



**Assessment of Serum Levels of Aminotransferase and Alkaline phosphatase
Activity among Chronic Renal Failure with Hemodialysis**

GadAllah Modawe^{1*}, Fatima A.B.Abdalla¹, Abdel Azim Alsanousi¹, AbdEkarim
A.Abrabo²

1. Omdurman Islamic University, Faculty of Medicine and Health Sciences,
Biochemistry department, Omdurman, Sudan.

2. AlNeelain University, Faculty of Medical Laboratory Sciences.

Corresponding author: gadobio77@hotmail.com.

INFORMATIONS

Submission:25/11/2020

Accepted: 22/09/2021

Publication:11/01/2023

ABSTRACT

Background: The serum enzymes of patients with end-stage renal disease (ESRD) are commonly abnormal. This is due in part to the absence of renal excretion and to the frequent presence of multiple co morbid conditions.

Objective: we aimed to assess the serum liver enzymes alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST) in Sudanese patients with chronic renal failure.

Materials and Methods: An analytical case control hospital based study. The conducted was in Ahmed Gasim Hospital at dialysis session, Khartoum Bahry, Khartoum state and carried out during from February to August 2019. A total of 100 subjects enrolled in the study, 60 patients with chronic renal failure as case group and 40 apparently healthy subjects as control group. The serum liver enzymes were estimated using spectrophotometer (auto biochemical analyzer). The data was analyzed using SPSS program version (16).

Results: Our result shows that, the serum ALP was significantly increase in chronic renal failure compare to control group ($p = 0.001$), while serum ALT and AST were significantly decrease in chronic renal failure compare to control group respectively ($p=0.000$). Their negative association between age and serum ALT and AST respectively ($r= -0.516$, $p = 0.000$), ($r= -0.489$, $p = 0.000$), and also negative association between duration of disease/years and serum ALT and AST respectively ($r= -0.333$, $p = 0.009$), ($r= -0.290$, $p = 0.025$).

Conclusion: Our study concluded that, The serum ALP was highly higher while the serum ALT and AST were a highly lower in chronic renal failure. And also the serum ALT and AST were negative association with age and duration of disease.

KEYWORDS

Renal failure, Liver enzymes, Hemodialysis, Sudanese

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).Very limited data are available public awareness for the causes of End Stage Renal Diseases (ESRD). Public awareness of the cause of (ESRD) helps both the nephrologists, patients and their families to anticipate problems during renal replacement therapy and helps to plan preventive measures for the community (2). Few data in literature are available on the causes of renal diseases in Sudan (3). The serum enzymes of patients with end-stage renal disease (ESRD) are commonly abnormal. This is due in part to the absence of renal excretion and to the frequent presence of multiple comorbid conditions. The serum enzymes most commonly used to assess the diagnosis of hepatobiliary disorders include the alkaline phosphatase (ALP), aspartate aminotransferase (AST) and alanine aminotransferase (ALT). ALT and AST are routinely measured to assess liver functions in patients with and without renal failure (4). Serum ALP increases in patients with chronic kidney disease (CKD). ALP may be associated with cardiovascular calcification in CKD (5). The alanine aminotransferase ALT are normally present in the circulation in low concentrations, usually less than 40 IU/L. The concentrations of serum ALT in both chronic dialysis and renal failure patients most commonly fall within the lower end of the range of normal values (6). ALT and AST levels may be lower in renal failure patients because of a deficiency in vitamin B6, which is a coenzyme of ALT, or haemodilution, which occurs because of water retention in patients with CKD before an hemodialysis session (7). ALT level was lowered in chronic kidney failure), and increased by hemodialysis (7). The objective of present study was to assess the serum ALP, ALT and AST in Sudanese patients with chronic renal failure regular hemodialysis.

Materials and Methods

Study population: An analytical case control hospital based study conducted in Khartoum state at Ahmed Gasim Hospital (dialysis session), Khartoum Bahry, during from the February to August 2019. A total of 100 subjects enrolled in the study. Sixteen patients with chronic renal failure as case group, the male 45(75.0%) and the female 15(25%) and the age ranged from (41 to 49 years) with an average age

Assessment of Serum Levels of Aminotransferase and Alkaline phosphatase Activity among Chronic Renal Failure with Hemodialysis

(45.53±14.685). The hemodialysis patients suffering of 2 to 3 times /week. 21(35%) two time/week and 3 times 39(65%). The duration of disease ranged from 10 years to 3month and the history of include hypertension, diabetes mellitus and other. The patients received hemodialysis thrice a week for 3-4 hours per session at blood flow rates of 250-350 ml/min using polyflux hollow-fiber filter. All hemodialysis patients were taking erythropoietin (EPO).Fourteen apparently healthy subjects as control group the male 35 (87.5%) and the female 5(12.5%) and the age ranged from (22 to 27 years) with an average age (25.00±8.691).

