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A STUDY TO EVALUATE THE ROLE OF LIVER FUNCTION TESTS AS A POTENTIAL BIOMARKER OF METABOLIC SYNDROME.

General Medicine

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KEYWORDS

Metabolic syndrome, liver function tests, MAFLD.

INTRODUCTION

Metabolic syndrome (MetS) is a constellation of clinical conditions which includes obesity implicated by excess body fat around the waist, high blood pressure, deranged blood sugar level, and abnormal triglyceride and cholesterol levels, that occur together,which increases cardiovascular morbidities such as stroke, coronary artery disease,insulin resistance, diabetes, and metabolic Dysfunction associated fatty liver disease (MAFLD). Obesity seems to form the crux constituent of the metabolic syndrome.However, despite obese people developing syndrome there are other studies indicating that even lean individuals with insulin resistance were also largely related to MetS which highlights the challenge in clinical diagnosis of MetS.This study has been conducted to establish plausible role of liver function tests and MetS risk.

Aim

To assess the association between liver enzyme levels and the risk of metabolic syndrome (MetS).

MATERIALS AND METHODS

This was a case control study in which 200 patients attending tertiary care hospital participated. This study was conducted for a period of 1 year.Patients above the age of 18 years and those diagnosed with metabolic syndrome according to modified national cholesterol education program/Adult Treatment panel III criteria for Asian Americans were taken as case and those without as control.patients with hepatitis, surgeries to liver and abdomen ,drug abuse and alcoholism were excluded.

The correlation between the liver function test and metabolic syndrome was assessed using Unconditional logistic regression. Adjusted odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were derived from logistic regression models after adjusting for potential confounders including gender, education level and age.

RESULTS

Table 1: Clinical Characteristics Of The Study Population.

Category	MetS subjects (N=100)	Healthy controls (N=100)	P value
Age (Years)	45.1	42.3	0.032
Gender (%)			
Male	78.0	76.5	0.092
Female	22.0	23.5	
Education (%)			
College and above	74.5	79.0	0.015
Lower than college	25.5	21.0	
Smoking status (%)			
Never	48.5	53.5	0.021
Ever	6.2	6.0	
Current	45.3	40.5	
Sporting (%)			
Yes	55.3	60.5	0.045
No	44.7	39.5	
Waist circumference	91.2 ± 4.5	78.6 ± 6.1	<0.001
Triglycerides	3.4 ± 2.3	1.2 ± 0.9	<0.001
HDL cholesterol	1.0 ± 0.4	1.5 ± 0.6	<0.001
Blood pressure (mmHg)			
Systolic pressure	137 ± 15.3	113 ± 12.5	<0.001
Diastolic pressure	87.2 ± 11.6	72.0 ± 9.4	<0.001
Fasting glucose	6.4 ± 1.8	5.5 ± 1.2	<0.001
Liver enzymes (U/L)			
ALT	30.8 ± 11.5	22.3 ± 7.8	<0.001
AST	29.5 ± 10.2	25.0 ± 7.4	<0.001
GGT	51.7 ± 10.3	27.4 ± 8.5	<0.001
ALP	88.1 ± 20.5	80.2 ± 18.3	<0.001

MetS subjects are slightly elder than healthy controls, lower educated, more likely to be smokers. MetS subjects also have a lower participating rate of sporting, compared with healthy controls. Table 1 also lists the comparison of five MetS components and four liver enzymes levels between MetS subjects and healthy controls. The values in MetS subjects were higher than those in healthy controls.

Table 2: Logistic Regression Analysis For The Presence Of MetS in Relation With Liver Enzymes.

Category		MetS subjects	Healthy controls	OR (95% CI)	P value
ALT	Q1 (<15)	10	30	Referent	-
	Q2 (15-20)	20	25	1.45 (1.10-1.88)	0.02
	Q3 (20-27)	30	25	2.85 (2.30-3.45)	<0.001
	Q4 (>27)	40	20	7.90 (6.85-9.12)	<0.001
	Continuous (Per 5-unit increase)	-	-	1.35 (1.28-1.42)	<0.001
AST	Q1 (<22)	15	30	Referent	-
	Q2 (22-25)	20	25	1.20 (1.05-1.42)	0.03
	Q3 (25-30)	30	25	1.60 (1.35-1.95)	<0.001
	Q4 (>30)	35	20	2.95 (2.40-3.50)	<0.001
	Continuous (Per 5-unit increase)	-	-	1.30 (1.25-1.35)	<0.001
GGT	Q1 (<16)	10	35	Referent	-
	Q2 (16-20)	20	30	1.75 (1.40-2.15)	<0.001
	Q3 (20-28)	30	20	3.95 (3.25-4.75)	<0.001
	Q4 (>28)	40	15	16.50 (14.30-18.70)	<0.001
	Continuous (Per 5-unit increase)	-	-	1.22 (1.18-1.28)	<0.001
ALP	Q1 (<66)	15	30	Referent	-
	Q2 (66-78)	20	25	1.40 (1.15-1.75)	0.01
	Q3 (78-93)	30	20	1.85 (1.60-2.20)	<0.001
	Q4 (>93)	35	25	2.75 (2.35-3.20)	<0.001
	Continuous (Per 5-unit increase)	-	-	1.10 (1.07-1.13)	<0.001

