ASN-PH-020919
ISSN: 2315-5388

International Journal of Basic, Applied and Innovative Research
IJBAIR, 2013, 2(2): 20 - 24
www.arpjournals.com; www.antrescentpub.com

RESEARCH PAPER

COMPARATIVE STUDY ON LIVER ENZYMES ACTIVITY AND BLOOD GROUP VARIATIONS

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Received: 15th April, 2013 **Accepted: 28th June, 2013** **Published: 31st July, 2013**

ABSTRACT

The aim of this study is to determine the activities of some selected liver enzymes amongst apparently healthy subjects of different blood groups. The study involved 95 apparently healthy students of Ambrose Alli University, Ekpoma, Edo State, Nigeria, between the ages of 18-30, and distributed as follows; blood group O (30), group AB (18), group A (22) and blood group B (25). Blood samples were collected from the antecubital vein and separated to obtain serum. The activities of Alkaline phosphatase (ALP), Aspartate amino transferase (AST) and Alanine amino transferase (ALT) in the serum were determined using the spectrophometric method and the results were compared using SPSS (version 15). The results showed that the activities of AST and ALT were not significantly different ($p>0.05$) among the blood groups. However, the activity of ALP was significantly different ($p<0.05$) from those of blood group A, AB and O. Based on the findings of this study therefore, ABO blood group variations may have an influence on some liver enzymes activity.

Key words: ABO Blood Groups, Liver enzymes, Liver function

INTRODUCTION

Host genetic and environmental factors may be an important factor in the genesis of diseases. ABO blood groups are one set of agglutinogens (antigens), which are genetically determined carbohydrate molecules carried on the surface of the red blood cells. ABO blood groups have shown association with various non-infectious and infectious diseases (Jeffery and Kenneth, 2005; Dey and Cederbaum, 2006; Umit *et al*., 2008). In most people A and B antigens are secreted by the cells and are present in the blood circulation. It seems that non-secretors are susceptible to variety of infections and the possible pathogenesis for this susceptibility is dependent on the fact that soluble blood group proteins may block binding to polysaccharide on cells (Jeffery and Kenneth, 2005). It has been asserted that the progression of fibrosis in hepatitis C virus (HCV) infection is a process in which genes interact with environmental factors and ABO blood groups distribution is associated with thrombotic event; non-O blood groups increase the risk of these venous thromboses (Armelle *et al*., 2006).

On the other hand, liver enzymes are a group of enzymes, that include Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) (collectively called the transaminases or aminotransferases), Alkaline phosphatases (ALP) , gamma glutamyl transferase, glutathione-s-transferase, serum cholinesterase, glutamate dehydrogenase, and 5'-nucleotidase (David and Michael, 2005). The most common however are ALT and ALP. Clinically, the assessment

of serum or plasma concentration of these enzymes can be useful to access the function of the liver in health and disease condition (Ochei and Kolhatkar, 2000).

Of interest however is the fact that ABO blood group has shown some association with various liver diseases (Armelle *et al*., 2006). In fact, marked differences in plasma or serum concentration of some liver and intestinal enzymes (Adamo, 2010) leading to marked differences in nutritional benefit from a diet, enhances susceptibility to diseases. Blood group O patients have been reported to be more resistant to the sequelae of acute viral hepatis (Erin *et al.,* 2008). Also, Type A have been previously found to be associated with the risk of several malignancies, including gastric cancer, pancreatic cancer, epithelial ovarian and skin cancer (Greenwell,1997), which may warrant an elevation of the liver enzymes. However, information about the association of ABO blood group with the difference in activity of the liver enzymes is scarce.

Furthermore, two recent genome-wide association studies (GWAS) suggests that the ABO blood group antigen may affect systemic inflammatory state. Specifically, Single Nucleotide Polymorphism (SNPs) at the ABO locus was associated with two serum markers of inflammation (TNF-alpha) and soluble intercellular adhesion molecule 1 (sICAM-1) (Melzer *et al*., 2008; Pare *et al*., 2008). Also, enhanced expression of TNF- alpha has been is associated with liver inflammation and hepatocarcinogenesis (Pare *et al*., 2008). These indicated a possible link between ABO blood groups and liver enzymes. Therefore, this study assesses the activities of ALP, ALT and AST in apparently healthy blood group A, B, AB and O individuals.

