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ASSOCIATION OF GAMMA GLUTAMYL TRANSFERASE WITH METABOLIC SYNDROME AS A DIAGNOSTIC MARKER

Biochemistry

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ABSTRACT

Introduction: The research emphasises on the association bond of Gamma Glutamyl Transferase with Metabolic syndrome used as a marker for diagnostic. Therefore, it assists in contrast and correlates the parameters that are biochemical controls and cases.

Material and Methods: The samples for the study were collected from the diagnostic centre, out-patient department and in-patient department of Medicine and Biochemistry department of RNT Medical College and M.B. Hospital, Udaipur and Central Laboratory. The observations took about a year's time. The research was carried out on a total of 100 patients, out of which 50 cases were satisfying IDF criteria for metabolic syndrome and the remaining 50 were based on age and sex determination and controlled patients.

Results: The GGT mean values, Alanine Amino Transferase (ALT), Aspartate Aminotransferase (AST) levels were statistically noted to be high in the MS group. The mean value associated with the liver enzymes in the MS group which was 51.06±6.05 for GGT, 30.87±15.85 for AST and 37.82±13.58 for ALT. The current research depicts that GGT and MS prevalence has a direct association and relation. ROC analysis states that GGT is however strongly associated with the IDF diagnostic criteria of components. Similarly, there it is seen a strong correlation amongst each of the IDF components present, except for the elevated levels of systolic blood pressure. The results show an important interdependence between GGT levels and the presence of MS. This type of result was attained after the adjustment of age, gender and based on the MS diagnosis criteria. Ultimately, the analysis based on multi-variance shows a positive correlation with the high GGT levels and CVD in contrast to low GGT found in the MS group. The analysis done was with the GGT and CVD in independent age of smoking habits.

Conclusion: Increase in the number of liver enzymes, being in the normal range values, specifically considering the upper qualities, caters an important role in early diagnosis of the fats overflow to the liver details. In terms of affordability and availability with the simple tests based on routine clinical practices, specifically, the GGT have the capacity to take into account in algorithms for defined and metabolic syndrome.

KEYWORDS

Gamma Glutamyl Transferase, Metabolic Syndrome, Diagnostic Marker

Introduction

The Metabolic Syndrome (MetS) is termed as insulin resistance syndrome, syndrome X, plurimetabolic syndrome, deadly quarter, dysmetabolic metabolic abnormalities those are of prime concerns in an increase in the risk factors for the improvement of the atherosclerotic cardiovascular diseases. The collection of metabolic abnormalities consists of intolerant glucose; the number of people with metabolic syndrome worldwide has shown remarkable results. Obesity and diabetes are the major issues and types of the majority of the population in the world.

The ratio of metabolic syndromes in India is 26% with the estimates of around 20-25% of the total world's population. They are prone to have a heart attack and strokes related to cardiovascular disease and not predefined with the syndrome. Different organisations have mentioned and stated with the metabolic syndrome is based or biochemical parameters and clinical investigations. The newly mentioned IDF definition of information in the epidemiological studies, it points out to both the clinical and researchers needs with provided diagnostics tools being used around the world.

IDF Criteria

The occurrence of severe abdominal obesities termed as a waist circumference of ≥90 cm in males and ≥80 cm in females among the Indian population. Along with central adiposity that is severe abdominal obesity some of the factors associated should be there in defining metabolic syndrome5.

1. Fasting triglycerides ≥150 mg/dl
2. HDL cholesterol < 40 mg/dl and < 50 mg/dl for men and women,
3. Blood pressure ≥ 130 mm systolic or ≥85 mm diastolic or previous diagnosis or prescribed medication.
4. Fasting plasma glucose ≥ 100 mg/dl or previously diagnosed as Type 2 diabetes.

Gamma-Glutamyl transferase (GGT) is proved to be a varied and the only factor for the mortality rate considering the cardiovascular ailments in the clinical as well as the epidemiological research. Gamma Glutamyl Transferase is a different only factor for dealing with some of the principles studies that were reported to subject with serum GGT baseline concentrations again being a risk issue for coronary and the artery diseases like stroke, diabetes mellitus, hypertension. Increased levels of liver enzymes, more prone to sensitivity and also the suspect markers of NAFLD those are symptoms of sctopic chronic deposition of fats in the liver may prove assistance in MS diagnostics. By observing the observations, stating the high liver tests and functions, GGT levels are also associated with the syndrome related to metabolic rate. In some conditions, that is assumed as an imaginary approx value nearby original readings present in the diagnosis done for metabolic syndromes.

Materials and Methods

Introduction

The sampling done was all collected from the diagnosis centre, OPD and IPD relevant to M. B. hospital, situated in RNT Medical College and M.B. Hospital, Udaipur . The subjects studied included both the males and the females and age and gender-matched on non MS subjects in the 20 to 65 age cycle. The observations took nearly 365 days. The study carried out was on a total of 100 patients, amongst which 50 cases were satisfying the criteria of IDF and are related to metabolic syndrome, and the rest 50 were based on gender and age control.