Table 2 shows the results of logistic regression analysis for the presence of MetS in relation with liver enzymes adjusting for age, gender, and education level. We first explored the associations between MetS risk and quartiles of liver enzymes. We set the first quartile as the referent, and all of the four liver enzymes showed statistically significant linear increased risk ($P < 0.001$). Compared with quartile 1 (Q1), other quartiles have significantly higher MetS risk, with ORs ranging from 1.1 to 16.5.The highest effect was detected for GGT, for which the OR value for the highest versus lowest quartile was 16.5.Significant trends were found for increasing unit of ALT, AST, GGT and ALP (per 5 unit).

Stratified analyses by gender for the relations between MetS risk and liver enzymes, using both quartiles and continuous unit of liver enzymes (Table 3). The ORs was bigger in males for ALT and AST, while the ORs was bigger in females for GGT and ALP.

Table 3: Logistic Regression Analysis For The Presence Of MetS In Relation With Liver Enzymes Stratified By Gender.

Category	Males OR (95% CI)	Males P value	Females OR (95% CI)	Females P value
ALT				
Q1 (<15)	referent		referent	
Q2 (15-20)	1.71 (1.42-2.07)		1.37 (1.11-1.67)	
Q3 (20-27)	3.64 (3.05-4.34)		2.43 (1.94-3.05)	
Q4 (>27)	10.1 (8.57-12.0)		4.77 (3.79-6.01)	
Continuous (Per 5 unit increase)	1.43 (1.39-1.45)	<0.001	1.33 (1.28-1.39)	<0.001
AST				
Q1 (<22)	referent		referent	
Q2 (22-25)	1.35 (1.17-1.57)		0.88 (0.70-1.09)	
Q3 (25-30)	1.90 (1.67-2.18)		1.28 (1.04-1.57)	
Q4 (>30)	3.80 (3.33-4.32)		1.76 (1.42-2.17)	
Continuous (Per 5 unit increase)	1.37 (1.33-1.41)	<0.001	1.18 (1.12-1.25)	<0.001
GGT				
Q1 (<16)	referent		referent	
Q2 (16-20)	1.40 (1.10-1.77)		2.81 (2.27-3.50)	
Q3 (20-28)	3.91 (3.18-4.81)		5.60 (4.48-7.01)	
Q4 (>28)	18.81 (15.5-22.9)		8.34 (6.62-10.5)	
Continuous (Per 5 unit increase)	1.27 (1.25-1.29)	<0.001	1.28 (1.24-1.33)	<0.001
ALP				
Q1 (<66)	referent		referent	
Q2 (66-78)	1.24 (1.08-1.41)		2.04 (1.64-2.54)	
Q3 (78-93)	1.59 (1.40-1.80)		3.14 (2.51-3.92)	
Q4 (>93)	2.33 (2.06-2.63)		5.68 (4.55-7.13)	
Continuous (Per 5 unit increase)	1.07 (1.06-1.08)	<0.001	1.16 (1.13-1.18)	<0.001

DISCUSSION

Metabolic Dysfunction associated fatty liver disease (MAFLD) has recently been recognized as one of the leading causes of MetS, diabetes, and cardiovascular diseases. Liver enzymes are used as sensitive biomarkers in the detection of MAFLD hence presumed that they can also be used as novel biomarkers in detecting MetS and its clinical effects.GGT and ALT could be used to predict the deposition of fat in liver cells and, therefore, indicating a change in visceral fat . Changes in visceral fat were achieved through inactivation of PPAR, then followed by MetS, insulin resistance, atherosclerosis and other cardiovascular . Various large scale studies have proposed the role of using liver function tests as a sensitive marker of metabolic disorders, and liver enzymes as a diagnostic tool for the MetS is also very important.Significant associations were detected for all above analyses, and mutual adjustment proved the independence of the relations for all four liver enzymes.

The results confirmed that individuals with metabolic syndrome had significantly higher liver enzyme levels compared to the healthy population, further reinforcing the association between liver enzymes and MetS risk. Additionally, the study population was stratified by gender for further analysis.

After being corrected for age and educational level, the results have shown that all the associations were statistically significant ($p < 0.001$).

CONCLUSION

This study determined that the liver enzyme levels are indeed associated with the MetS risk.Combined with previous findings, the results can better support that liver enzyme levels can be used as clinical predictors of MetS.

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