divided in HOMA, Quicki and Insulinogenic Index quartiles and SGPT comparisons were made within these quartiles. Statistic analysis included ANOVA, multiple regression analysis, Man-Whitney test and non parametric (Spearman) correlation.

SUBJECTS-METHODS

	Males (n=218)	Females (n=382)	p
Age (years)	46.0 ± 13.9	42.2 ± 13.7	0.001
BMI (kg/m^2)	35.1 ±6.2	34.3 ±6.2	NS
Waist Circumference (cm)	115.6 ± 14.5	104.0 ± 13.6	0.000
% Total Body Fat	35.9 ± 5.9	44.4 ± 6.1	0.000
Glucose (mg/dl)	122.1 ± 49.3	102.9 ± 33.7	0.000
Insulin (μU/ml)	16.9 ± 11.6	13.3 ± 9.8	0.000
SGOT (U/l)	25.8 ± 13.2	20.7 ± 8.3	0.000
SGPT (U/l)	38.9 ± 24.3	25.7 ± 15.2	0.000
Gamma-GT (U/l)	38.1 ± 26.9	23.4 ± 19.8	0.000
HOMA	5.06 ± 3.86	3.45 ± 2.82	0.000
Quicki	0.318 ± 0.046	0.331 ± 0.0319	0.000
Insulinogenic Index	0.154 ± 0.117	0.135 ± 0.101	0.043
Type 2 Diabetes (Yes/No)	94 / 124	64 / 318	0.000

RESULTS

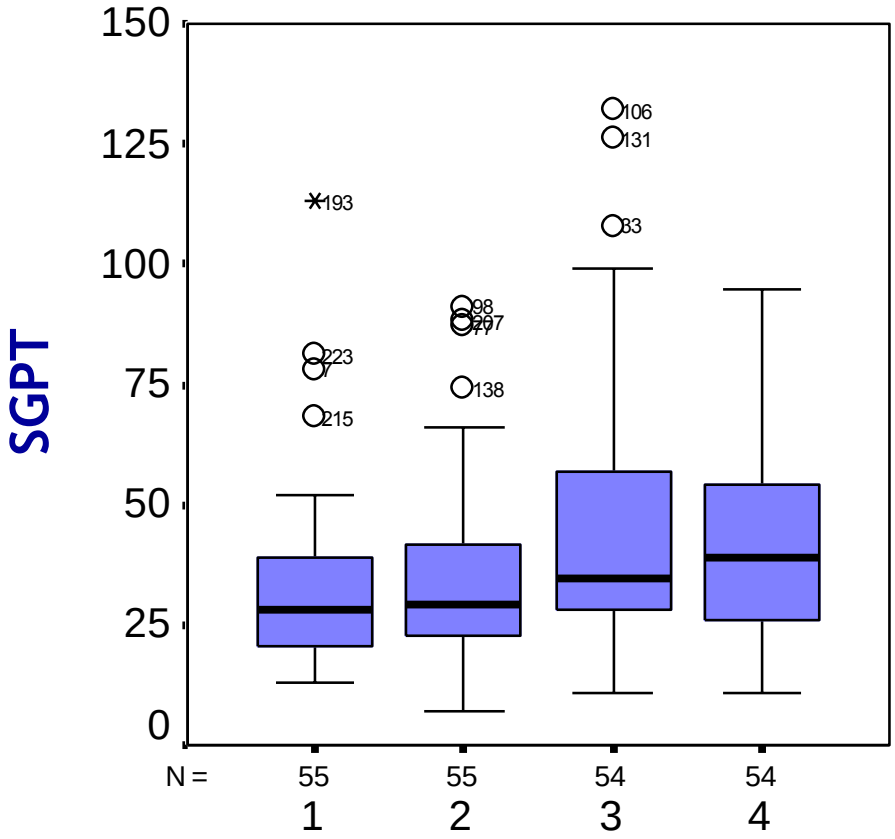


Males had higher SGPT levels than females (38.9U/l ± 24.3U/l vs. 25.7U/l ± 15.2U/l, p= 0.000)

RESULTS (Males)

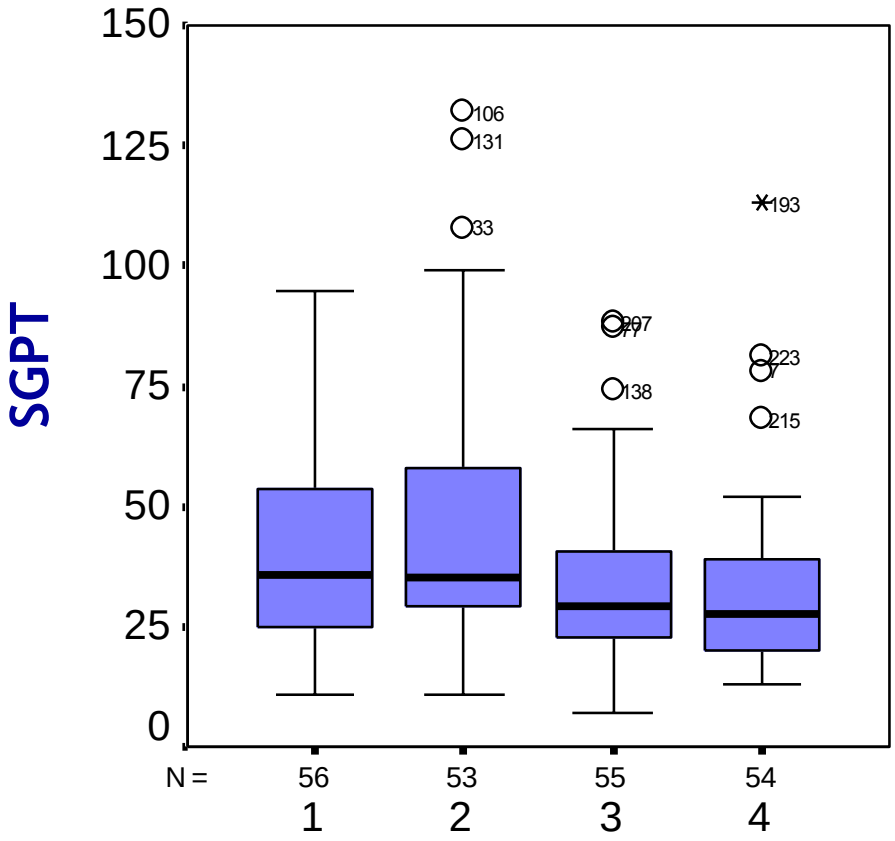
SGPT differed within HOMA, Quicki and Insulinogenic Index quartiles.