This is a study of around 100 subjects under M. B. hospital, located in Udaipur and categorised in both OPD and IPD patients. BP, fasting plasma glucose, lipid profile, liver function tests such as GGT, AST, ALT and ALP, waist circumference, renal function tests, thyroid profile and USG abdomen were some of the tests that were carried out in context with metabolic syndrome and allied diseases

Inclusion Criteria

Patients included in the category of 20-65 age inclusive of both males and females prescribed with diagnosis correlated with the metabolic

syndrome dealing with the IDF criteria. The patients who attended OPD during the time span of research gave their reviews in the form of a written document format about the study of how it has been conducted and monitored.

Exclusion Criteria

- Malignant diseases
- Hypothyroidism.
- Severe renal insufficiency
- Chronic alcohol consumption
- Acute and chronic liver disease
- Drugs- antiepileptic, oral contraceptives, erythromycin, cimetidine
- Pregnant women

Study Protocol: Sample Collection, Analysis

Before collecting the samples, each patient was given a demonstration with the detailed illustration including the study rationale on the basis of the validating criteria, benefiting the factors, risks involved in profiles, securing rules, norms and protocols to be followed. Among all the patients only a few of them were convinced to give their views in written consent format to follow the study and deal with the protocols that were in the study and the rest of them were excluded. No additional costs were imposed on the patients to participate in the research work.

Appropriate samples of blood as per the need were recorded and collected from the MS patients as well as the age and the gender controlled non MS subjects. For further investigation of the serum GGT, HDL, triglyceride, cholesterol etc plasma glucose, blood fasting were drawn in the form of serum without any form of anticoagulant, a gel that contains yellow colour that was capped BD type of Vacutainer tubes. All the samples were certainly at an immediate basis centrifuged as well as preserved at 2 to 8 degree C unless the proper analysis is done relating to biochemical parameters. The samples were investigated within the 3 hours.

- Serum Cholesterol was measured by RxL max Siemens fully autoanalyser using CHOD-PAP principle[9].
- Serum Triglyceride was measured by RxL max Siemens fully autoanalyser using Glycerol Kinase principle[10].
- Serum HDL was measured by RxL max Siemens fully autoanalyser using PEG Precipitation principle[11].
- Serum GGT level was measured by RxL max Siemens fully autoanalyser using Gamma Glutamyl p-Nitroanilidine (GPNA) principle[12].
- Plasma glucose was measured by RxL max Siemens fully autoanalyser using GOD-POD principle.
- Serum Albumin was measured by RxL max Siemens fully autoanalyser using BCG principle.
- Serum total protein was measured by RxL max Siemens fully autoanalyser using Biuret principle.
- The serum levels of GGT, Cholesterol, Triglyceride, HDL and fasting plasma glucose levels of the two groups were compared for occurrence and absence of statistically significant differences.

Statistical Methods

Microsoft Excel was made use of to enter the details in the sheets and was accurately tested and analysed with the use of SPSS 22 version of the software, Frequencies and proportions, as well as calculations, were performed on the categorised data. The Chi-square test was also used to measure the importance of the performances. Mean, and SD was also determined for the purpose of continuous data. Identifying the significant mean value of difference amongst two of the groups, Independent t-test was performed. The importance of all the results was tested at 95% interval of confidence. Finally, ROC was plotted to determine the specificity and sensitivity of GGT in Metabolic syndrome.

Results

The present research affirms the findings linked of the previous study made alike of that of serum GGT levels that helps in metabolic syndrome associated with patients found higher than their non - metabolic syndromes with the associating terms. In this research, there was no much variation in the age and gender-based studies among the two groups. Serum levels associated with cholesterol, triglyceride, HDL and the fasting plasma glucose levels those were differentiated in two groups. The study diagnosed 15% patients with hypertension, 22% with dyslipidemia, 3% with DM, and 8% with impaired glucose tolerance.

Further, during the tenure of the study, it was found there is no variation in total cholesterol, plasma, LDL cholesterol levels and 2 groups, but as compared to control groups, HDL C levels were found to be low, triglyceride levels and were noticed to be higher in MS patients. However, BMI in the MS group was important statistically and higher than the control group. At a final stage, the research denotes that the mean values associated with LFT (ALT, AST, and GGT) were statistically and importantly higher in the MS group. Following are the results obtained:

Table 1: The Biochemical Parameters of MS and Non-MS Group

	MS Group	Control Group
Number of Patients	50	50
Male/Female	36/14	16/34
Age (Years)	41.32±9.80	43.02±10.00
SBP (mmHg)	131.47±15.09	117.30±7.55
DBP (mmHg)	84.01±7.99	77.05±5.42
BMI (Kg/m2)	29.06±2.45	24.02±1.15
FBS (mg/dl)	142.98±59.01	87.95±10.00
PPBS (mg/dl)	182. 5±68.00	131.00±14.53
HBA1C(%)	8.19%	6.20%
Waist Circumference	97.98±5.40	78.99±3.25
AST	30.87±15.85	26.00±5.10
ALT	37.82±13.58	29.64±5.44
GGT	51.06±6.05	36.05±7.91
HDL	35.88±8.95	49.17±6.25
LDL	109.52±37.85	68.08±19.09
Triglycerides	209.10±91.50	102.00±21.40

In MS group there were 50 patients out of these 50 patients 36 patients were male, and 14 patients were female. On the contrary, in the control group, out of 50 patients, 16 patients were male, and 34 patients were female. In MS group the average of patients age came to 41.2 years whereas that in the control group of patients it came to 43.02 years. In addition to this, apart from the HDL values, all the parameters were denoted and marked on the higher side in the MS group when contrasted with the control group.

ALT, AST, GGT in subjects with impaired glucose tolerance, DM, and abdominal obesity was observed to be importantly higher than those found in subjects without the contents of MS. The mean value (ALT=37.82 U/l; AST= 30.87 U/l; GGT= 51.06 U/l) of liver enzymes were found to be highest in abdominal obesity group. Subjects with dyslipidemia reported significantly higher GGT levels when contrasted with the subjects without dyslipidemia.

The analysis showed that there is a strong association amongst the GGT levels as well as metabolic syndrome prevalence. In addition, the levels of GGT show a positive association with CVD presence. To contrast GGT with other MS diagnostic criteria, ROC analysis was done. The area under the curve (AUC) for GGT ranges between 0.860-0.950. As compared to GGT, there is a weak association between Metabolic Syndrome and Transaminases: ALT 0.63-0.83, and AST 0.45-0.72. Thus, ROC analysis shows that GGT is strongly associated with the IDF diagnostic components. Similarly, there was a strong correlation between each IDF component, except for elevated systolic blood pressure.

After the adjustment for age, sex and MS diagnostic criteria, covariance analysis that shows strong relationships between the elevated GGT levels and MS presence; but not AST and ALT levels. At the final stage, the multi-variance analysis shows a positive association between high GGT and CVD (odds ratio: 2.15, 95% CI 1.18-4.45) in comparison to low GGT in the MS group. The multi-variance analysis was independent of the age, sex and smoking habits. Likewise, there was a positive association between high GGT and prevalent CVD in the control group (odds ratio: 1.85, 95% CI 1.15-3.85).

Discussion

The study emphasises on the comparison of the hepatic enzyme level among the subjects with MS and age, gender, control matches. The approximate and frequency increased to the GGT levels to diagnose the MS that was found to be higher than the hypertriglyceridemia, impaired glucose tolerance and increased waist circumference for both related to males and females. During the study, it was confronted that in men, increased systolic blood pressure was noticed as the highest predictive capability to diagnose MS, on the contrary, in women, increased waist circumference showed the highest predictive ability to

help diagnose MS.

The current study shows transaminases with 90.9% and GGT with 84.0% were found to be in normal range in MS patients. Further, in the case group, the ALT and GGT values were shown significantly higher, but in terms of normal range, than the control group. The current study unfolds the possibilities of normal liver enzymes values existing merely with metabolic syndrome. These findings are found to be in line with the findings of that of Balogun et al.[13] who also concluded that ALT and GGT values were significantly higher in the patients of diabetic group (52.9 IU/l and 24.3 U/l respectively) as compared to control group (34.4 IU/l and 9.2 IU/l respectively). Moreover, the findings of the present study also support the previously done findings that liver function tests are higher in subjects with MS than the controls[14,15].

The findings of Nannipieri et al.[16] a bond between MS mild elevation in liver function tests and. These are in line with the findings of Wannamethee et al.[17] who confronted that GGT and ALT are independent predictors of type 2 DM. The confrontation of covariance analysis of the current study supports the outcomes of Rantala et al.[18] as both the studies show a vital relationship amongst the elevated GGT levels and MS presence after adjusting for age and gender, sex.
Conveying that GGT assists in the measurement of the cardiovascular disease risk factors, those were not assessed by the standards in MS criteria. In the present scenario, Ruttmann et al.[19] showed that GGT activities were independently associated with a cardiovascular mortality rate (death-rate); in a large ratio of numbers. Some epidemiological studies also suggest that higher the serum GGT levels are found to be associated with the development of CVD risk factors, including metabolic syndrome, hypertension and diabetes.

Conclusion

Thus, the conclusion of the study is that the upper quartile, elevated liver enzymes cater a vital role in early diagnosis of MS with a higher predictive value for both the CVD and the MS presence. With regards to the availability and the simplicity of the conducted tests in clinical routine practices as well as the universal standardisation used, the findings of the current study depict that the potential of GGT as the liver enzyme is to be taken into consideration in algorithms processed for metabolic syndromes.

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