Original Article

Serum γ-Glutamyltransferase, Alanine Aminotransferase and Aspartate Aminotransferase Activity in Healthy Blood Donor of Different Ethnic Groups in Gorgan

Biochemistry Section

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ABSTRACT

Introduction: Measure of liver enzymes may help to increase safety of blood donation for both blood donor and recipient. Determination of liver enzymes may prepare valuable clinical information.

Aim: To assess serum γ-Glutamyltransferase (GGT), Alanine Aminotransferase (ALT), and Aspartate Aminotransferase (AST) activities in healthy blood donors in different ethnic groups in Gorgan.

Materials and Methods: This study was performed in 450 healthy male blood donors, in three ethnic groups (Fars, Sistanee and Turkman) who attended Gorgan blood transfusion center. Liver enzymes (GGT, ALT and AST) were determined.

Results: Serum AST and ALT in three ethnic groups were significant except for serum GGT levels. There was significant correlation between family histories of liver disease and systolic blood pressure and AST in Fars, and GGT in Sistanee ethnic groups.

Conclusion: Several factors, such as age, family history of diabetes mellitus, family history of liver disease and smoking habit had no effect on some liver enzymes in different ethnic groups in this area. Variation of AST, ALT, and GGT enzyme activities in healthy subjects was associated with some subjects in our study groups. According to our study, it suggests that screening of AST and GGT enzymes in subjects with family history of liver disease is necessary in different ethnic groups.

Keywords: Enzymes, Liver, Function

INTRODUCTION

Blood can transport essential substances to different tissues in the body. Serum analytes may change in some situations and conditions [1,2]. Blood donors must be in good health to save the life of blood recipient who have lost blood. Measures of liver enzymes may help to increase safety of blood donation for both blood donor and recipient. The important liver enzymes are a group of enzymes that include Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) Gamma γ-Glutamyltransferase (GGT) [3]. Aminotransferases are a group of enzymes that catalyze the reversible transfer of the amino group, from an α-amino acid to an oxo-acid [4]. There is a significant tendency to investigate variations of liver enzyme activities as biomarkers in healthy subjects and people with disease. The determination of serum levels of liver enzymes can be practical to assess liver function in different condition [5]. In general, liver enzymes are most increased in subjects with liver disease this may reflect liver damage. The increase level of aspartate aminotransferase, alanine aminotransferase, γ-glutamyltransferase as liver enzymes varies in different studies [6]. Recent studies showed that there are associations between increased levels of aspartate aminotransferase, alanine aminotransferase and the development of diabetes, metabolic syndrome, and overall mortality [7-11]. Several studies have indicated that changes in serum AST, ALT or GGT levels is associated with risk of cardiovascular disease, type 2 diabetes, stroke, or hypertension occurrence [12,13].

It has been reported that variations in liver enzymes levels have also taken into account as diagnostic parameters in a variety of extra-hepatic conditions [13]. The levels of liver transaminases in serum are useful biomarkers of liver injury in a patient with some degree of intact liver function that must be detected early [14]. In medical studies, there are different definitions of normal ranges and different interpretation of data for liver enzymes. The aim of this study was to determine serum γ-glutamyltransferase, alanine aminotransferase, and aspartate aminotransferase activities in apparently healthy blood donors in Gorgan Blood Transfusion Center, Iran. We have analysed these data to examine whether the liver enzymes activities are influenced by ethnicity, familial history of liver disease and diabetes, smoking habit in the healthy blood donors. Data extracted from such studies could be very valuable in modern medicine and future prospect in drug designing.

MATERIALS AND METHODS

Clinical and Laboratory Assessment

This cross- sectional study was done from May 2015 to February 2016. Four hundred fifty healthy males were selected from three different ethnic groups, who attended to Gorgan Blood Transfusion Center (Golestan province, South East of Caspian Sea) for blood donation. A standard interview and biochemical analysis were conducted for each participant. The study groups consisted of 150 healthy males from each three ethnicity groups.

The ethnicity was defined as follows: 1) Fars ethnic group: residing in this region since long time and are considered to be the native resident of this region. Their native language is Farsi; 2) Sistanee ethnic group: people immigrated to this region from Sistan and Baluchistan Province during past decades. Their native language is Sistanee; 3) Turkman ethnic group: this group does not have family relation with other ethnic group, therefore can be considered as an independent race and are residing in a particular rural area. Their native language is Turkman.

