

Effects of Chronic Kidney Disease on Some Liver Enzymes Activity Before and After Dialysis

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Abstract

The aim of the study is to compare the activity level of some liver enzymes such as aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP) of chronic kidney disease (CKD) patient before and after dialysis. 50 blood samples of male and female with chronic kidney disease compared with (55) healthy persons samples as control group ,both group aged between 20-65 years and have no history of liver diseases. The results of study showed a decrease ($P<0.001$) in activity level of (AST) and (ALT) ,while the study showed elevated ($P<0.001$) in activity level of (ALP) in serum of CKD patients before and after dialysis in compared with control group for male and female.

Keywords: Aminotransferase, Alkaline phosphatase , Chronic kidney disease, dialysis

INTRODUCTION

Chronic kidney disease (CKD, or kidney failure) is the state of reduce glomerular filtration rate (GFR) in period more than six months. In the later stages of CKD, the glomerular filtration decrease significantly leading to the increase of metabolic end products. There is decline in nephron function and number frequently quantities as fall in glomerular filtration rate. (1).CKD is divided into 5 stages based on glomerular filtration rate (GFR). The first stage were $GFR \geq 90$ mL/min along with demonstrable kidney damage such as present of albuminuria, stage 2, 3 and 4 refer to GFR of 60-89 mL/min, 30-59 mL/min and 15-29 mL/min respectively. stage 5 refer to GFR of <15 mL/min/1.73 m² and known as end stage renal disease (ESRD). As a result of accumulation of electrolytes, toxins and fluids in this stage, death can occur unless treated by dialysis or by kidney transplantation(2).Uremia (increase urea in blood) frequently develops with chronic kidney disease , mainly with stage 5 of chronic kidney disease and with acute kidney injury (AKI) if renal functions is rapidly loss (3).Liver enzyme alanine transaminase (ALT) some time named as glutamate-pyruvate transaminase (GPT) , while Aspartate

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transaminase (AST) named as glutamate oxaloacetate transaminase (GOT) [4]. Aspartate transaminase enzyme is similar to alanine transaminase in that they are related with hepatic parenchymal cells. Alanine transaminase is found mainly in the liver cells and found in small amount in kidney cells, cardiac muscle and skeletal muscle, while Aspartate transaminase found in significant amount in the liver, cardiac muscle, skeletal muscle, kidneys and brain. Therefore, ALT use to diagnosis of liver diseases, while AST use to diagnosis diseases affecting other organs, such as kidney and heart diseases (4). ALP is a hydrolase enzyme with function of elimination phosphate molecules from many types of compound, such as nucleic acid, proteins, and alkalis. The method of elimination phosphate group is called dephosphorylation. ALP mainly effective in an alkaline medium. (5). ALP enzyme is one of the main factor in the liver investigation tests and use in identification of obstructive jaundice in patients with no kidney diseases. The isoenzymes of ALP derived from liver, bones, intestine and placenta. The liver and bone isoenzymes provide the larger part of the circulating enzyme levels. Therefore, in a patient with liver disease serum ALP level is an important indicator for conclusion the type of disease. On the other hand, in a CKD patient, renal osteodystrophy may well cause in an important elevated in the bone isoenzyme causative to elevated serum ALP level. Therefore, elevated ALP has been related with elevated mortality in pre-dialysis CKD as well as patients on continuation hemodialysis. (6) The normal values for liver enzymes activity are as followings: Serum ALT (7-41 U/L), serum AST: (12-38 U/L) and serum ALP: (33-96 U/L) (7). Most studies reported that the activity of serum AST reduce in patients of chronic kidney disease. (8) Studies among hemodialysis persons also demonstrate a similar decreased in serum ALT and AST activity. (9) Dialysis refer to a method that performs to maintenance kidney functions, such as filtering urea from the blood. Dialysis classify to: hemodialysis and peritoneal dialysis. Dialysis is a method by which toxic waste products are eliminated from the blood during external blood stream by use synthetic membranes [10]. Continuous hemodialysis may be use to eliminate excess urea and potassium that are accumulated in the blood (11).

The aim of the study :

The aim of study was to identify the effect of chronic renal disease on activity of ALT, AST and ALP enzymes in the patients serum before and after dialysis as compared with healthy control group.