Inclusion and exclusion criteria: Adult patients suffering of renal failure and on regular hemodialysis at the above mentioned centre for renal disease were included. The study excluded persons who have a previous infected with any type of hepatitis or liver diseases.

Blood sample and data collection: ALP, ALT, and AST serum levels were determined by an automated kinetic method for blood samples, which were taken from each patient immediately as ingle hemodialysis session. In addition, samples were obtained from the patients after they completed the data collection through questionnaire. The questionnaire included the age, sex, number of hemodialysis/week, and duration of dialysis/years and history of disease.

Ethical considerations: The ethical approval obtained by the ethical committee, Omdurman Islamic university, faculty of medical laboratory sciences, clinical chemistry department. An ethical permission was obtained from relevant authorities. Samples were collected after written agreement assigned with laboratory administrations.

Statistical analysis:

The data of the current study was expressed as mean, standard error of mean (Mean ± SD) and the SPSS (statistical package for social science) (version16) using samples T-test for data analysis. Probably level of P value (P<0.05) level of significant was considered to be statistically significant.

Results

The history of patients with chronic renal failure included hypertension (HTN) (18%), diabetes mellitus (DM) (2%), HTN and DM (4%) and other (36%) were presented in figure (1). The (mean ± SD) of serum ALP, ALT and AST in case group respectively were (211.96±119.94U/L, 8.21±6.48 U/L, 10.86±6.95 U/L) , while the (mean± SD)

of serum ALP,ALT and AST in control group respectively were (153.56±33.82 U/L, 23.01±6.21 U/L, 23.76±6.65 U/L). The serum ALP was significantly increased in chronic renal failure compare to control group (p= 0.001), while serum ALT and AST were significantly decreased in chronic renal failure compare to control group respectively (p=0.000), were presented in table (1). In table (2 and 3) shows the ALP, ALT, and AST serum levels not affected by the gender and time of dialysis /week and not significantly differences. The serum ALP not significant association with the duration of disease (r =0.022, P 0.868) and age of patients (r =0.026, p= 0.798), the serum ALT and AST were negative correlation with the duration of disease respectively (r= -0.333, p = 0.009), (r= -0.290, p = 0.025) and age of patients respectively were (r= -0.516, p = 0.000), (r= -0.489, p = 0.000), were presented in table (4).

Table (1): Serum liver enzymes among study population

Liver enzymes	Mean ±SD Male	Mean ±SD Female	P value
ALP U/L	180.67±98.57	22.30±98.02	0.111
ALT U/L	14.77±9.45	11.53±10.30	0.179
AST U/L	16.12±9.32	15.38±9.44	0.731

Table (2): Serum liver enzymes according to the gender

Liver enzymes	Mean ±SD Case n=60	Mean ±SD Control n=40	P value
ALP U/L	211.96±119.94	153.56±33.82	0.001
ALT U/L	8.21±6.48	23.01±6.21	0.000
AST U/L	10.86±6.95	23.76±6.65	0.000

Assessment of Serum Levels of Aminotransferase and Alkaline phosphatase Activity among Chronic Renal Failure with Hemodialysis

Table (3): Serum liver enzymes in patients with chronic kidney failure according to time of dialysis per week

Liver enzymes	Mean \pm SD 2time/week	Mean \pm SD 3time/week	P value
ALP U/L	220.72 \pm 134.62	195.68 \pm 87.07	0.445 ^{NS}
ALT U/L	8.26 \pm 7.21	8.13 \pm 5.01	0.940 ^{NS}
AST U/L	10.86 \pm 7.27	10.88 \pm 6.48	0.987 ^{NS}

Table (4): Correlation of liver enzyme activity with duration of disease and age

Liver enzyme	Duration	P value	Age	P value
	R/Pearson		R/Pearson	
ALP U/L	0.022	0.868 ^{NS}	0.026	0.798 ^{NS}
ALT U/L	-0.333	0.009 ^S	-0.516	0.000 ^S
AST U/L	-0.290	0.025 ^S	-0.489	0.000 ^S

N» number of patients. **R**» correlation coefficient. +» positive correlation. -» negative correlation. **S**» significant (p value <0.05). **NS**» insignificant (p value >0.05). **ALP**» Alkaline phosphatase. **ALT**» Alanine aminotransferase. **AST**» Aspartate aminotransferase.

