VARIATIONS IN SERUM TRACE ELEMENTS LEVEL IN PATIENTS WITH CHRONIC KIDNEY DISEASE PRE AND POST DIALYSIS

I.Akinlua[1], A.T. Ogundajo[2] and A.E. George-Ojo[1]
1 Department of Biochemistry Ekiti State University, Ado Ekiti Nigeria.
2 Pathology department, Wesley Guide Hospital, Obafemi Awolowo University Teaching Hospital, IIesa Osun State Nigeria.
**ibikunle.akinlua@eksu.edu.ng.*

ABSTRACT : ***Chronic kidney disease remains a global health challenge of immense proportion and one of the major causes of morbidity and mortality worldwide. Disorders in mineral metabolism has been implicated in the various complications associated with haemodialysis patients. This study was carried out to determine variations in the levels of some trace elements or minerals in patients with chronic kidney disease due to haemodialysis. Blood samples were collected from 60 chronic kidney diseased patients before and after undergoing haemodialysis at Wesley Guide Hospital of Obafemi Awolowo University Teaching Hospital, Ilesa Osun State. Serum levels of Zinc, Manganese, Iron and Copper was determine using standard method. The results obtained were subjected to statistical analysis ($p<0.05$). The results of all the parameters pre dialysis was compared with those obtained after dialysis. There was a significant increase ($p<0.05$) in the serum levels of Iron and copper after dialysis when compared with their levels before dialysis. However, the serum levels of calcium, manganese and zinc was significantly lowered ($P<0.05$) in post dialysed patients when compared with their levels before dialysis. This study reveals variations in the serum levels of the various trace elements considered in this study in chronic kidney diseased patients pre and post dialysis which could prove vital in the management of these patients.***

Keywords: Chronic kidney disease, Trace Elements, Heamodialysis

I.INTRODUCTION

Chronic kidney disease (CKD) is as a result of damage to the kidney which resulted into a progressive loss of kidney function. It is an estimated glomerular filtration rate less than 60ml/min/1/73 m^2 lasting for a period of three months or more.

Haemodialysis or renal replacement therapy help to remove waste and extra water which accumulates in CKD patients as a result of loss of kidney function (Lee, 2017)[1]. This is achieved by using a dialysate created by adding regulated quantities of essential ions to water that has been treated to reduce solute to very low level. Equilibration of plasma water and the dialysate across a semi permeable membrane help to remove these nitrogenous waste products.

Theoretically, dialysis could lead to the loss of essential biological substances like minerals, vitamins and proteins if they are not included in the dialysate. There is potential deficiency of trace elements in these patients which can affect the body and lead to clinical complications such as increase risk of cardiovascular and organ damage because of the roles these elements play in important body metabolic processes (Wiesen *et al.*, 2011)[2]. Copper for instance is an essential trace element and an essential component of important proteins that plays diverse roles in biological electron transport and oxygen transportation. Deficiency can lead to anaemia and neutropenia (Brewer, 2010)[3]. Manganese is an important trace element that serve as cofactor for a number of important enzymes such as arginase and superoxide dismutase that help the body against free radical damage and oxidative stress. Selenium is an essential micronutrient which act as co-factor for oxidation and reduction enzymes such as glutathione peroxidase.

Zinc as an important micronutrient is an intrinsic metal and a cofactor for more than seventy enzyme systems which include angiotensin-converting enzyme, alkaline phosphatase, carbonic anhydrase, DNA and RNA polymerases, copper-zinc superoxide dismutase, metallothionein and zinc finger proteins which are key players in the regulation of gene transcription.

Deficiency of these essential trace elements may have adverse consequences and contribute to morbidity and

mortality among haemodialysis patients.

II MATERIALS AND METHODS

Participants

The subjects were sixty chronic kidney disease patients on dialysis at the outpatient Departments of Wesley Guide Hospital, Ilesha, Osun State.

Sample Collection

5mls of venous blood was collected from the patients using a sterile syringe and carefully dispensed into a plain bottle. The blood sample was centrifuged for 5mins at 1200rev per mins. The supernatant which is the serum (a clear yellow liquid) was separated from the cells for analysis.

Biochemical Analysis

Serum levels of the trace elements (Fe, Zn, Ca, Cu and Mn) were determined using atomic absorption spectophotometry as described by AOAC, (1990)[4].

Statistical Analysis

The results of the replicate reading were pooled and expressed as Mean + or -Standard deviation. The level of homogenicity among the group were tested using analysis of variance (ANOVA) Followed by multiple comparism test. The level of significance was accepted at ($p<0.05$).