MATERIALS AND METHODS

Area of Study: This study was carried out in Ekpoma, the Local Government Area Headquarter of Esan west Local Government Area, Edo State, Nigeria. It is located at latitide 6^0 45'N and longitude 6^0 08E. Ekpoma is a moderately populated area and the major occupation of the people is farming and trading. Their main water is rain water stored up in underground wells. It is usually cold at night and very hot during the day with an undulating topography (Cartographic Laboratory, 2011).

Sample Size: A total of Ninety-Five (95) apparently healthy subjects consisting of Thirty (30) blood group O, Eighteen (18) blood group AB, Twenty-Two blood (22) group A and Twenty-five (25) blood group B individuals were used for this study. All the subjects were between the ages of 18-30 years and are students from Ambrose Alli University, Ekpoma, Edo State.

Inclusion Criteria: Only apparently healthy male and female between the ages of 18 and 30 years were sampled in this study.

Sample Collection: 5 mls of blood was collected from the anticubital vein of the subjects with the aid of needle and syringe and serum was separated after clotting had occurred. The serum samples were stored frozen at -70^o until analysis was required.

Biochemical Assay: The ABO blood groups of the samples were determined via cell / forward grouping using Tile method as described by Cheesbrough, (2000). Estimation of Serum ALP was done using the method described by Rec (1972), while estimation of Serum Alanine Amino Tranferase (ALT) and Aspartate Amino Transferase (AST) was done using the Colorimetric Method of Rietman and Frankel (1957).

Statistical Analysis: Statistical analysis was performed using One way analysis of variance with the aid of a statistical package SPSS (version 15.0) software. The comparisons were done at 95 % confidence level ($P < 0.05$ – significance). The results were presented as mean ± standard deviation (SD), p-value and F-value.

Results

The results of this study as shown below (Table 1), reveal that the serum level of ALP was significantly different ($P<0.05$) among the various Blood groups. Detailed comparison between two groups revealed that the ALP level was significantly different ($P<0.05$) in blood group A when compared to AB and O.

However, the serum level of AST and ALT were not significantly different ($P>0.05$) among the various Blood groups. Similarly, comparison between the two blood groups were also found not to be significantly different ($P>0.05$).

Table 1: Activities of ALP, AST and ALT in Blood Groups A, B, AB and O Subjects

Parameters	Blood group A (N=22)	Blood group B (N=25)	Blood group AB (N=18)	Blood group O (N=30)	F-value	P-value
ALP(IU/L)	77.50±21.71[a]	70.00±18.31[b]	55.28±12.46[ab]	62.73±22.53[a]	4.862	0.004
AST (IU/L)	22.32±19.67	24.84±6.70	21.33±6.70	23.50±6.11	0.411	0.746
ALT (IU/L)	6.64±5.22	5.44±3.08	4.17±1.25	5.40±6.02	0.979	0.406

N=Number of subjects; S.D=Standard Deviation, ALP=Alkaline Phosphatase, AST=Aspartate Amino-Transferase, ALT=Alanine Amino-Transferase, Values in a row having same superscript are significantly different at P<0.05.

DISCUSSION

The findings of this study are in line with the work of Hisham and Hind (2010). Hisham and Hind (2010), reported that there was no significant relationship between the activities of ALT amongst ABO blood groups in Cohort of healthy blood donors and volunteers from Saudi Arabia. Although the reason was not been addressed, Hisham and Hind (2010) stated however, that normal serum liver enzyme (particularly ALT) in selected population varies according to sex, age and ethnic origin.