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Materials and Methods

The study included 50 patients suffering from chronic kidney disease reviewing Artificial Kidney unite of Al- Kut hospital , Iraq and 50 people have no chronic kidney disease were chosen as control group, both groups aged 20 to 65 years of both sex and make dialysis process at least once every month since 6 month at list. The study excluded persons who have a previous infected with any type of hepatitis. Blood samples collected from the study participants and sent immediately to the laboratory to avoid the loss of enzymes activity. the activity level of ALT, AST and ALP enzymes estimated by using kinetic method before and after the dialysis process.

Statistical analysis:

Data analysis statistically is done by using t-test to compare the activity of enzymes ALT, AST and ALP between the patient and the control group. mean \pm SD used to expression of results . (ANOVA) used to find a correlation between the two groups. The mean at $P < 0.05$ is statistically significant (12).

Results :

Table (1) showed a significant decrease ($p < 0.001$) in AST activity level in serum of CKD patients before HD (18.48 ± 4.14) and after HD (10.08 ± 3.49) as compared to controls Group (30.5 ± 10.75). serum ALT activity were significantly lower ($P < 0.001$) in patient before HD (16.82 ± 4.38) and after HD (8.3 ± 3.58) as compared to control group (26.94 ± 13.07), while serum ALP activity significantly higher ($P < 0.001$) in patient before HD (121.24 ± 59.77) and after HD (112.5 ± 77.98) as compared to control group (72.72 ± 0.71)

Table 1 : comparative of CKD liver enzyme before and after dialysis with healthy control group

Enzyme	ALT (U/L)	AST (U/L)	ALP (U/L)
Before HD No.= 50	$16.82 \pm 4.38^*$	$18.48 \pm 4.14^*$	$121.24 \pm 59.77^*$
After HD No.= 50	8.3 ± 3.58	10.08 ± 3.49	112.5 ± 77.98
Control No.= 55	26.94 ± 13.07	30.5 ± 10.75	72.72 ± 0.71

Data are mean \pm SD
*P < 0.001 compared to results before and after dialysis with control group

Discussion

The study showed that there is a significant decrease in serum AST, ALT and an increase in ALP activity among CKD patients before and after hemodialysis (HD) patient as compared with healthy control group. There are several reasons that could lead to a reduction in the level of enzymatic activity of ALT and AST underline the normal level. Some studies have attributed the cause to a possible deficiency in vitamin B6 (pyridoxal phosphate is cofactor for both enzymes (13), while some studies attribute the reason to the presence of inhibitory substances to the activity of the enzymes in the uremic medium, glomerular lesion also may cause decrease in activity level, other studies not find reason to this decline (14),(15),(16)and(17).

The decrease in ALT, AST and ALP activity level before the dialysis could be caused by hemodilution and fluid retention as a result of dialysis process.(18). Alkaline phosphatase (ALP) is derived from several tissues including bone, where it's one of the bone metabolites, abnormal conditions such as chronic kidney disease cause increase osteoblastic differentiation which leads to increase cross several associated protein compounds such as alkaline phosphatase, where it leads to significantly increased in the level of ALP enzyme in the blood (19) so, higher levels of serum ALP are associated with increased mortality in chronic kidney disease patients.(20)

Conclusion

The study concluded that there are differences in the activity level of liver enzymes before and after the dialysis in patients with chronic kidney disease, where possible to use this difference to the determination of stage renal disease(SRD).

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تأثير مرض عجز الكلى المزمن على فعالية بعض الانزيمات

الكبدية قبل وبعد عملية غسيل الكلى

رياض حسين والي - مدرس / المعهد التقني - كوت

الدراسة تضمنت مقارنة فعالية انزيمات الكبد (الاسبارتيت الناقل للامين , الالانين الناقل للامين والفسفاتيز القاعدي) في مصل المرضى المصابين بمرض عجز الكلى المزمن قبل وبعد عملية الغسيل حيث تمت مقارنة نشاط الانزيمات ل 50 عينة دم لاشخاص مصابين بمرض عجز الكلى المزمن من كلا الجنسين مع 55 عينة دم لاشخاص اصحاء كمجموعة سيطرة , كلا المجموعتين تتراوح اعمارهم بين 20 الى 65 عام وغير مصابين بامراض الكبد مسبقا أظهرت النتائج انخفاض في نشاط (الاسبارتيت الناقل للامين و الالانين الناقل للامين) بينما اظهرت الدراسة زيادة ملحوظة في نشاط (الفسفاتيز القاعدي) لمرضى العجز الكلوي قبل وبعد عملية غسيل الكلى بالمقارنة مع المجموعة القياسية ولكلا الجنسين