III RESULTS

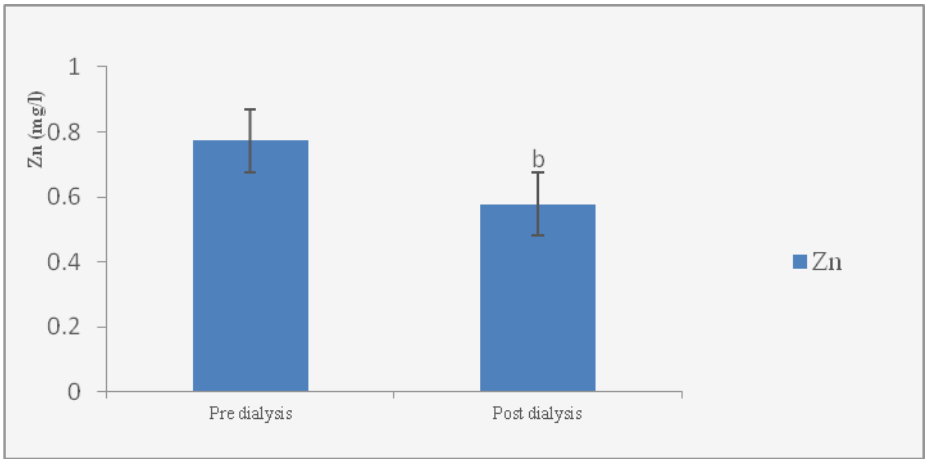

Figure 3.1: Figure showing the serum Zinc level of Chronic Renal Failure Patients of Pre and Post dialysis. Values were expressed as mean ± standard deviation Graph with different data labels indicate significant differences at $P<0.05$

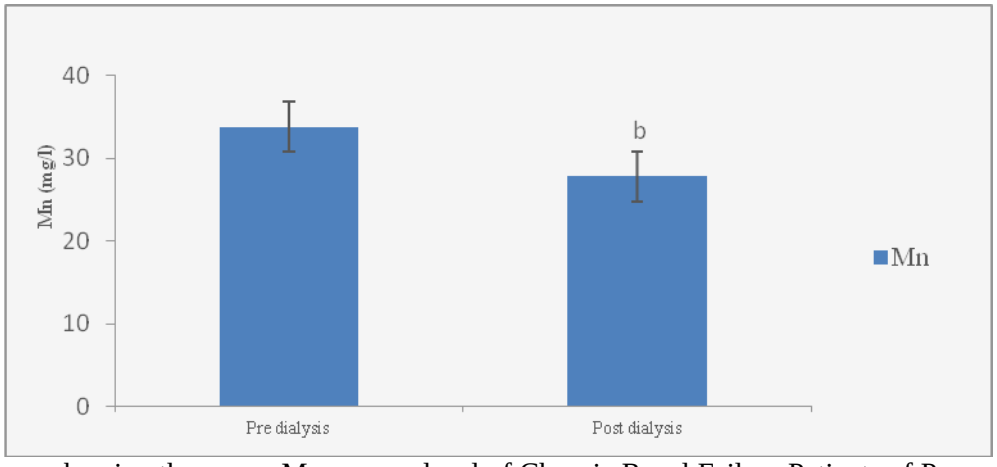

Figure 3.2: Figure showing the serum Manganese level of Chronic Renal Failure Patients of Pre and Post dialysis. Values were expressed as mean ± standard deviation Graph with different data labels indicate significant differences at $P<0.05$

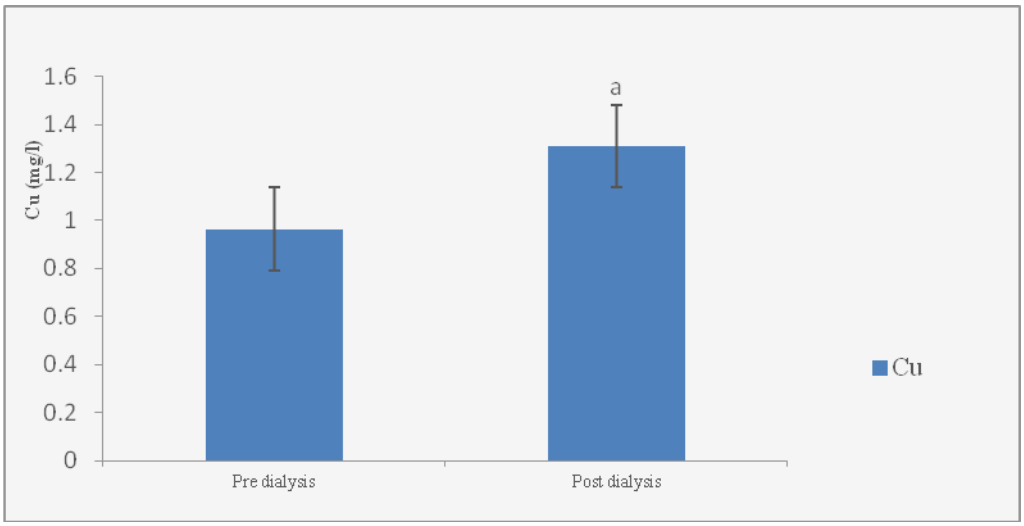

Figure 3.3: Figure showing the serum Copper level of Chronic Renal Failure Patients of Pre and Post dialysis. Values were expressed as mean ± standard deviation Graph with different data labels indicate significant differences at P<0.05.