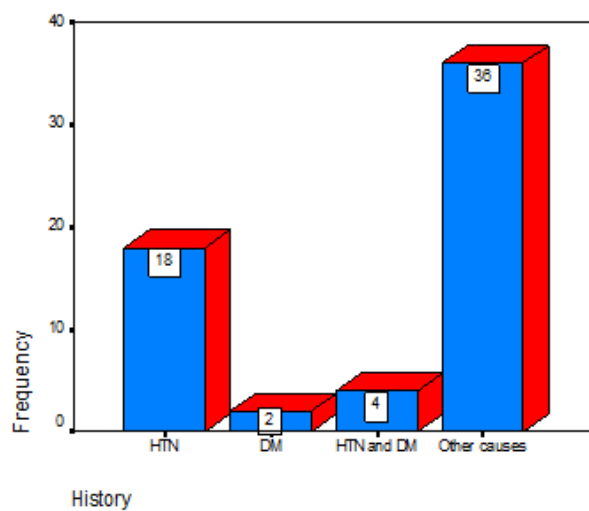


Figure (1): History of patients in chronic renal failure

Discussion

A total of 100 subjects enrolled in the study, 60 patients with chronic renal failure as case group and 40 apparently healthy subjects as control group. We examined the levels of serum ALP, ALT and AST in patients with renal failure compared to control group. The serum ALP was significantly increased in chronic renal failure compare to control group, while serum ALT and AST were significantly decreased in chronic renal failure compare to control group respectively. Their negative association between age and serum ALT and AST respectively (and also negative association between duration of disease/years and serum ALT and AST respectively. Our study supported by Musher and Kamaran,(4) reported that Chronic renal failure patients showed lower levels of AST, ALT, and higher levels of ALP. The major history of renal failure patients include the other case include urinary tract infection beside the hypertension, diabetes, our study supported by Abdelsamee, *et al* (2) reported that Hypertension, diabetes mellitus, and obstructive uropathy are the major noncommunicable preventable diseases that cause ESRD. . The results of study showed a decrease in activity level of AST and ALT, while the study showed elevated in activity level of ALP in serum of CKD patients with hmo dialysis in compared with control group for male and female, Our results of study similar to other study (8). Many researchers have attributed the cause to a possible deficiency in vitamin B6 (pyridoxal phosphate is coenzyme for transaminaes enzymes (9). While many 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 (10, 11, 12, and 13). 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 ALP, where it leads to significantly increased in the level of ALP enzyme in the blood (14) so, higher levels of serum ALP are associated with increased mortality in chronic kidney disease patients (15).Studies have revealed that serum transaminase enzymes levels are lower in patients with chronic renal failure compared with patients with normal renal function, which raises the question of whether the lower levels are related to CKD factors or to the hemodialysis (16,17,18,19) .Researchers have assumed that there is a correlation between the serum trnasaminase levels and the

Assessment of Serum Levels of Aminotransferase and Alkaline phosphatase Activity among Chronic Renal Failure with Hemodialysis

duration of renal failure caused by glomerular lesions. Indeed, Fabrizi et al (13). Other study agrees with (21). Levels of serum aminotransferases were low in CKD with ESRD and the levels become lower as the severity of CKD increases

Conclusion:

Our study concluded that, the serum ALP was highly higher while the serum ALT and AST were a highly lower in chronic renal failure. And also the serum ALT and AST were negative association with age and duration of disease.