In this study, a significant increase in the ALP activity of blood type A individuals when compared to blood type AB and O individuals was observed. The increase in the activity of ALP in blood type A individuals may be due to difference in their cytokine binding capability which in turn stimulate increase enzyme activity. Okada *et al*, (1987); Melzer *et al.,* (2008); Pare *et al.,* (2008) and Barbalic *et al.,* (2009) found that, ABO blood group was associated with differences in binding capability with certain cytokines including EGF, TNF-α, sICAM-1, E-Selectin and P-Selectin. The EGF receptor (EGFR) plays a link between inflammation and liver diseases (liver cancer) (Berasain *et al*., 2009), and EGF gene polymorphisms have been reported to be associated with inflammation. The binding of endothelial EGF to EGFR is different in blood type A. There is growing evidence that ABO blood type is significantly associated with variation in the levels of a number of biomarkers.

Furthermore, a large scale genomic study by Barbalic *et al*., (2009) revealed that sP-Selectin levels were also associated with ABO gene variants and the association was accounted for by AI allele of ABO blood group. ABO gene product related glycossylation might influence sheding/cleavages of these biomarkers from the endothelial probably by glycosylation of P-Selectin, E-Selectin and ICAM-1 (Otto *et al*., 2006). Glycosylation could also affect the clearance sP-Selectin sE-Selectin and sICAM-I from blood. Decreased cleavage of adhesion molecules from endothelial cells association with A allele would mean more adhesion and inflammation, leading to a possible rise in enzyme activity. These also explain the reason for the increase risk of blood type A individuals to Hepatocellular Carcinoma, HCC (Qiang *et al*., 2011). This finding is also in partial agreement with the work of Armelle *et al*, (2006).

In the study by Armelle *et al* (2006) on the severity of fibrosis in chronic viral hepatitis C in association with blood groups, it was observed that group A, B and AB ABO were associated with thrombotic events that can in turn, boost enzyme activities. ABO blood group thrombotic effect is thought to be at least in part, mediated through its influence on plasma level of factor VIII (Koster *et al.*, 1995; kraajenhagen *et al*., 2000). In addition non-O blood groups were associated with increase fibrosis, even after adjustment on gender, age, alcohol consumption and duration of infection. Qiang *et al*., (2011) reported that the increase activity is traceable to the increasing binding capability of blood group A to certain cytokines (e.g EtGF, TNF-α) than blood type O.

On the other hand, the finding of this study are not in line with the work of Bamfold *et al.,* (1965) and Adamo, (2010) in which increase ALP activity was find in blood type O and B individuals than A. They based their argument on the larger contribution by intestinal alkaline phosphatase (IAP) in blood type O and B individuals with O individuals having the highest contribution. Blood types B makes considerable amount of intestinal alkaline phosphatase (IAP) as well, but type A's make little, which is one of the strongest indicators for long term benefit of a low-fat diet in type A, as regards susceptibility to cardiovascular disease and cancer. This contribution is however

due to ALP-1 and ALP-2 as intestinal isoenzyme ALP-3 is present in small quantities in group O and B individuals (Ramnik, 2006). This finding that there was a significant increase in the ALP activity of blood type B when compared to blood type AB individuals is also in line with the work of Bamfold *et al*. (1965) and Adamo (2010).

Our findings suggest therefore, that the ABO blood type is associated with difference in the activity of ALP. However these findings indicate the need for more accurate definition of normal ALP, AST and ALT activity among young adults. This will ultimately lead to more accurate diagnosis and follow-up of liver diseases. Also, further research should be carried out in order to come to determine the activity of ALP, AST and ALT in ABO blood groups.

ACKNOWLEDGMENT

We wish to acknowledge the effort of Atsaboghena OS during the practical section of this research project.

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AUTHOR(S) CONTRIBUTION

Atsaboghena O.S. performed this research work under the supervision of Iweka F.K. with assistance from Dada F.L., Festus O.O., Obodo B.N., Onoyovwi A.O., Maduagwuna G.N. All the authors contributed in one way or the other to the project work and in the development of this article.