Evaluation of Some Biochemical Indices in Chronic Kidney Failure (CKF) Patients in Pre- and Post-Haemodialysis in Wasit Province

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تقييم بعض المؤشرات الحيوية الكيميائية في مرضى فشل الكلية المزمن قبل وبعد الديلزة في محافظة واسط

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المستخلص

هدفت الدراسة الحالية الى تقييم بعض المؤشرات البايوكيمائية (انزيم الانين امينوترانسفير وانزيم اسبارتيت امينوترانسفير وانزيم الفوسفات القاعدي والبليروبين الكلي والالبومين وحامض البول) قبل الديلزة وبعد الديلزة في مصل المرضى المصابين بفشل الكلية المزمن (CKF) ، ومقارنة نتائجهم مع مجموعة السيطرة ، وكذلك فيما بينهم . لهذا الغرض ، خضع 72 مريضا بالاضافة الى 72 شخص سليم ومن كلا الجنسين لجمع عينات الدم واختبار المؤشرات البايوكيميائية في وحدة الديلزة في محافظة واسط . من كل مريض ، تم سحب اثنان من عينات الدم ، الاولى في فترة قبل الديلزة والثانية في فترة بعد الديلزة ، في حين استخدمت عينات دم الاشخاص السليمين كمجموعة سيطرة . اظهرت نتائج قبل الديلزة زيادة ملحوظة في تراكيز انزيم الانين امينوترانسفير وانزيم الفوسفات القاعدي وحامض البول ، مع انخفاض في

مستوى البليروبين الكلي عندما تقارن مع مجموعة السيطرة ، في حين لم تلاحظ الاختلافات في نتائج الالبومين وانزيم اسبارتيت امينوترانسفير . كذلك ، سجلت نتائج بعد الديلزة ارتفاعا واضحا في تراكيز انزيم الانين امينوترانسفير وانزيم اسبارتيت امينوترانسفير وانزيم الفوسفات القاعدي والبليروبين الكلي ، لكنها لم تلاحظ في مستويات الالبومين وحامض البول عندما تقارن مع مجموعة السيطرة . اضافة الى ذلك ، اظهرت نتائج بعد الديلزة ، عند مقارنتها مع نتائج قبل الديلزة ، الى وجود ارتفاع في تراكيز انزيم الانين امينوترانسفير وانزيم اسبارتيت امينوترانسفير وانزيم الفوسفات القاعدي والبليروبين الكلي، بينما سجلت نتائج حامض البول انخفاضا ملحوظا .

الكلمات المفتاحية : فشل الكلية المزمن ، مؤشرات حيوية كيمايئية ، قبل وبعد الديلزة ، مرضى ، محافظة واسط

Abstract

The present study aimed for evaluation of some biochemical indices (ALT, AST, ALP, total bilirubin, albumin, and uric acid) in pre-haemodialysis and post-haemodialysis, in sera of chronic kidney failure (CKF) patients, to compare their results between them and with control groups. For this purpose, a total of 72 CKF patients as well as 72 healthy people, from both sexes, were submitted for blood samples collection and biochemical indices testing in dialysis unit at Wasit province. From each patient, two blood samples have been drained, the first in pre-haemodialysis period and the second post-haemodialysis period, while the blood samples of healthy people have been used as a control group. The results of pre-haemodialysis were revealed on a noticeable increasing in concentrations of ALT, ALP, and uric acid; with decreasing a totally bilirubin levels if compared with control group, while, the differences in AST and albumin results were not showed. Also, the results of post-dialysis were reported a marked elevation in concentrations of ALT, AST, ALP, and total bilirubin; but they did not detect in albumin and uric acid levels, when compared to control group. In addition, the results of post-haemodialysis, when compared with pre-haemodialysis results, appeared to have an elevation in concentrations of ALT, AST, ALP, and total bilirubine; while, they reported an obvious reduction in uric acid.