RESULTS (Males)



F= 3.798, p= 0.011

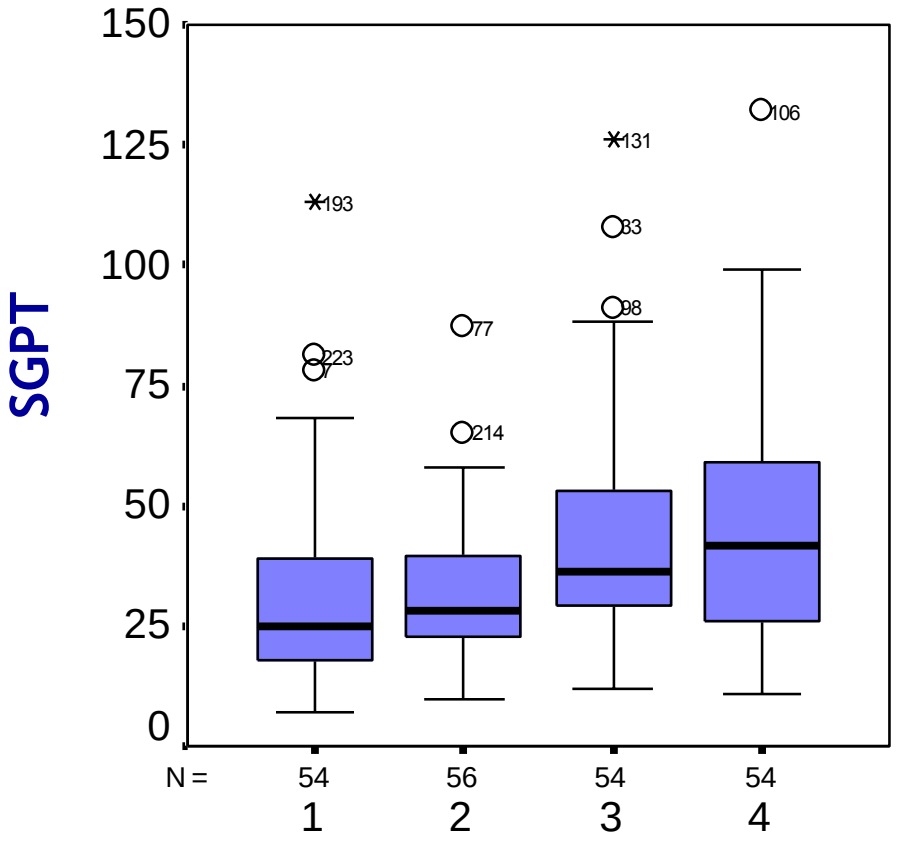
RESULTS (Males)



Quicki quartiles

F= 4.440, p= 0.005

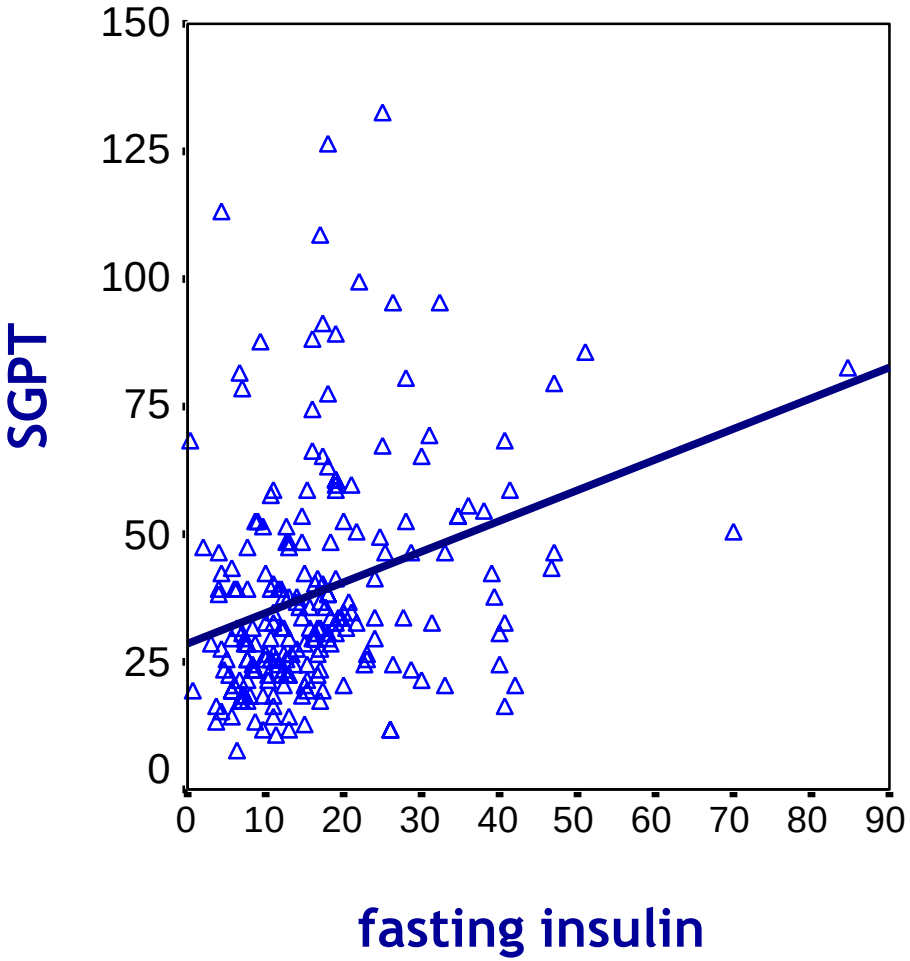
RESULTS (Males)



