

Changes in Activities of Alkaline Phosphatase and Transaminases in Jaundice

Aydin Siddiq Ahmad¹, Wahbi Abdul-Kadir Sulayman² & Fatin Abdul-Wahid Majeed²

¹Colege of Technology /Kirkuk, Iraq.

²College of Education-University of Tikrit, Iraq.

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Abstract:

Jaundice refers to the yellow pigmentation of the skin or sclera by bilirubin, which is a result of elevated levels of bilirubin in the blood stream. Clinical biochemistry laboratories often measure enzymes as part of a liver function test. The present study was designed to elucidate the changes in the activities of transaminases(GPT&GOT) and ALP in jaundiced patients. Serum transaminases and ALP were estimated by procedure described by kits. The results showed that activities of transaminases GOT and GPT showed significant ($p<0.01$) increase in patients and it reached 34.8 ± 3.265 U/L and 42.14 ± 4.62 U/L respectively. ALP showed also significant ($P<0.01$) increase in serum of patients and it reached 130.71 ± 9.281 U/L. Significant difference in the activities of GOT between male and female patients and this difference is very obvious in neonatal jaundice. It is concluded that there were significant changes in the activities of GOT, GPT and ALP enzymes in jaundiced patients.

Introduction:

Jaundice is a clinical term referring to the yellow appearance of the skin and mucous membranes resulting from an increased bilirubin concentration in the body fluids. Pathological mechanisms giving rise to jaundice fall into three groups: hemolytic, hepatocellular and cholestatic or obstructive (1). Hepatocytes make many different proteins. Some of these are enzymes. The activities of several enzymes are used to estimate the status of liver including the integrity of hepatocellular organelles and ability of the organ to synthesize or metabolically convert various compounds, and the ability to secrete bile. (2). These enzymes are widely distributed throughout the body and are found in many different tissues. Measurement of most substances is based on determining concentration in serum or amount excreted in urine or bile in a given time. Enzymes, however, are measured by their activities, that is, how rapidly or extensively they perform their catalytic functions (3). Transaminases catalyze the transfer of an amino group of one amino acid to a hydrocarbon to form a different amino acid. Aspartate aminotransferase (AST, SGOT) and alanine aminotransferase (ALT, SGPT) activities have been used as indicators of hepatocellular damage (4). Alkaline phosphatase rises rapidly when bile flow is impaired or space-occupying lesions develop, even if these lesions are small but numerous, like granulomas or large and single, like a tumor metastasis (5). Clinical laboratories often measure enzymes as part of a liver function test. Commonly GOT or GPT is measured as an indicator of hepatic damage (3). In the liver, ALP is found in high concentrations in the cells lining the biliary ducts. ALP, an enzyme associated with cholestasis, may be only slightly raised in case of hepatitis but is greatly raised in cholestasis. However, although a large body of information is now available worldwide, the exact mechanisms underlying the activities of these enzymes in various types of jaundice are still not clearly understood. The purpose of this study is to elucidate serum levels of the transaminase (SGOT and SGPT) and ALP enzymes among jaundiced patients.

Subjects and Methods:

Subjects: One hundred thirty-seven patients, suspected jaundiced (74 males & 63 females) were subjected to this

study. They were seen at the Kirkuk hospital and pediatric hospital in Kirkuk city. Their ages ranged between 1-73 years. 43 normal healthy (20 males and 23 females) were subjected to the study as a control group.

Blood collection: Five milliliters of venous blood were collected from all subjected individuals into a clean dry free from anticoagulant, and then allowed to clot. Serum was separated for biochemical investigations.

Investigations:

Glutamic pyruvic transaminase (GPT) and Glutamic oxaloacetic transaminase (GOT) activities were measured by using kits (Randox-146 &147 respectively), while Alkaline phosphatase enzyme activity was measured by using a kit-ALP-Ph-17580-Biomerieux)

Results:

As shown in figure (1) activities of transaminases GOT and GPT showed significant ($p<0.01$) increase in patients and it reached 34.8 ± 3.265 U/L and 42.14 ± 4.62 respectively. ALP showed also significant ($P<0.01$) increase in serum of patients and it reached 130.71 ± 9.281 U/L.

Figure(1):Mean values +SD of enzyme activities of GPT,GOT and ALP in patients and control group.

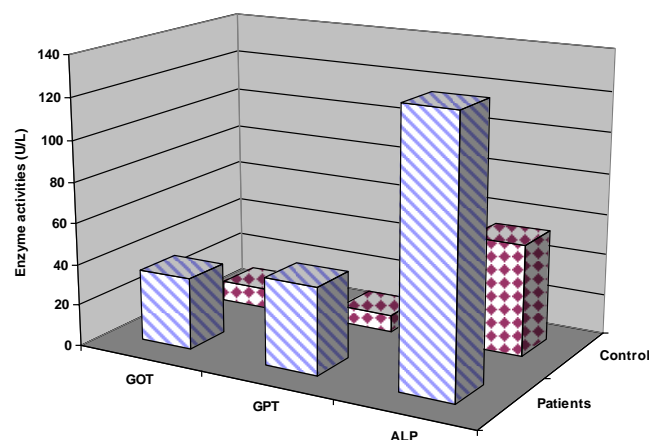


Table-1 shows the activities of GOT, GPT and ALP in various types of jaundice and in control group. It is very obvious that GOT activities showed significant ($P<0.01$) increase in all types of jaundice and reached the highest level in hepatic jaundice which was

87.97±15.75U/L. GPT activities also showed significant ($P<0.01$) increase but reached its highest level in obstructive jaundice which was 117.45±16.45 U/L. Serum ALP level showed significant ($P<0.01$)

differences between patients and control group in all types of jaundice except neonatal jaundice. Its activities reached the highest level (265.0±46.34 U/L) in obstructive.