Keywords: Chronic kidney failure, Biochemical indices, Pre- and post-haemodialysis, Patients, Wasit province

Introduction

Chronic kidney failure (CKF) is defined as a slow cumulative lack of kidney functions and abnormal glomerular filtration rate that decrease to result in elevation of creatinine concentration and other organic substances in the blood **(1).** The disease is considered as one of the most widespread diseases in the world which occurs in 1 every 5000 and effects mostly on middle aged and older people **(2).** In patient with sudden lack of renal work and/or reach to end stage of renal failure, only two lines of therapy included the transplantation and dialysis throughout removing of excessive metabolic from the plasma and correction the electrolyte imbalance by dialysis **(3, 4).** Although, (ALT), (AST) and (ALP) are liver enzymes, serum level values of these enzymes in patients with CKF, in general, are not normal because of partial lack of kidney excretions and frequently persistance of multiple illness problems **(5, 6).** Also, the raising of uremia is an accelerated agent to kidney problems and acts as potent agent for heart and vessels diseases, and may affect on levels of albumin and total bilirubin in CKF patients **(7).** Hence, many problems can be diagnosed in depending on measurement the bodily enzymes, with exact evaluation of status, clinically, may restricted due to the raring of available data that relating to the sera concentrations of many enzymes in several diseased status **(8, 9, 10).**

This study was designed for measurement the levels of some biochemical serum indices (ALT, AST, ALP, total bilirubin, albumin and uric acid) during prehaemo-dialysis and post-haemodialysis periods, and comparing their results between them and against control groups.

Materials and Methods

Study area and samples collection: During the period from July 2015 to May 2016 at a Dialysis Unit-Wasit provincial council / Al-Kut city-Wasit province, a totally of 72 patients with chronic kidney failure and 72 healthy people, from both sexes, were submitted for this study. From each CKF patient, the blood samples (5ml) were drained before and after haemodialysis for subsequently biochemical analysis. Also, about 5 ml of venous blood samples were drawn from

healthy people to be used as control. All obtained samples were packaged in numbered EDTA anticoagulant tubes, centrifuged at 3000 rpm for 10 minute for serum obtaining. The serum samples were transferred immediately into marked 1 ml eppendorf microtubes that kept within a dark container in refrigerator at -20°C until used **(11).**

Biochemical analysis: In this study, the serum samples were directed for measuring of six biochemical indices involved Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Alkaline Phosphatase (ALP), Total Serum Bilirubin (TSB), Albumin and Uric acid. The ALT, AST, and ALP enzymes were evaluated according to the manufacturer instructions of a Reflotron plus clinical chemistry analyser (WOODLEY LABORATORY DIAGNOS -TICS / United Kingdom) and cobas ® 4000 analyser (Roche Diagnostics /GmbH-Germany), while, the TSB, Albumin and Uric acid were tested by using of the BIOLABO chemistry analyser kits (BIOLABO / France) **(12, 13).**

Statistical application: All biochemical results (before and after dialysis) were tabled by using a computerized Microsoft Office Excel (2013) program analysed by an IBM/SPSS program (*V23*). Descriptive statistics and Chi-square (X^2) test were used for evaluation the statistical variations ($P \leq 0.05$) within prehaemodialysis and post-haemodialysis data, and against control groups **(14).**

Results

The results of pre-haemodialysis compared with control group has been detailed, respectively, as follows: ALT (39.33±1.94) U/L and (25.31±1.06) U/L, AST (26.97±2.06) U/L and (26.76±1.15) U/L, ALP (109.79±2.1) U/L and (89.98±1.52) U/L, total bilirubin (0.47±0.17) mg/dL and (0.76±0.03) mg/dL, albumin (27.06±1.58) g/L and (36.97±0.92) g/L, and uric acid (5.59±0.36) mg/dL and (3.81±0.15) mg/dL (Table 1)

Table (1): Comparison of Pre-haemodialysis with Control results (Mean ± Standard Errors)

No.	Indices	Unit	Pre-haemodialysis M ± SE	Control M ± SE
1	ALT	U/L	(39.33±1.94) [a]	(25.31±1.06) [b]
2	AST	U/L	(26.97±2.06) [b]	(26.76±1.15) [b]
3	ALP	U/L	(109.79±2.1) [a]	(89.98±1.52) b
4	Total bilirubin	mg/dL	(0.47±0.17) [b]	(0.76±0.03) [a]
5	Albumin	g/L	(27.06±1.58) [b]	(36.97±0.92) [b]
6	Uric Acid	mg/dL	(5.59±0.36) [a]	(3.81±0.15) [b]