Insulinogenic index quartiles

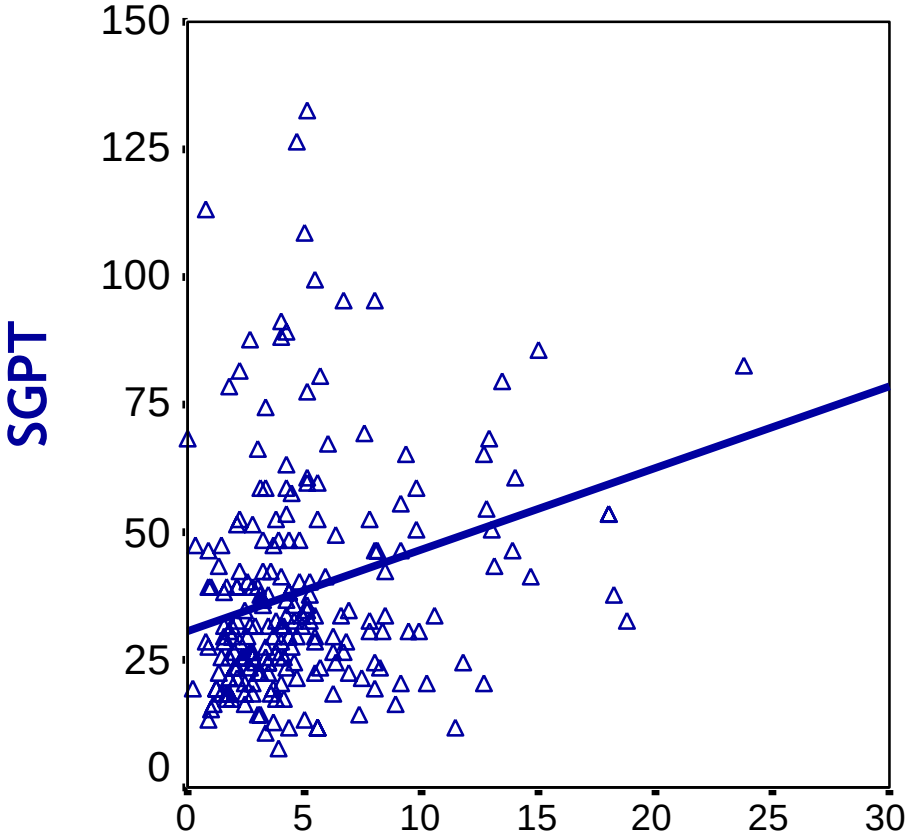
F= 5.215, p= 0.002

RESULTS (Males)



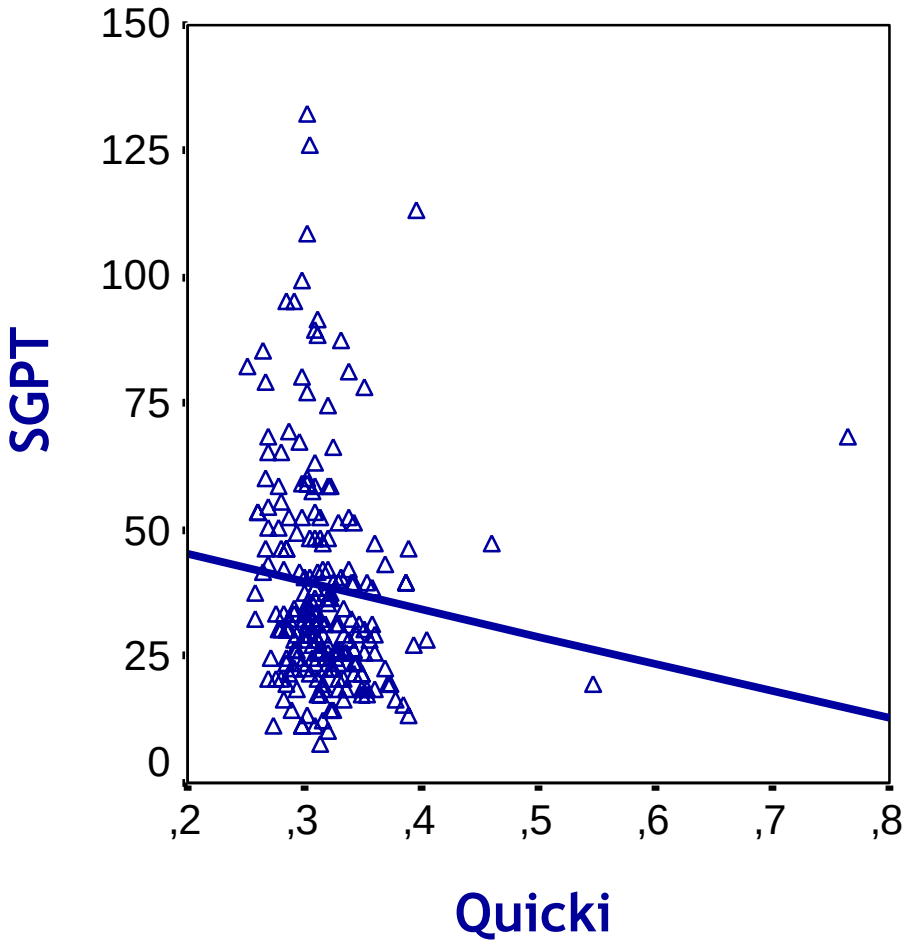
r= 0.351, p= 0.000

RESULTS (Males)



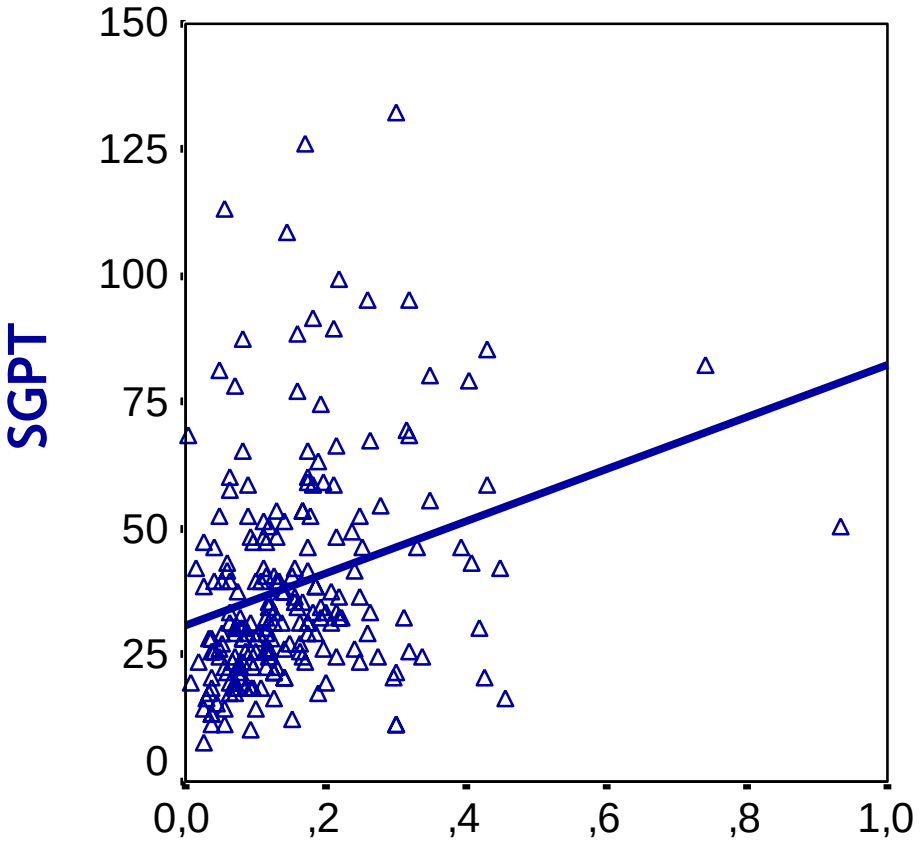
r= 0.248, p= 0.000

RESULTS (Males)



r= -0.248, p=0.000

RESULTS (Males)



r= 0.340, p= 0.000

RESULTS (Males)