Samples were tested according to the recognized screening test algorithms for hepatitis B surface antigen, anti-HCV, anti-HIV1/2, syphilis and for AST, ALT and GGT levels. Personal and family history of diabetes mellitus, chronic liver disease according to diagnosis of physician, cigarette smoking habit, medication history and demographic findings such as body weight, height, body mass index and blood pressure were recorded. Weight and height were

measured using digital scale and tape meter. Calculation of Body Mass Index (BMI) was calculated by dividing weight in kilograms by height in meters squared. Overweight and obese were specified as BMI = 25.0-29.9 and ≥30 Kg/m^2, respectively [15]. Systolic and diastolic blood pressure measurement was done by using a standard mercury manometer with different subjects in sitting position, from their right hands. Biochemical parameters were carried out for each participant. Serum AST, ALT and GGT, levels were measured using commercial kits and spectrophotometer technique in the Metabolic Disorders Research Center, Gorgan Faculty of Medicine.

The study protocol was approved by Ethical committees of the Research Deputy of Golestan University of Medical Sciences and a written informed consent was obtained from each participant.

STATISTICAL ANALYSIS

Analysis of data was done using SPSS software version 16.0 (SPSS Inc., Chicago, IL, USA). The results were shown as mean ± SD. One-way analysis of variance (ANOVA) was used to test the variable differences between ethnic groups. For analysing statistical association among categorical variables (family history of diabetes mellitus, family history of liver disease and smoking habit) in relation to Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), AST, ALT, and GGT levels, Pearson's correlation test were done. The p-values <0.05 were considered statistically significant.

RESULTS

The mean age of 450 participants was 36.22±10.45 (range of 18 to 95 years). The mean body mass index of most participants was 28.20± 3.98 (Kg/m^2). The characteristics of the study ethnic groups in relation to serum GGT, AST, ALT, Age, BMI, systolic and diastolic blood pressures, are shown in [Table/Fig-1].

Tests for differences in characteristics across the three ethnic groups were significant except for serum GGT levels. Correlation between family history of diabetes mellitus, family history of liver disease and smoking habit with age, body mass index, and serum Alanine Aminotransferase, Aspartate Aminotransferase, gamma γ-glutamyltransferase and systolic and diastolic blood pressure in different ethnic groups are shown in [Table/Fig-2-4]. Spearman correlation analysis showed that there were there was significant correlation between family histories of liver disease and SBP and AST in Fars and GGT in Sistanee ethnic groups.

DISCUSSION

Recent studies have shown that there are genetic differences between subjects to expression of RNA, translation and protein levels. The genetic variations in different ethnic groups may be important information for drug designing prospects in the future [7]. There is a greater ethnic variation in the incidences of many diseases [12].

Several studies have indicated that serum GGT is associated with risk of death or development of cardiovascular disease, type 2 diabetes, stroke, or hypertension. Study in Tehran blood transfusion center on male blood donors have revealed significant associations between increased in AST, ALT, or GGT activities and body mass index. AST, ALT, and GGT levels had positive correlation with family history of liver disease [16].

Study by Whitfield et al., exhibited the importance of genetic and environmental sources of variation in GGT. They have shown significant correlation between GGT and body mass index and blood pressure. They concluded that these correlation were more attributable to genes that affect GGT and cardiovascular risk factors than to environmental factors [12].

The results of this study indicated that serum GGT and AST, and SBP are associated with ethnicity and significant correlation between family history of liver disease and liver enzymes may be attributable to genes that affect AST in Fars and GGT in Sistanee populations.

Study of Khedmat et al., also revealed the association of liver enzymes and body mass index, age and body weight [17]. Study

Variables	Fars (n=150)	Turkman (n=150)	Sistanee (n=150)	p-value
Age (years)	36.48±11.56	36.02±10.42	36.16±9.32	0.856
Systolic blood pressure (mm Hg)	120.34±12.47	117.2±12.65	116.36±10.39	0.007
Diastolic blood pressure (mm Hg)	78.41±9.83	73.45±8.01	72.90±7.88	0.01
Body mass index (Kg/m^2)	28.37±4.46	28.66±4.33	27.57±4.29	0.687
Alanine Aminotransferase (IU/L)	16.92±15.32	27.68±24.56	26.126±21.04	<0.001
Aspartate Aminotransferase (IU/L)	23.17±16.46	32.16±31.69	30.77±24.02	0.002
gamma γ-glutamyltransferase (IU/L)	32.56±24.37	30.38±34.29	29.65±30.39	0.060

[Table/Fig-1]: Characteristics of study population according to their ethnic groups.