Variation in small letters, horizontally, referred to significant differences at a level of P≤0.05

In (Table 2) that dealt with the comparative association between the results of post-haemodialysis and control group, the study reported the following values, respectively: ALT (64.32±2.67) U/L and (25.31±1.06) U/L, AST (44.07±1.91) U/L and (26.76±1.15) U/L, ALP (136.09±1.34) U/L and (89.98±1.52) U/L, total bilirubin (0.82±0.06) mg/dL and (0.76±0.03) mg/dL, albumin (26.34±1.44) g/L and (0.76±0.03) g/L, and uric acid (3.36±0.23) mg/dL and (3.81±0.15) mg/dL.

Table (2): Comparison of Post-haemodialysis with Control results (Mean ± Standard Errors)

No.	Indices	Unit	Post-haemodialysis M ± SE	Control M ± SE
1	ALT	U/L	(64.32±2.67) [a]	(25.31±1.06) [b]
2	AST	U/L	(44.07±1.91) [a]	(26.76±1.15) [b]
3	ALP	U/L	(136.09±1.34) [a]	(89.98±1.52) [b]
4	Total bilirubin	mg/dL	(0.82±0.06) [a]	(0.76±0.03) [b]
5	Albumin	g/L	(26.34±1.44) [b]	(36.97±0.92) [b]
6	Uric Acid	mg/dL	(3.36±0.23) [b]	(3.81±0.15) [b]

Variation in small letters, horizontally, referred to significant differences at a level of P≤0.05

In (Table 3): The results of testing some biochemical indices in pre-haemodialysis and post-haemodialysis were discussed, respectively, as follows: ALT (39.33±1.94) U/L and (64.32±2.67) U/L (Figure 1), AST (26.97±2.06) U/L and (44.07±1.91) U/L (Figure 2), ALP (109.79±2.1) U/L and (136.09±1.34) U/L (Figure 3), total bilirubin (0.47±0.17) mg/dL and (0.82±0.06) mg/dL (Figure 4), albumin (27.06±1.58) g/L and (26.34±1.44) g/L (Figure 5), and uric acid (5.59±0.36) mg/dL and (3.36±0.23) mg/dL (Figure 6).

Table (3): Comparison of Pre-haemodialysis with Post-haemodialysis Results (Mean ± Standard Errors)

No.	Indices	Unit	Pre-haemodialysis M ± SE	Post-haemodialysis M ± SE
1	ALT	U/L	(39.33±1.94) [b]	(64.32±2.67) [a]
2	AST	U/L	(26.97±2.06) [b]	(44.07±1.91) [a]
3	ALP	U/L	(109.79±2.1) [b]	(136.09±1.34) [a]
4	Total bilirubin	mg/dL	(0.47±0.17) [b]	(0.82±0.06) [a]
5	Albumin	g/L	(27.06±1.58) [b]	(26.34±1.44) [b]
6	Uric Acid	mg/dL	(5.59±0.36) [a]	(3.36±0.23) [b]

Variation in small letters, horizontally, referred to significant differences at a level of P≤0.05