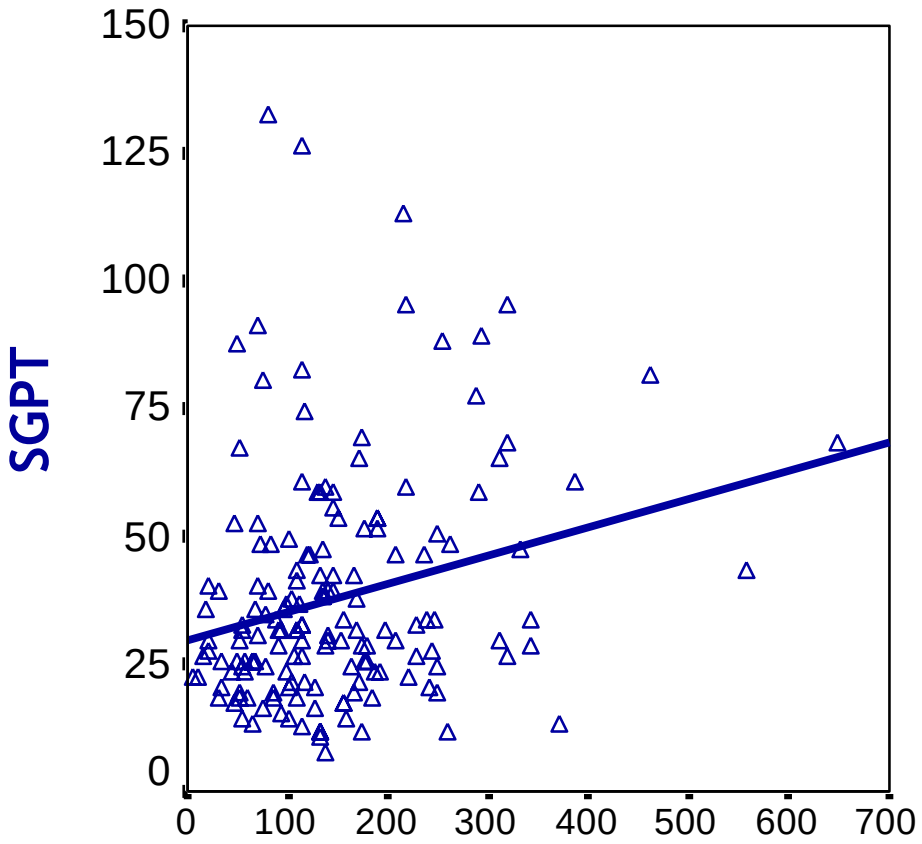
Multiple regression analysis

R	R square	F	p
0.401	0.161	15.24	0.000

	Beta	t	p
Insulinogenic Index	0.319	4.39	0.000
Ferritin	0.230	3.16	0.002

Age, BMI, WHR and Waist circumference were not significant in the model

RESULTS (Males)

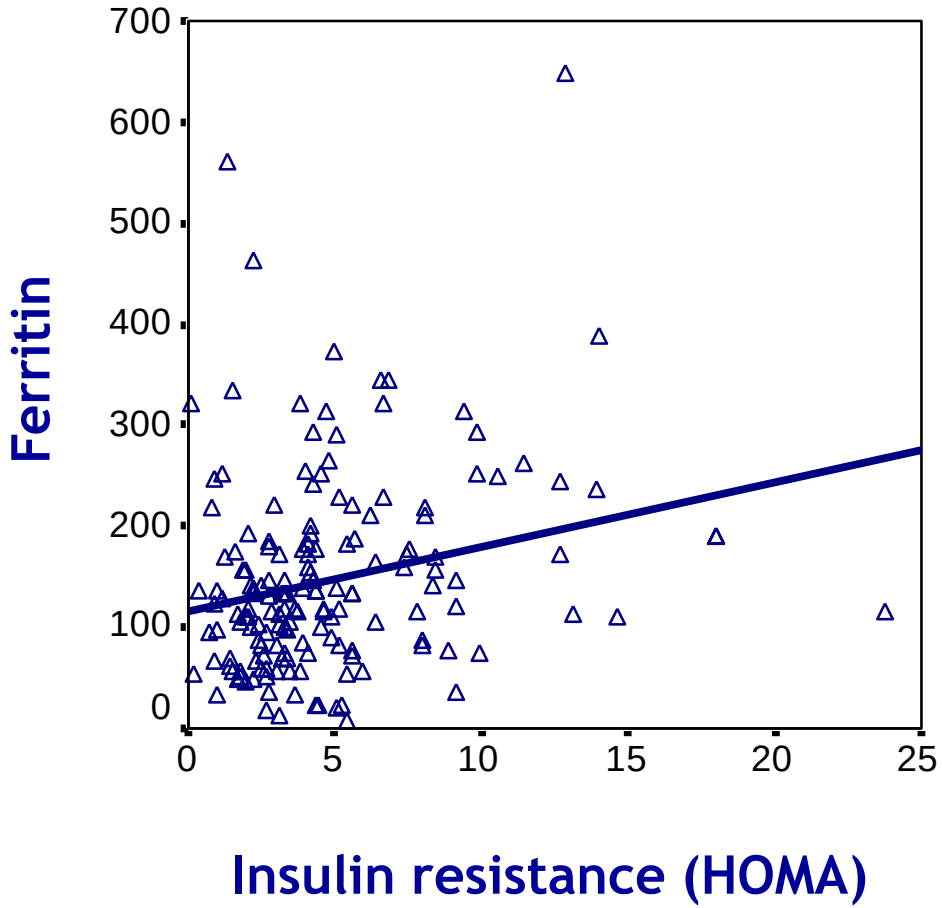


r= 0.230, p= 0.003

(r= 0.2015, p= 0.01 after controlling for Insulin Resistance)

On the other side, the relationship between SGPT and Insulin Resistance remains after controlling for ferritin (r= 0.1706, p= 0.03)

RESULTS (Males)