Variables	Family history of liver disease		Family history of diabetes		Smoking habits	
	r	p-value	r	p-value	r	p-value
Age	-0.036	0.661	0.020	0.811	0.035	0.667
BMI	-0.002	0.981	-0.113	0170	0.082	0.320
SBP	-2.103	0.035	-0.739	0.46	-0.698	0.485
DBP	-1.814	0.070	-0.975	0.330	-1.107	0.268
ALT	-2.624	0.059	-0.998	0.306	-1.376	0.169
AST	-0.590	0.009	-0.395	0.318	-0.498	0.618
GGT	-1.885	0.555	-1.023	0.693	-1.409	0.159

[Table/Fig-2]: Parameters correlated with Age, BMI and serum ALT (Alanine Aminotransferase), Aspartate Aminotransferase, GGT (gamma γ-glutamyltransferase) and SBP and DBP (systolic and diastolic blood pressure) of Fars ethnic group.

Variables	Family history of liver disease		Family history of diabetes		Smoking habits	
	r	p-value	r	p-value	r	p-value
Age	0.033	0.692	0.113	0.168	0.033	0.692
BMI	-0.011	0.891	0.001	0.991	-0.021	0.799
SBP	-0.630	0.529	-1.293	0.196	-0.451	0.652
DBP	-1.238	0.216	-0.057	0.955	-0.025	0.980
ALT	-1.154	0.248	-0.381	0.703	-1.362	0.173
AST	-0.400	0.689	-0.832	0.406	-1.601	0.109
GGT	-0.469	0.639	-0.060	0.953	-1.880	0.060

[Table/Fig-3]: Parameters correlated with Age, BMI and serum ALT (Alanine Aminotransferase), Aspartate Aminotransferase, GGT (gamma γ-glutamyltransferase) and SBP and DBP (systolic and diastolic blood pressure) of Turkman ethnic group.

Variables	Family history of liver disease		Family history of diabetes		Smoking habits	
	r	p-value	r	p-value	r	p-value
Age	0.042	0.608	0.099	0.226	-0.098	0.232
BMI	-0.054	0.515	-0.0187	0.222	0.117	0.153
SBP	-0.238	0.812	-0.838	0.402	-0.067	0.947
DBP	-0.582	0.560	-0.528	0.598	-0.168	0.867
ALT	-0.343	0.732	-0.035	0.972	-0.048	0.962
AST	-0.230	0.818	-1.152	0.249	-0.955	0.340
GGT	-2.537	0.011	-1.633	0.103	-0.095	0.924

[Table/Fig-4]: Parameters correlated with Age, BMI and serum ALT (Alanine Aminotransferase), Aspartate Aminotransferase, GGT (gamma γ-glutamyltransferase) and SBP and DBP (systolic and diastolic blood pressure) of Sistanee ethnic group.

of Mohammadnejad et al., showed that serum ALT activity was associated with body mass index and male gender, but not with age [16]. Our study was in line with finding of Mohammadnejad et al., [16] while our results were not consistent with other studies [18-20].

A study showed a correlation between BMI and liver enzymes. It was reported that increase in BMI cause significant increase in liver enzymes in males [15]. Many other studies have shown that there is an association between increased serum activity of various liver enzymes with overweight or obesity, especially ALT and AST [21-23] which is not in agreement with our study (Data is not shown).

The findings of our study are in agreement with other findings which showed a significant correlation between the activities of AST, ALT, and GGT levels, systolic blood pressure and family history of liver disease in healthy blood donors [17,18]. In our study, correlation between family history of liver disease and elevated liver enzymes can be attributed to genes that may affect AST, ALT and GGT levels. Abnormal liver enzymes may be present without symptoms and signs of liver disease. Liver enzymes may associate with variations of some biochemical factors. Nakanishi et al., showed the association between serum GGT and risk of metabolic syndrome and type 2 diabetes mellitus. They have revealed that serum GGT may be an important predictor for developing different diseases such as metabolic syndrome and type 2 diabetes mellitus [13]. Kim et al., showed that the serum ALT and GGT levels were significantly associated with metabolic syndrome in only male subjects [18].

LIMITATION

There were some limitations in our study. All participants in our study were male. Thus we could not compare the liver enzyme variation in male and female blood donors. We did not consider the physical activity and eating habits.

CONCLUSION

Several factors, such as age, family history of diabetes mellitus, family history of liver disease and smoking habit had no effect on some liver enzymes in different ethnic groups in this area. Variation of AST, ALT, and GGT enzyme activities in healthy subjects were associated with some subjects in our study groups. According to our study, it suggests that screening of AST and GGT enzymes in subjects with family history of liver disease is necessary.

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