References

1. Levey, A.S. ; Eckardt, K.U. and Tsukamoto, Y. (2005). Definition and classification of chronic kidney disease: a position statement from Kidney Disease:Improving Global Outcomes (KDIGO). *Kidney Int.*;67: 2089.
2. Abdelsamee E. M. Elamin,, Nagah A. A. Mohammed, Gad Allah Modawe. Aetiology of End-Stage Renal Disease among adult Sudanese patient. *Sudan JMS Vol. 7, No.4. December 2012.*
3. Elsharif ME, Elsharif EG. Causes of end-stagerenal disease in Sudan: A single centre experience.*Saudi J Kidney Dis Transpl.* 2011; 22: 373-376.
4. Musher Ismail Salih Kakey and Kamaran Kaiani Abdoulrahman. Estimation of Liver Parameters and Oxidative Stress in Chronic Renal Failure Patients on Hemodialysis in ErbilGovernorate. AIP Conference Proceedings 1888, 020029 (2017); <https://doi.org/10.1063/1.5004306>. Published Online: 21 September 2017.
5. Lomashvili, K.A., Garg, P., Narisawa, S., Millan, J.L. and O'Neill, W.C., *Kidney international*, 73 (9), 10241030(2008).
6. Fabrizi, F., Lunghi, G., Finazzi, S., Colucci, P., Pagano, A., Ponticelli, C. and Locatelli, F., *American journal of kidney diseases*, 38(5), 1009-1015 (2001).
7. Lopes, E.P., Sette, L.H.B., Sette, J.B.C., Luna, C.F., Andrade, A.M., Moraes, M., Sette, P.C., Menezes, R.,Cavalcanti, R.L. and Conceição, S.C., *Clinics*, 64 (10), 941-945 (2009).
8. Riyadh Hussein Wally. Effects of Chronic Kidney Disease on Some Liver Enzymes Activity before and After Dialysis. *Journal of primary education*.22 (96), 2016. 89-94.
9. Steel, R.G. and Torrie, J.H. *Principle and procedure of statistics a biometrical approach*1984.2nd., Mc.Graw-Hill,Inc.,Singapore.
- 10 . Wolf, P.L. ; Williams, D.; Coplon, N. and Coulson A.S. Lowaspartate transaminase activity in serum of patients undergoing chronic hemodialysis. *Clin Chem* . 2008. 18:567..

11. Olut, A.I. ; Ozsakarya, F.and Dilek, M. Seroprevalence of hepatitis C virus infection and evaluation of serum aminotransferase levels among haemodialysis patients in Izmir, Turkey. *J Int. Med.Res.*2005 ;33(6):641–6.
12. Trevizoli, J.E.; de Paula, ; Menezes, R. ; Ribeiro Velasco, L.F. ; Amorim, R. ; de Carvalho, M.B. and Mendes L.S., et al. (). Hepatitis C is less aggressive in hemodialysis patients than in nonuremic patients. *Clin. J. Am. Soc. Nephrol*; 2008.3:1385-90
13. Fabrizi, F. ; Lunghi, G. ; Finazzi, S. ; Colucci, P. ; Pagano, A. and Ponticelli, C. et al, Decreased serum aminotransferase activity in patients with chronic renal failure: impact on the detection of viral hepatitis. *Am. J. Kidney Dis.* ; 2001.38:1009–15.
14. Torres, P.U. Bone alkaline phosphatase isoforms in chronic renal failure. *Kidney Int.*; 2002. 61:1178-9.
15. Regidor, D.L. ; Kovesdy, C.P. ; Mehrotra, R. ; Rambod, M. ; Jing, J. and McAllister C.J. et al. Serum alkaline phosphatase predicts mortality among maintenance hemodialysis patients. *J. Am. Soc.Nephrol*; 2004.19:2193-203.
16. Al-Wakeel J, Maikl GH, Al-Mohaya S, Mitwalli A, Baroudi F, El Gamal H, et al. Liver disease in dialysis patients with antibodies to hepatitis C virus. *Nephrol Dial Transplant.* 1996;11:2265-8.
17. Yuki N, Ishida H, Inoue T, Tabata T, Matsushita Y, Sasaki Y, et al. Reappraisal of biochemical hepatitis C activity in hemodialysis patients. *J Clin Gastroenterol.* 2000;30:187-94, <http://dx.doi.org/10.1097/00004836-200003000-00012>.
18. Lopes EP, Sette LH, Sette JB, Luna CF, Andrade AM, Moraes M, et al. Serum alanine aminotransferase levels, hematocrit rate and body weight correlations before and after hemodialysis session. *Clinics (Sao Paulo)*.2009;64:941-5.
19. Trevizoli JE, Menezes R, Velasco LF, Amorim R, de Carvalho MB, Mendes LS, et al. Hepatitis C is less aggressive in hemodialysis patients than in nonuremic patients. *Clin J Am Soc Nephrol.* 2008;3:1385-90, <http://dx.doi.org/10.2215/CJN.01330308>.
20. Cotler SJ, Diaz G, Gundlapalli S, Jakate S, Chawla A, Mital D, et al. Characteristics of hepatitis C in renal transplant candidates. *J Clin Gastroenterol.* 2002;35:191-5, <http://dx.doi.org/10.1097/00004836-200208000-00013>.
21. Ray L, Nanda SK, Chatterjee A, Sarangi R, Ganguly S. A comparative study of serum aminotransferases in chronic kidney disease with and without end-stage renal disease: Need for new reference ranges. *Int J App Basic Med Res* 2015;5:31-5.