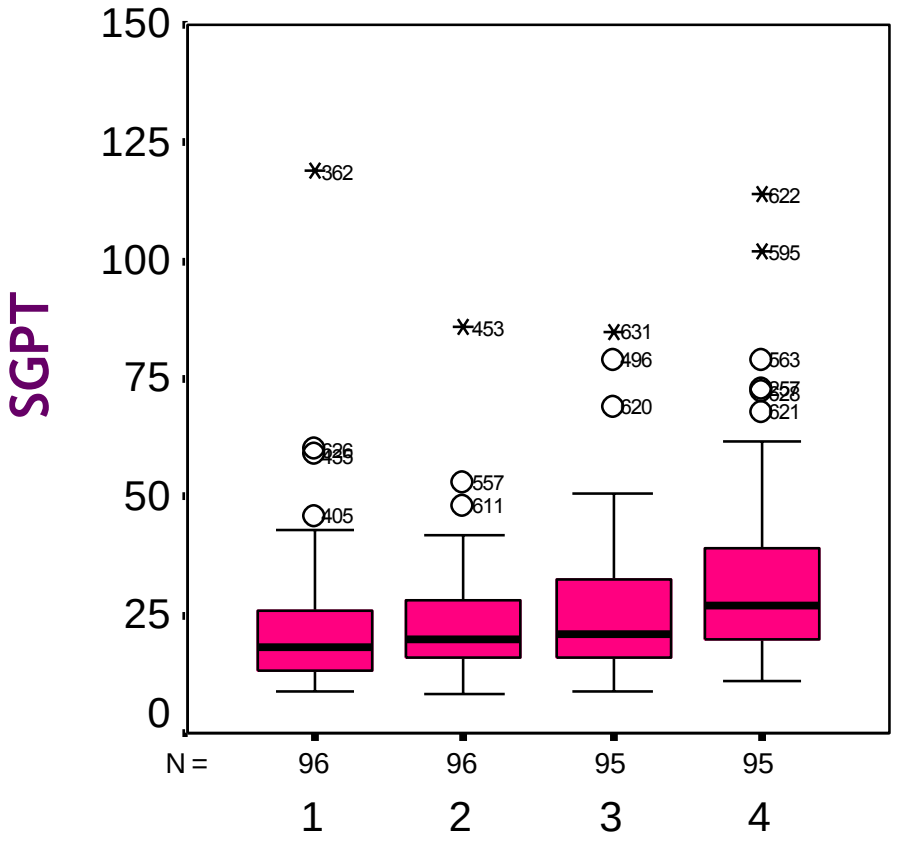


r= 0.265, p= 0.001

RESULTS (Females)

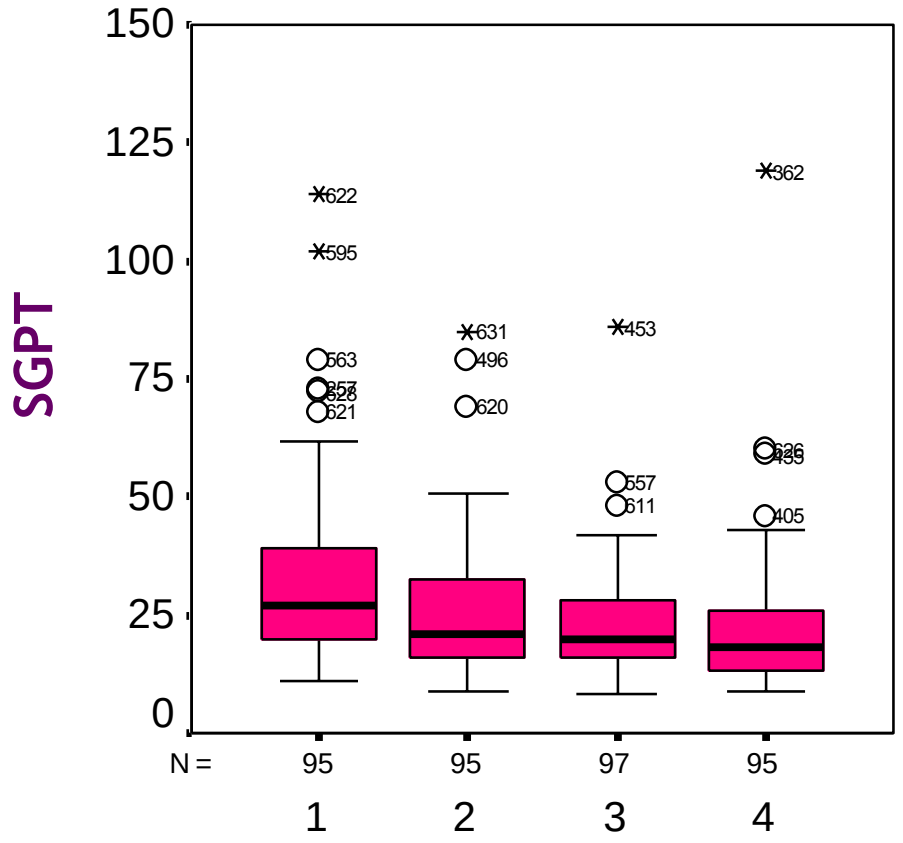
SGPT differed within HOMA, Quicki and Insulinogenic Index quartiles.

RESULTS (Females)



F= 10.830, p= 0.000

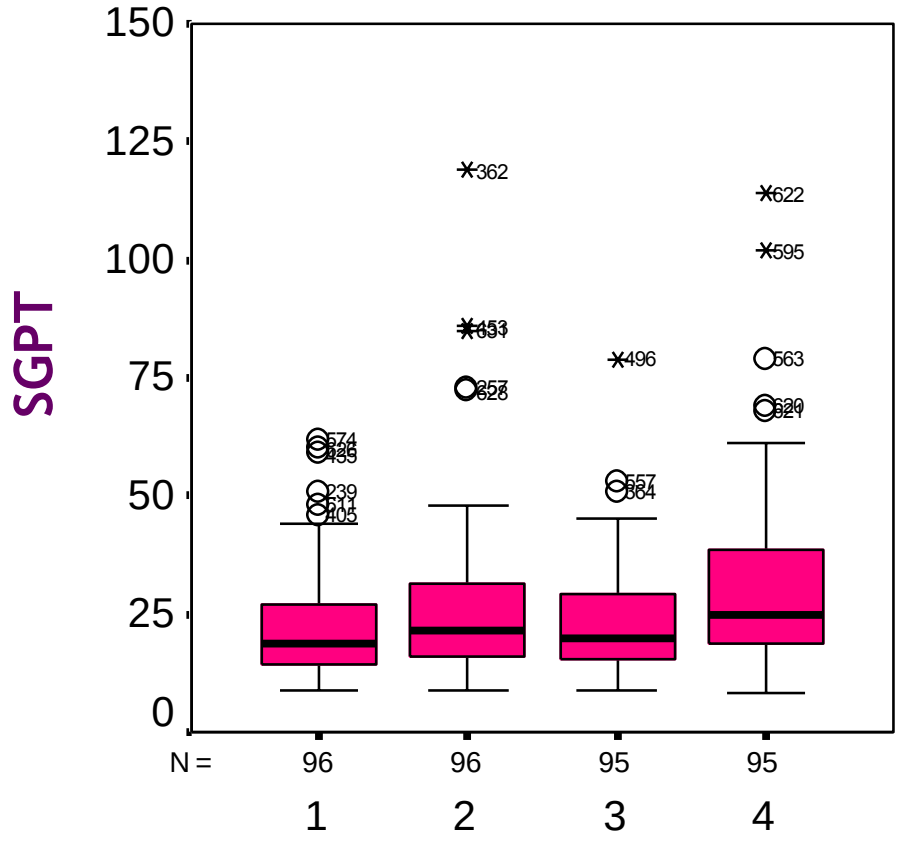
RESULTS (Females)