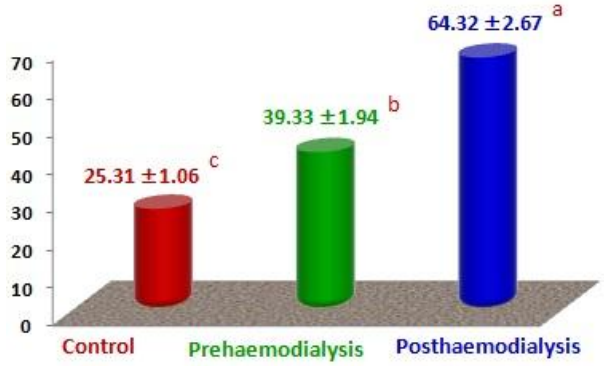

Fig (1): ALT

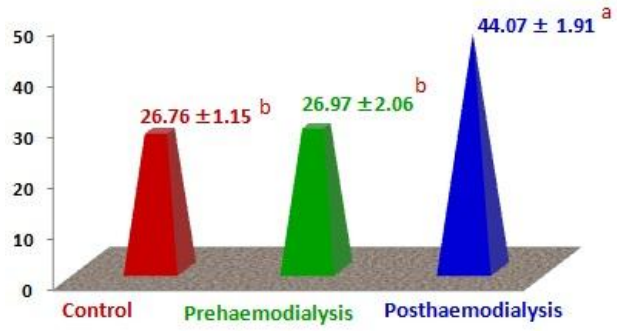

Fig (2): AST

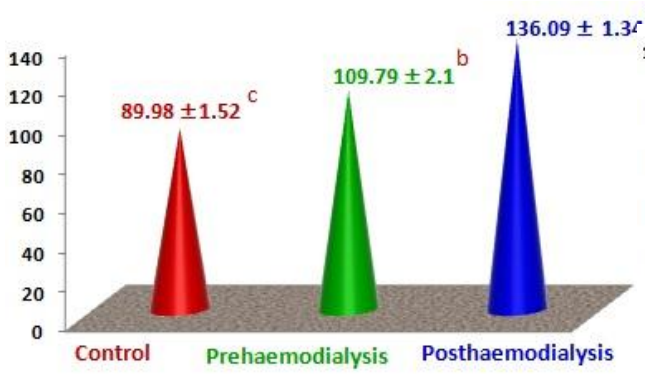

Fig (3): ALP

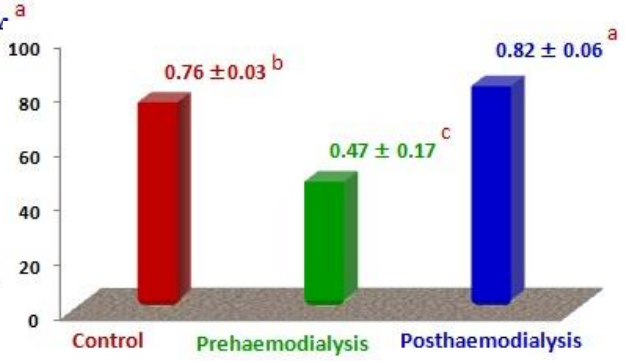

Fig (4): Total Bilirubin

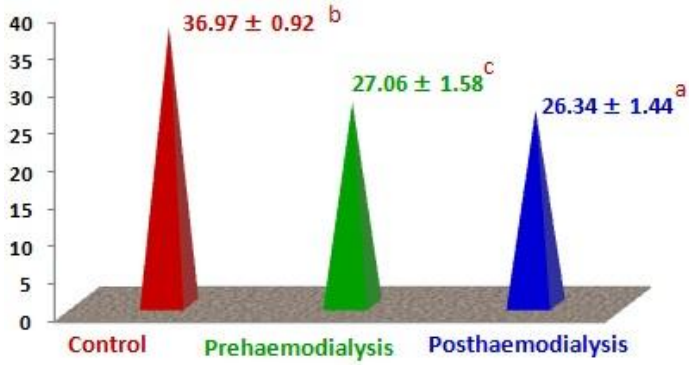

Fig (5): Albumin

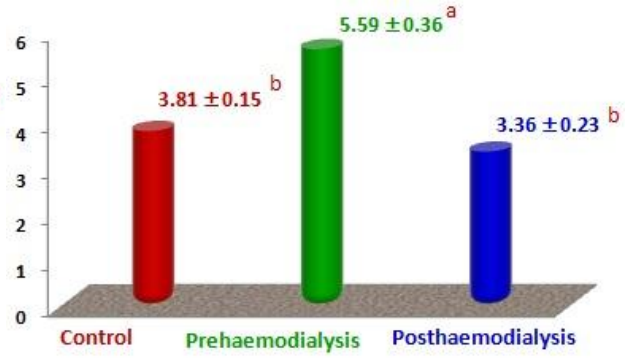

Fig (6): Uric Acid

Discussion

In this study, a number of biochemical indices including ALT, AST, ALP, total bilirubin, albumin and uric acid were measured in CKF patients pre-haemodialysis and post-haemodialysis that compared with control group and between them. ALT enzyme was reported a high elevation in post-haemodialysis (64.32±2.67) U/L where compared with pre-haemodialysis (39.33±1.94) U/L and control (25.31±1.1.06) U/L. Several studies reported that the serum ALT level in normal kidney function was higher if compared with CKF patients, which mean that the level of serum ALT was decreased as a result of kidney failure progression **(15).** However, the significant decreasing of ALT in post-haemodialysis could be related to haemodilution and to inversely proportional loss of water weight **(16).** In

this study, AST enzyme was reported an increasing in its concentration in post-haemodialysis (44.07±1.91) U/L if compared to pre-haemodialysis (26.97±2.06) U/L and control results (26.76±1.15) U/L. The probability of haemodilution in increasing of ALT value after haemodilution was demonstrated, in same patients, during measurement of AST values at pre-haemodialysis and post-haemodialysis, and supported the hypothesis that these enzymes were not decreased as the aminotransaminase but might influence by haemodilution because of fluid retention in CKF patient **(17).** Although, a few number of studies have dealt with ALT and AST in CKF patients during pre-haemodialysis and post-haemodialysis, most of these studies reported approximate results in which the values of these enzymes were increased in a similar manner after haemodialysis **(18, 19).** ALP, also, showed a rising in its values during post-haemodialysis (136.09±1.34) U/L in comparing with pre-haemodialysis (109.79±2.1) U/L and control groups (89.98±1.52) U/L. In CKF, The increasing of serum ALP levels post-haemodialysis might derive from the injury to the brush border membrane of the renal tubular cells, or due to bone disease. However, several studies demonstrated that the high level of ALP was concerned with increasing of mortality and coronary artery calcification in CKF patients **(20, 21, 22).