(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

Serum magnesium and zinc level in patients with chronic renal failure- A biochemical analysis

Ranjit Kumar

Assistant Professor, Department of Biochemistry, Major S D Singh Medical College and Hospital, Farrukhabad, Uttar Pradesh, India

ABSTRACT:

Background: Hemodialysis is a frequent interventional treatment method because of high prevalence of chronic kidney disease. The present study was conducted to assess serum magnesium and zinc level in patients with chronic renal failure. **Materials & Methods:** 80 chronic renal failure patients of both genders were enrolled. 2 groups were prepared. Group I had CRF patients undergoing hemodialysis and group II hadhealthy control. Serum samples were studied for magnesium and zinc level. **Results:** Group I had 45 males and 35 females and group II had 42 males and 38 females. The mean magnesium level before dialysis in group I was 2.81 µg/L and after treatment was 1.92 µg/L. In group II, the mean magnesium level before dialysis was 2.01 µg/L and after was 1.95 µg/L. The mean zinc level before dialysis in cases was 273.2 µg/L and after was 174.5 µg/L. In group II, the mean zinc level before dialysis was 293.7 µg/L and after was 216.4 µg/L. The difference was significant (P< 0.05). **Conclusion:** The level of zinc and magnesium falls after dialysis especially in patients with chronic renal failure (CRF).

Key words: Chronic kidney disease, Magnesium, Zinc

Corresponding author: Ranjit Kumar, Assistant Professor, Department of Biochemistry, Major S D Singh Medical College and Hospital, Farrukhabad, Uttar Pradesh, India

This article may be cited as: Kumar R. Serum magnesium and zinc level in patients with chronic renal failure- A biochemical analysis. J Adv Med Dent Scie Res 2017;5(10):116-118.

INTRODUCTION

Cardiovascular disease is the leading cause of hospitalization and mortality in patients with chronic kidney disease.[1] The process of cardiovascular disease most likely started in early stages of CKD considering its severity at commencement of renal replacement therapy (RRT). Dyslipidaemia is one of the recognized traditional cardiovascular risk factors in the general population as well as CKD patients.This cardiovascular risk factor occurs commonly in patients with CKD.[2]

Dyslipidaemia is associated with rapid decline in renal function and commencement of RRT in CKD patients.The precise mechanism is unknown, but it has been postulated that mesangial cells bind and take up oxidized LDL which then causes injury to mesangial, epithelial and endothelial cells by favouring recruitment of inflammatory cells such as macrophages which release cytokines, chemokines and growth factors.[3]

It is reported that hemodialysis results into the loss of some trace elements such as manganese, selenium and zinc. The importance of trace elements measurement for monitoring the effect of long-term hemodialysis on the trace elements blood level, is suspicious.[4]Low circulating zinc concentrations have been described in CRF. The cause of the decrease is unclear but may be a consequence of the low-protein diets recommended for these patients. Zinc deficiency in CRF may also be partly due to impaired intestinal absorption, alterations in tubular transport or loss of ion-transporting plasma proteins.[5] The present study was conducted to assess serum zinc and magnesium level in patients with chronic renal failure (CRF).

MATERIALS & METHODS

The present study consisted of 80 chronic renal failure(CRF) patients of both genders. All were enrolled once they agreed to participate in the study with their written consent.

Data such as name, age, gender etc. was recorded. We made 2 groups. Group I had CRF patients undergoing hemodialysis and group II hadage matched control subjects. 5 ml of venous blood was obtained under aseptic conditions. Serum samples were separated and analysed using atomic absorption technique. Data thus obtained were analysed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Groups	Group I	Group II
Status	CRF	Healthy
M:F	45:35	42:38