Quicki quartiles

F= 10.800, p= 0.000

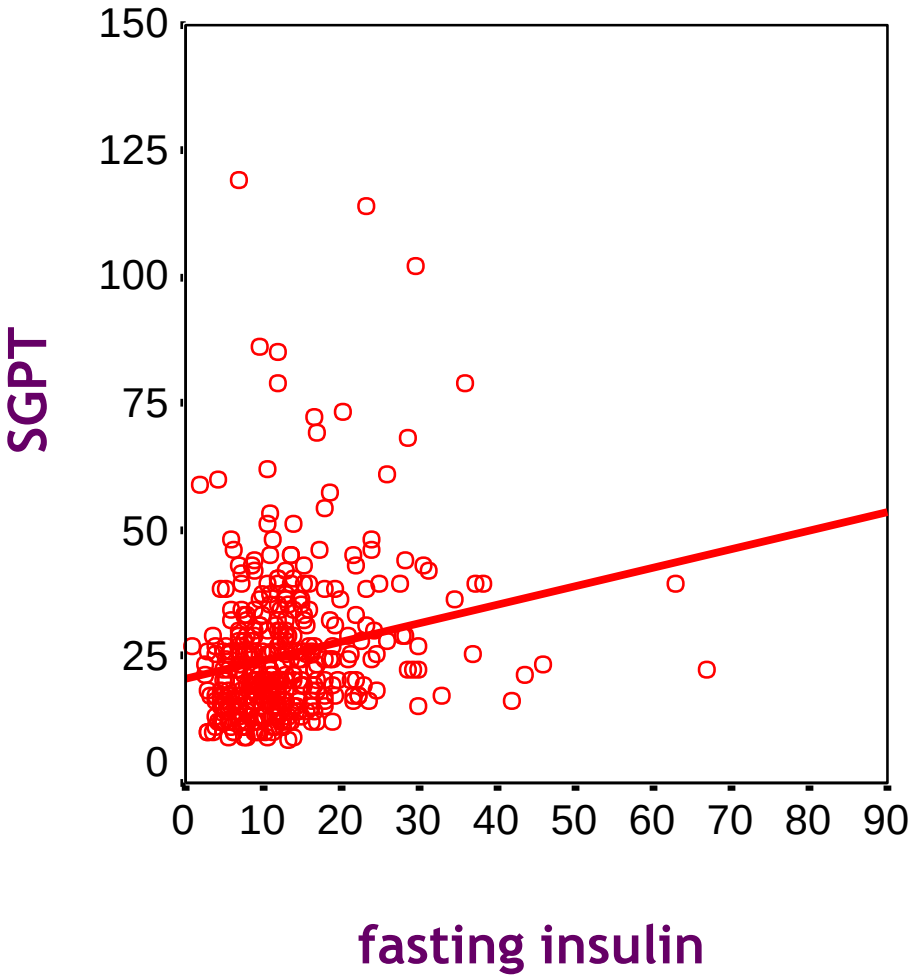
RESULTS (Females)



Insulinogenic index quartiles

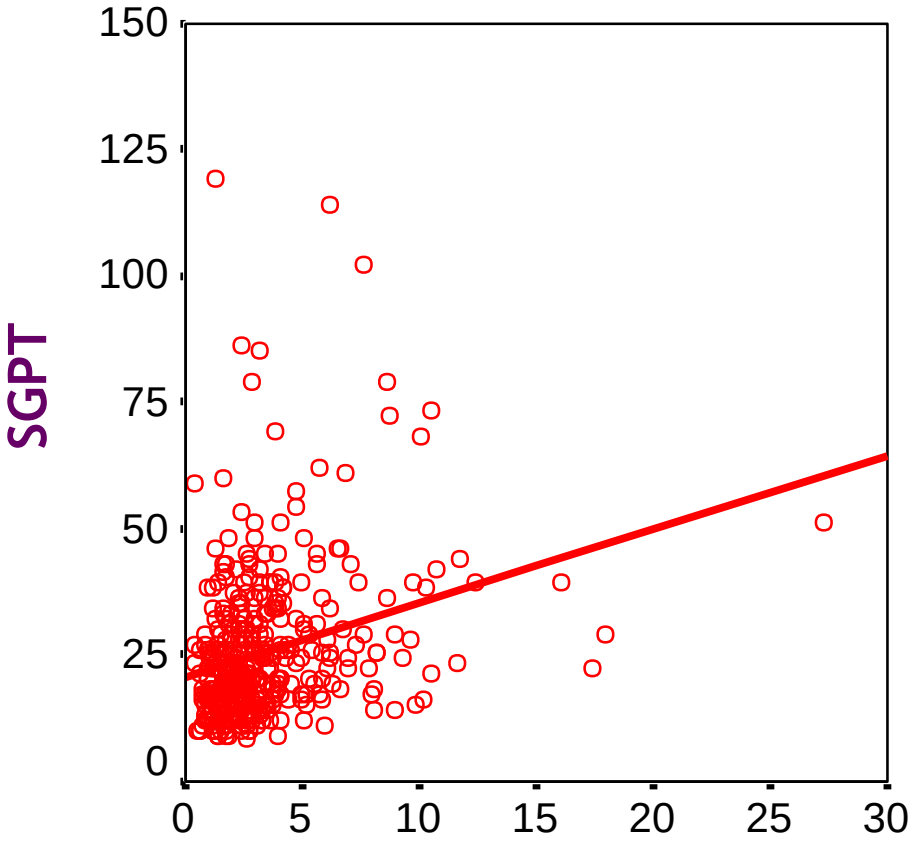
F= 4.836, p= 0.003

RESULTS (Females)