Table 1-Activities of enzymes (GOT, GPT & ALP) in jaundiced patients compared with control group.

Enzymes	Enzymes activities (Mean values ± Standard deviation)				
	Obstructive Jaundice	Hepatic Jaundice	Hemolytic Jaundice	Neonatal Jaundice	Control Group
GOT(U/L)	16.32±6.21	87.97±15.75	15.53±5.46	17.81±6.33	9.97±2.83
GPT(U/L)	28.97±13.61	117.45±16.45	13.9±4.83	13.65±6.24	8.18±2.56
ALP(U/L)	265.0±46.34	95.0±21.29	77.7±18.46	59.59±19.72	53.93±17.97

Table 2 shows differences in activities of enzymes between male and female patients. It is apparent that there is significant difference in the activities of GOT between male and female patients and this difference is very obvious in neonatal jaundice while other types showed no significant differences. GPT activities showed

significant differences between male and female patients with obstructive jaundice but showed no significant differences in other types of jaundice. There were no significant differences in activities of ALP enzyme between males and females patients with all types of jaundice.

Table 2- Activities of enzymes (GOT, GPT & ALP) in jaundiced patients according to the sex.

Enzymes	Sex	Obstructive Jaundice	Hepatic Jaundice	Hemolytic Jaundice	Neonatal Jaundice
GOT(U/L)	M	16.65 ± 7.71*	85.44±16.82	14.68±5.66	20.2±6.63*
	F	16 ± 4.42	90.64±14.55	16.50±5.27	13.83±3.01
GPT(U/L)	M	29.7 ± 17.54*	105.72±17.30	13.25±4.38	15.70±7.0
	F	28.25 ± 8.44	109.29±15.81	14.64±5.35	10.25±2.17
ALP(U/L)	M	260.50±45.56	93.05±23.33	74.93±20.58	56.9±18.91
	F	269.50±47.84	97.11±19.38	80.85±15.83	42.75±18.46

* means significant (P,0.05)

Discussion:

In this study, it was apparent that there were significant differences in enzyme activities of GPT, GOT and ALP in patients with various types of jaundice and control group, which may be due to defects in the liver function as a result of viral infections, destruction of hepatic cells, liver dysfunction biliray obstruction or any other defects which cause secretion of these enzymes into the circulation (6-10).

Regarding the activities of enzymes, this study showed that there were significant increase of activities of GPT and GOT enzymes in patients with hepatic jaundice. Many studies (7, 9, 11) reported the same finding and the increase in activities may reach six-fold of normal values. GPT activities showed more increase than GOT which may be due to specificity of GPT in hepatic jaundice (11-12).

Patients with obstructive jaundice showed significant increase in ALP activities which reached five-fold of normal values. This finding was in agreement with the results reported by al-Aga, Crosley *et al.*, and Patel *et al.* (1,13-15.)

Regarding effect of sex on the activities of enzymes GOT, GPT &ALP the results of this study showed significant differences in the activities of those enzymes between male and female patients. Activities of GOT and GPT significantly increased in males than in females especially in obstructive jaundice. This finding was in agreement with that reported by O'kell, and Hawary (16-17). In contrast to these findings, activities of these enzymes showed no significant differences between male and female patients with other types of jaundice. This may be due to the fact that both sexes exposed to the same physiological effects (10, 18)

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التغير في فعالية أنزيم الفوسفاتير القاعدي والإنزيمات الناقلة لمجموعة الأمين عند مرضى اليرقان

ايدن صديق حمد¹ و وهبي عبد القادر سلمان² و فاتن عبد الواحد مجيد²

¹ قسم التحليلات المرضية، الكلية التقنية في كركوك
² قسم علوم الحياة، كلية التربية للبنات، جامعة تكريت

الخلاصة:

أظهرت الدراسة تغيرات في فعاليات الانزيمات الناقلة لمجموعة الامين (GPT, GOT) وانزيم الفوسفاتير القاعدي ALP عند مرضى اليرقان، وجرى قياس هذه الانزيمات في دم المرضى والاصحاء بواسطة ال Kits عدة قياس الانزيمات، كما تمت مقارنة فعاليات هذه الانزيمات عند المرضى والاصحاء. اظهرت الدراسة ان الانزيمات الناقلة لمجموعة الامين (GPT, GOT) وانزيم الفوسفاتير القاعدي ALP قد تفوقت معنوياً ($p < 0.01$) عند المرضى وقد بلغت 34.8 ± 3.265 U/L ، 42.14 ± 4.62 U/L و 130.71 ± 9.281 U/L على التوالي بالمقارنة مع الاصحاء. كما ظهرت اختلافات معنوية في فعالية أنزيم GOT بين الذكور والاناث المرضى، وهذه الاختلافات كانت اعلى بكثير من مرضى اليرقان الولادي، نستنتج من هذه الدراسة تفوق المرضى في فعالية انزيمات GPT, GOT و ALP بالمقارنة مع الاصحاء.