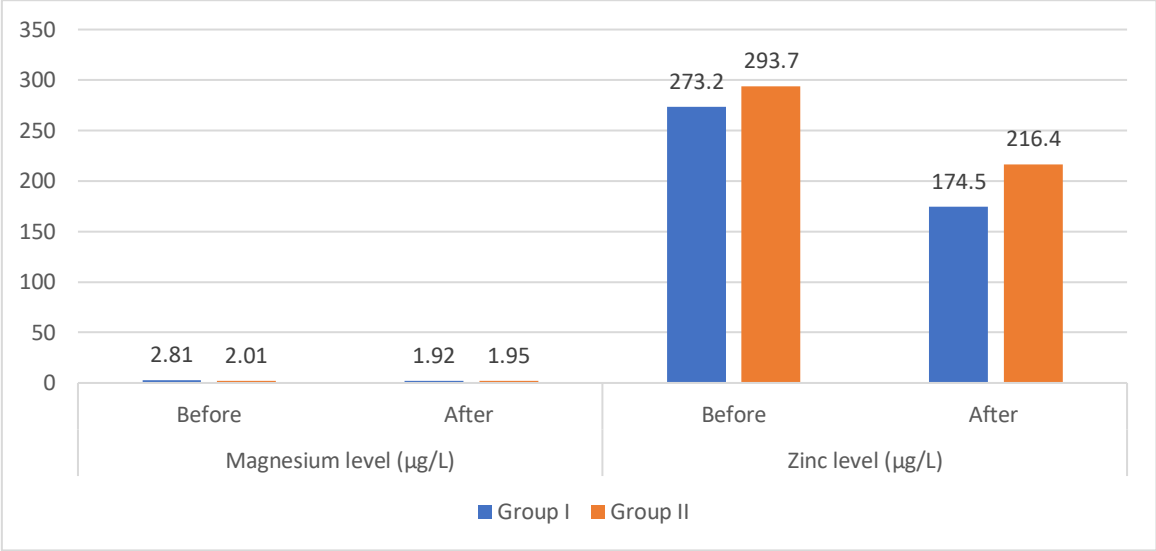
Table I shows that group I had 45 males and 35 females and group II had 42 males and 38 females.

Table II Assessment of magnesiumand zinc level in both groups

Parameters	variables	Group I	Group II	P value
Magnesium level (µg/L)	Before	2.81	2.01	0.90
	After	1.92	1.95	0.98
Zinc level (µg/L)	Before	273.2	293.7	0.03
	After	174.5	216.4	0.01

Table II, graph II shows that mean magnesium level before dialysis in group I was 2.81µg/L and after treatment was 1.92µg/L. In group II, the mean magnesium level before dialysis was 2.01µg/L and after was 1.95µg/L. Themean zinc level before dialysis in cases was 273.2µg/L and after was 174.5µg/L. In group II, the mean zinc level before dialysis was 293.7µg/L and after was 216.4µg/L. The difference was significant (P< 0.05).

Graph I Assessment of magnesium and zinc level in both groups



DISCUSSION

Chronic renal failure (CRF) provokes imbalances of elemental status in physiological fluids and tissues, and can lead to deficiency in or raised levels of these nutrients, but the mechanisms responsible for these changes are poorly understood, and the contribution of toxicity or deficiency in some elements to the symptoms of CRF is uncertain.[6] Among the causes of these alterations are reduced food intake and the low element content of some low-protein diets recommended in CRF to delay the progression of kidney damage.[7]

Low circulating zinc concentrations have been described in CRF. The cause of the decrease is unclear but may be a consequence of the low-protein diets recommended for these patients.[8] Zinc deficiency in CRF may also be partly due to impaired intestinal absorption, alterations in tubular transport or loss of ion-transporting plasma proteins. Determination of essential trace elements is important for hemodialysis patients. It is because of treatment interventions, hemodialysis facilities and patient's life style.[9]CRF is accompanied by a decrease in tubular resorption of magnesium ions, lower magnesium intake and diminished intestinal absorption of this element.[10]The present study was conducted to assess serum magnesium and zinc level in patients with chronic renal failure.

In present study,group I had 45 males and 35 females and group II had 42 males and 38 females.Adejumo et al[11]determined the prevalence and pattern of dyslipidaemia in 105 pre-dialysis CKD patients. The mean age of the CKD and control subjects were 46.98±16.81 and 47.57±15.97 years respectively with a male:female ratio of 1.7:1. The median atherogenic index of plasma (AIP), low density lipoprotein-cholesterol and triglyceride (TG) were significantly higher in the CKD patients while mean high density lipoprotein-cholesterol (HDL-C) was significantly lower in the CKD patients. The overall prevalence of dyslipidaemia in the CKD patients was 60% which was significantly higher than 39% in the control. The prevalence of high AIP, elevated TG and reduced HDL-C increased with worsening renal function. Dyslipidaemia was commoner in female CKD patients and those who were ≥ 45years (p=0.94).