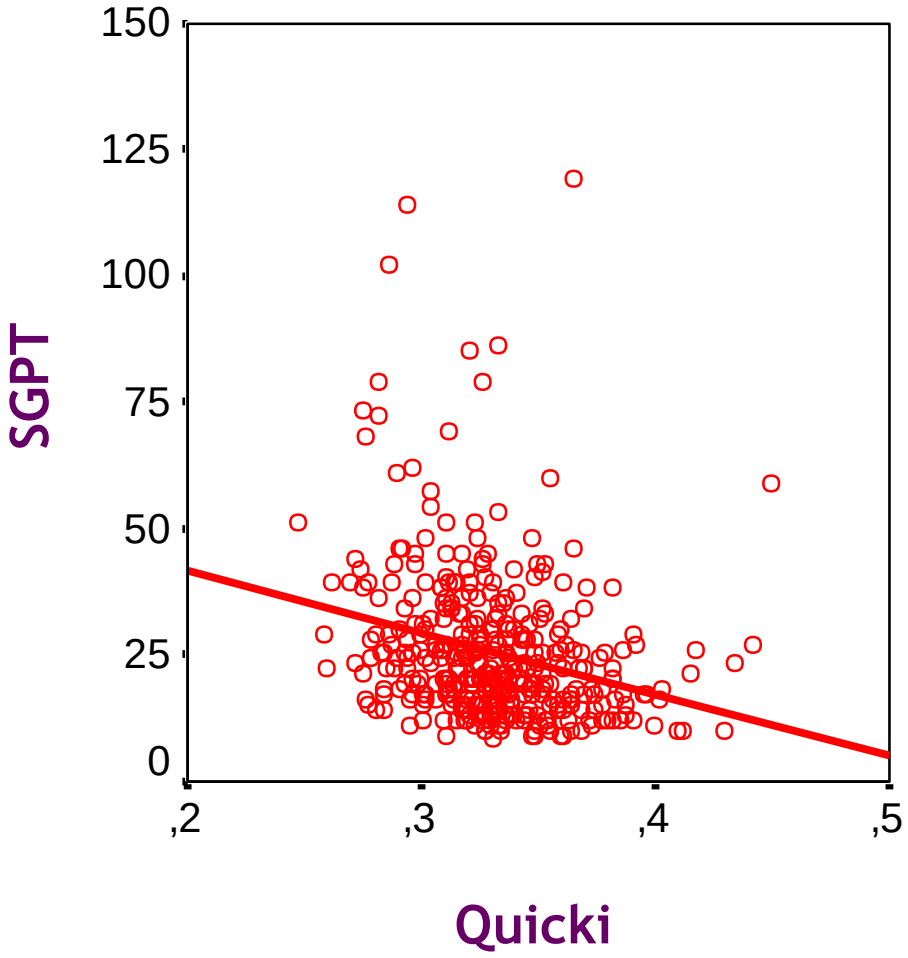
r= 0.278, p= 0.000

RESULTS (Females)



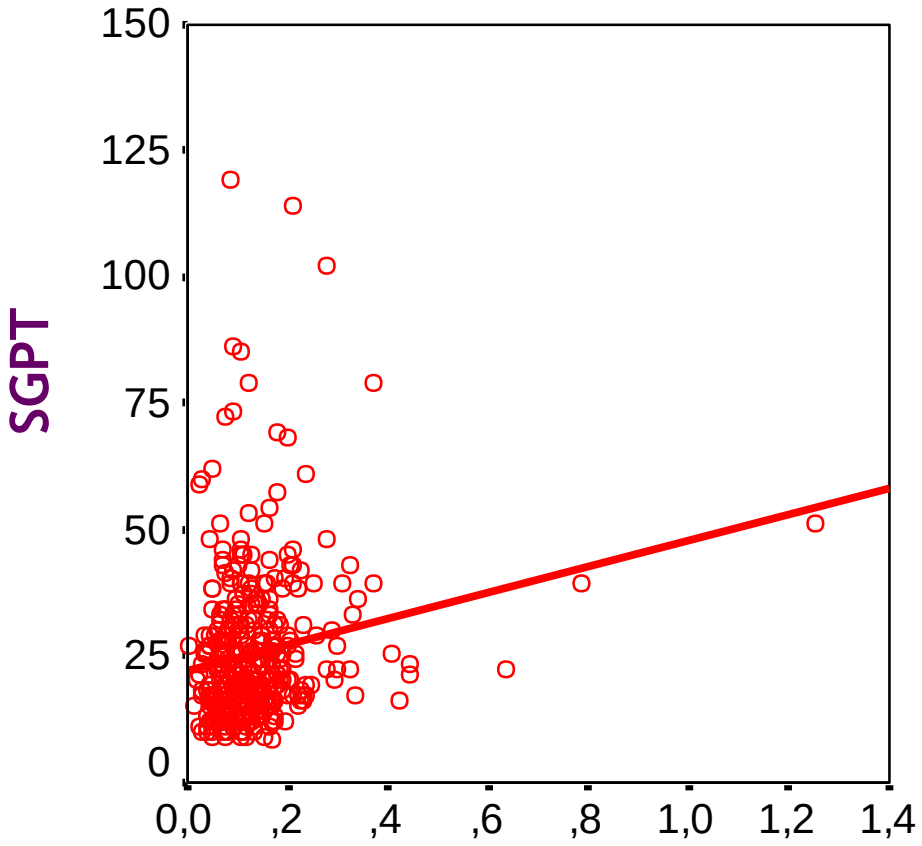
r= 0.309, p= 0.000

RESULTS (Females)



r= -0.309, p= 0.000

RESULTS (Females)



r= 0.180, p= 0.000

RESULTS (Females)