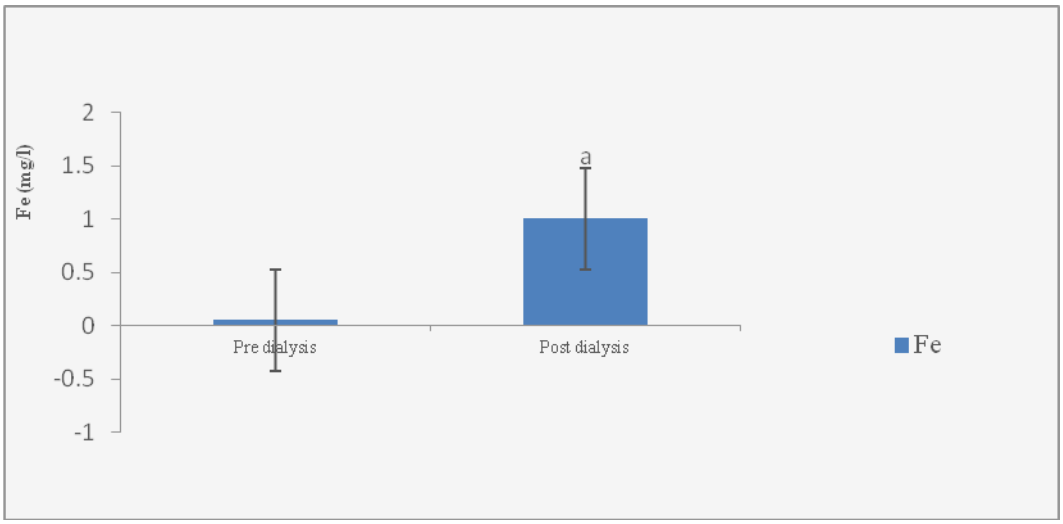

Figure 3.4: Figure showing the serum Iron level of Chronic Renal Failure Patients of Pre and Post dialysis. Values were expressed as mean ± standard deviation Graph with different data labels indicate significant differences at P<0.05

IV. DISCUSSION

Chronic kidney disease (CKD) is a public health issue of global concerns and a major cause of morbidity and mortality worldwide. The progressive and irreversible loss of kidney functions in CKD patients make dialysis the only option for remedy. Information on the impact of dialysis on body metabolism is essential for proper care of CKD patients. The result of this study shown in figure 1 revealed a significant decrease ($p<0.05$) in the serum level of Zinc in these patients post- dialysis when compared with its level pre-dialysis. This decrease may be as a result of composition of source water used for dialysis or dietary pattern of these patients. Zinc remains an important component of many enzyme systems that are vital to many physiological processes in the body and lower concentration may pose adverse clinical and biochemical outcome. Similar outcomes was also reported by previous researchers (Tonelli *et al.,* 2009)[5].

The results in table 3.2 also reveals a significant decrease ($p<0.05$) in the serum level of manganese in these patients after dialysis when compared with its levels before dialysis. This difference could be as a result of processes involved in dialysis and inadequate intake through diet. Manganese like zinc plays vital roles as cofactor of important enzymes involve in key physiological processes especially superoxide dismutase(SOD) which help the body avoid oxidative stress the underline factor for many other diseases especially cardiovascular diseases. This outcome corroborate the earlier report of Tonelli *et al.,* (2009)[5] who reported decreased concentration of manganese in CKD patients after dialysis.

The serum copper level of these patients as shown in figure 3.3 was significantly raised ($p<0.05$) post dialysis when compared with its level before dialysis. This could be as a result of residual kidney function in these patients and dietary pattern. Copper remain an essential trace element and component of important proteins but its accumulation could be detrimental to health because of its dual oxidation state which makes the unbound copper susceptible to free radicals generation. Increased serum concentration of copper in post dialysed patients has not been widely reported, Marcelo *et al.*,(2018)[6] reported raised level of copper in haemodialysis patients which supported the outcome of this study. Abdelrazig *et al* (2016)[7] on the other hand reported decreased serum copper level in CKD patients after dialysis.

The outcome of this study also revealed a significant increase in the serum iron level in CKD patients after undergoing dialysis when compared with its level before dialysis as shown in figure 3.4. The increase in serum iron level in these patients could be due to supplementation and dietary intervention prior dialysis. Iron is an essential trace element and a vital element in human metabolism because of its unique ability to act both as an electron donor in its ferrous state and as an electron acceptor in its ferric state, however, due to its ability to receive and transfer electron, iron can cause oxidative stress and tissue damage. Previous studies revealed iron deficiency and anaemia in CKD patients before dialysis as this study also shows (Shaheen *et al*,.2011), (Babua *et al.*, 2015)[8][9]. As much as CKD patients need iron therapy, there is need for monitoring to avoid overload.

V. CONCLUSION

There is alteration in the serum levels of all the trace elements in CKD patients considered in this study after undergoing dialysis which are information that is vital to the proper management of CKD patients.

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