We observed that mean magnesium level before dialysis in group I was 2.81 µg/L and after treatment was 1.92 µg/L. In group II, the mean magnesium level before dialysis was 2.01 µg/L and after was 1.95 µg/L. The mean zinc level before dialysis in cases was 273.2 µg/L and after was 174.5 µg/L. In group II, the mean zinc level before dialysis was 293.7 µg/L and after was 216.4 µg/L.Mahajan et al[12] conducted a study who studied Zn metabolism in patients with renal transplantation and functioning allograft up to 96 months after the transplant. They

concluded that subnormal plasma and hair zinc, as well as hyperzincuria, were present in patients less than 12 months post- transplant. In contrast, patients who were more than 12 months post- transplant had plasma zinc levels, hair zinc, and urinary zinc excretions in the normal range. Zinc concentrations in plasma and hair of some patients who were more than 12 months post- transplant with renal failure, were subnormal and were similar to those in hemodialysis patients. These results suggest that abnormalities of zinc and taste persist up to 12 months post- transplant and may be related to increased urinary zinc losses.

Sanchez et al[13]studied nutritional status for magnesium and zinc were changed by a nutritional intervention providing patients with CRF with enough information to prepare a low protein diet that met their needs. The effects of the intervention were compared in 40 adult participants divided into two groups. The control group consumed their usual prescribed diet, and the nutritionally instructed group received dietary training to teach them how to choose foods that met their nutritional needs. Magnesium and zinc were measured in plasma at the start and at the end of the study. Participants in the nutritionally instructed group decreased their protein intake and increased that of carbohydrates, magnesium and zinc. Plasma zinc correlated with glomerular filtration rate, measured as creatinine clearance, (r = 0.37) plasma protein (r = 0.39) and zinc intake (r = 0.63). After the intervention, they observed no changes in the number of participants with hypomagnesaemia in either group, whereas hypozincaemia was found in only 1 participant in the control group and 1 in the instructed group.

CONCLUSION

Authors found that level of zinc and magnesium falls after dialysis especially in patients with chronic renal failure (CRF).

REFERENCES

1. Sandstead HH. Trace elements in uremia and hemodialysis. Am J Clin Nutr. 1980;33(7):1501–8.
2. Berlyne GM, Diskin C, Gonick H, Dobbie J, Prasad A. Trace elements in dialysis patients. ASAIO Trans Am Soc Artif Internal Organs. 1986;32(2):662–70.
3. Richard MJ, Arnaud J, Jurkovitz C, Hachache T, Meftahi H, Laporte F, et al. Trace elements and lipid peroxidation abnormalities in patients with chronic renal failure. Nephron. 1991;57(1):10–5.
4. Gallery ED, Blomfield J, Dixon SR. Acute zinc toxicity in haemodialysis. Br Med J. 1972;4(5836):331–3.
5. Sharma K, Mittal DK, Kesarwani RC, Kamboj VP, Chowdhery. Diagnostic and prognostic significance of serum and tissue trace elements in breast malignancy. Indian J Med Sci. 1994;48(10): 227–32.
6. Bender JE, Kapadia AJ, Sharma AC, Tourassi GD, Harrawood BP, Floyd CE Jr. Breast cancer detection using neutron stimulated emission computed tomography: prominent elements and dose requirements. Med Phys. 2007;34(10):3866–71.
7. Manzanares W, Biestro A, Galusso F, Torre MH, Manay N, Pittini G, et al. Serum selenium and glutathione peroxidase-3 activity: biomarkers of systemic inflammation in the critically ill? Intensive Care Med. 2009;35(5):882–9.
8. Kalantar-Zadeh K, Kopple JD. Trace elements and vitamins in maintenance dialysis patients. Adv Ren Replace Ther. 2003;10(3):170–82.
9. Bogden J, Oleske J, Weiner B, Smith L, Najem G. Elevated plasma zinc concentrations in renal dialysis patients. Am J Clin Nutr. 1980;33(5):1088–95.
10. Piechota W, Dobrucki T, Symonowicz N, Wadowska E, Murkowska E. Zinc in patients with chronic renal failure. Int Urol Nephrol. 1983;15(4):377–82.
11. Adejumo OA, Okaka EI, Ojogwu LI. Lipid profile in pre-dialysis chronic kidney disease patients in southern Nigeria. Ghana medical journal. 2016 Apr 7;50(1):44-9.
12. Mahajan SK, Abraham J, Hessburg T, Prasad AS, Migdal SD, Abu-Hamdan DK, Briggs WA, McDonald FD. Zinc metabolism and taste acuity in renal transplant recipients. Kidney Int Suppl. 1983 Dec;16:S310–4.
13. Sánchez C, Aranda P, de la Cruz AP, Llopis J. Magnesium and zinc status in patients with chronic renal failure: influence of a nutritional intervention. Magnesium research. 2009 Jun 1;22(2):72-80.