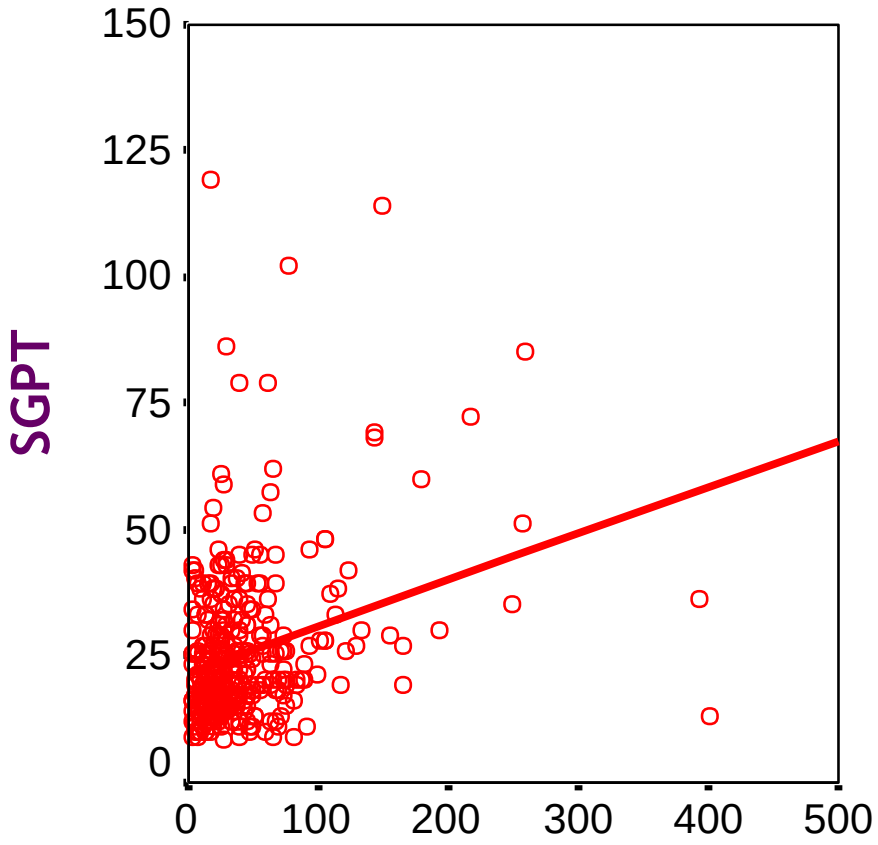
Multiple regression analysis

R	R square	F	p
0.361	0.130	25.57	0.000

	Beta	t	p
HOMA-IR	0.226	4.40	0.000
Ferritin	0.243	4.75	0.000

Age, BMI, WHR and Waist circumference were not significant in the model

RESULTS (Females)

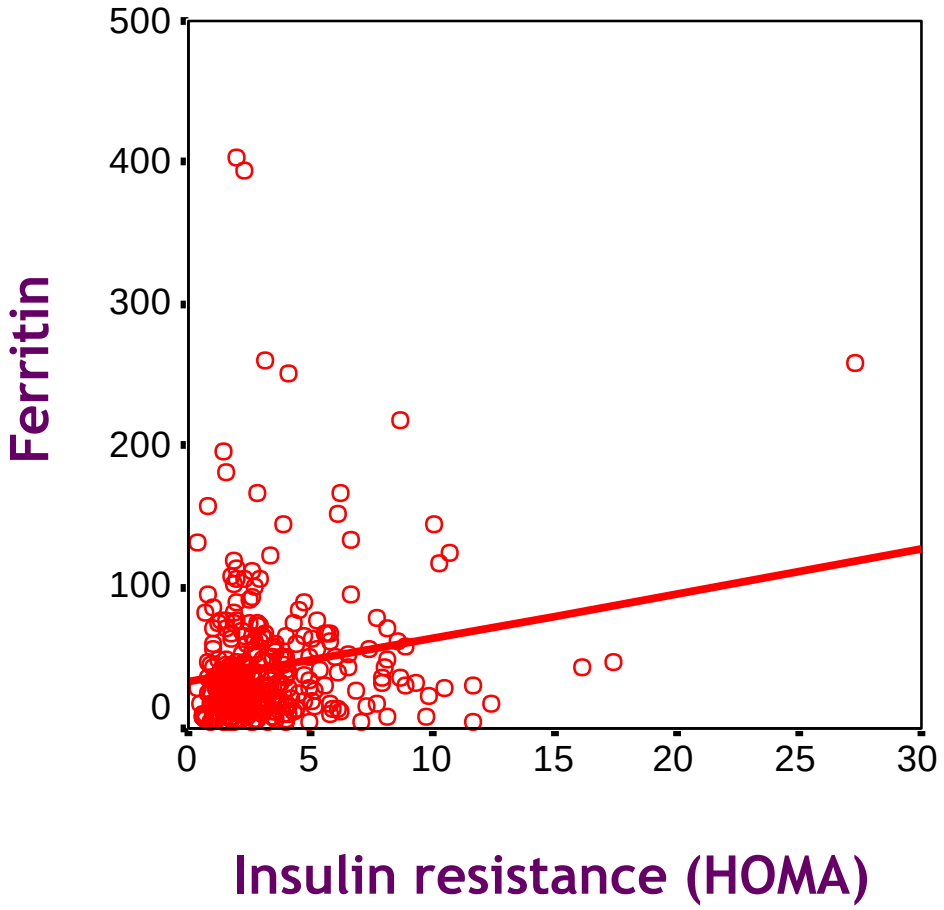


r= 0.240, p= 0.000

(r= 0.2485, p=0.000 after controlling for Insulin Resistance)

On the other side, the relationship between SGPT and Insulin Resistance remains after controlling for ferritin (r= 0.2314, p= 0.000)

RESULTS (Females)



r= 0.126, p= 0.019

Conclusions

1. SGPT/ALT levels are positively related to insulin resistance not only in the general population, but also among the overweight and obese persons, in both sexes, irrespectively of age, BMI, ferritin levels, body fat distribution or presence of type-2 diabetes.
2. In overweight and obese persons SGPT/ALT levels are also positively related to serum ferritin levels, in both sexes.
3. Moreover, our findings document a strong and positive association between serum ferritin levels and Insulin resistance.

Discussion

Possible links between SGPT/ALT levels and insulin resistance:

1. **ALT has been associated with fatty liver disease, and fatty liver disease has been associated with insulin resistance.**
2. **Moreover, because insulin suppresses genes encoding gluconeogenic enzymes, and ALT is a gluconeogenic enzyme, it is also possible that ALT is an indicator or impaired insulin signaling not necessarily associated with liver injury.**
3. **Finally, inflammation may impair insulin signaling both in the liver and systemically. Our observation that a high ALT is associated with high ferritin levels independent of obesity and insulin resistance is consistent with the hypothesis that raised ALT levels may reflect inflammation which may lead to insulin resistance. (That, if we consider ferritin to be not only a marker of insulin resistance, but also an independent inflammatory marker)**

One way or another, SGPT/ALT is a simple measurement, available in routine clinical practice, which, according to our findings, may help identify individuals likely to have insulin resistance.

Suggested Bibliography

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