** In association to total bilirubin (TB), this study reported an increasing in results of post-haemodialysis (0.82±0.06) mg/dL when compared to pre-dialysis (0.47±0.17) mg/dL and control group result (0.76±0.03). A number of studies demonstrated a high TB could be concerned, relatively, to the reduction of glomerular filtration rate **(23, 24).** Also, the increasing in TB could be a reflection for non-alcoholic fatty liver illness that concerned, separately, for increasing the CKF incidence **(25).** The mechanism by which the serum bilirubin level concerned to CKF was not, completely, understood. Nonetheless, many studies described TB as one of the most powerful endogenous antioxidant substances that play defensive effect against many system diseases such cardiovascular disease **(26).**

This study was showed a significant reduction in serum albumin

concentration during the pre-haemodialysis (27.06±1.58) g/L and post-haemodialysis (26.34±1.44) g/L, if compared with the control (36.97±0.92) mg/L. The depressed values in serum albumin concentration that showed in both pre-haemodialysis and post-haemodialysis might be represented a reflection for malnutrition. Several researches reported that (23-67%) of haemodialyzed patients, were undergone from malnutrition **(27).** The reduced albumin values were, highly, referred to bad prognosis at whole CKF phases **(28).** Nonetheless, many non-nutritional causes for serum hypoalbumin could be affected on the specificity of this marker **(29).**

In uric acid evaluation, the study reported a marked decreasing in its concentration during comparison of pre-haemodialysis (5.59±0.36) mg/dL to post-haemodialysis (3.36±0.32) mg/dL that became similar, statistically, for control group (3.81±0.15) mg/dL. The appearance of significant elevation in uric acid pre-haemodialysis could because of the patients with CKF were, mostly, sufferings from endothelial renal dysfunction that determined as endothelial disturbances or defects in bioviability that play an important role in kidneys problems **(30).** These dysfunctions might be associated with reducing of glomerular filtration rate that leading to retention of metabolic materials that competed with nitrous oxide synthesis, and this suggested that the uric acid might be affected on endothelial function distinct from the effect of glomerular filtration rate reduction **(31).**

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