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Original Research

Assessment of serum magnesium and zinc level in patients with chronic renal failure

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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:** 72 chronic renal failure patients of both genders were enrolled. 2 groups were prepared. Group I had CRF patients undergoing hemodialysis patients and group II had control subjects. Serum samples were separated and analysed using atomic absorption technique and according to the instruction of apparatus. **Results:** Group I had 42 males and 30 females and group II had 45 males and 27 females. The mean zinc level before dialysis in cases was 281.6 µg/L and after was 172.3 µg/L. In group II, the mean zinc level before dialysis was 290.4 µg/L and after was 210.2 µg/L. The mean magnesium level before dialysis in cases was 2.9 µg/L and after was 1.8 µg/L. In group II, the mean magnesium level before dialysis was 2.04 µg/L and after was 1.92 µg/L. The difference was significant in group I (P< 0.05). **Conclusion:** Level of zinc and magnesium fall significantly after dialysis especially in patients with chronic renal failure, hence there is need to assess the level of these trace elements periodically.

Key words: Chronic kidney disease, Magnesium, Zinc

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INTRODUCTION

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.[1] 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.[2]

Hemodialysis is a frequent interventional treatment method because of high prevalence of chronic kidney disease (CKD).[3] It is reported that hemodialysis results into the loss of some trace elements such as manganese, selenium and zinc. On the other hand, the importance of trace elements measurement for monitoring the effect of long-term hemodialysis on the trace elements blood level, is suspicious. Determination of essential trace elements is important for hemodialysis patients. It is because of treatment interventions, hemodialysis facilities and patient's life style.[4] CRF is accompanied by a decrease in tubular resorption of magnesium ions, lower magnesium intake and diminished intestinal absorption of this element. 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 magnesium and zinc level in patients with chronic renal failure.

MATERIALS & METHODS

The present study comprised of 72 chronic renal failure patients of both genders. All were enrolled once they agreed to participate in the study.

Data such as name, age, gender etc. was recorded. 2 groups were prepared. Group I had CRF patients

undergoing hemodialysis patients and group II had control subjects. Serum samples were separated and analysed using atomic absorption technique and according to the instruction of apparatus. Data thus obtained were analysed using IBM Statistical Package for Social Sciences. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Groups	Group I	Group II
Status	CRF	Control
M:F	42:30	45:27

Table I shows that group I had 42 males and 30 females and group II had 45 males and 27 females.

Table II Comparison of zinc level in both groups

Zinc level (µg/L)	Group I	Group II	P value
Before	281.6	290.4	0.09
After	172.3	210.2	0.05
P value	0.02	0.15	

Table II, graph I shows that mean zinc level before dialysis in cases was 281.6 µg/L and after was 172.3 µg/L. In group II, the mean zinc level before dialysis was 290.4 µg/L and after was 210.2 µg/L. The difference was significant in group I (P< 0.05).

Graph I Comparison of zinc level in both groups

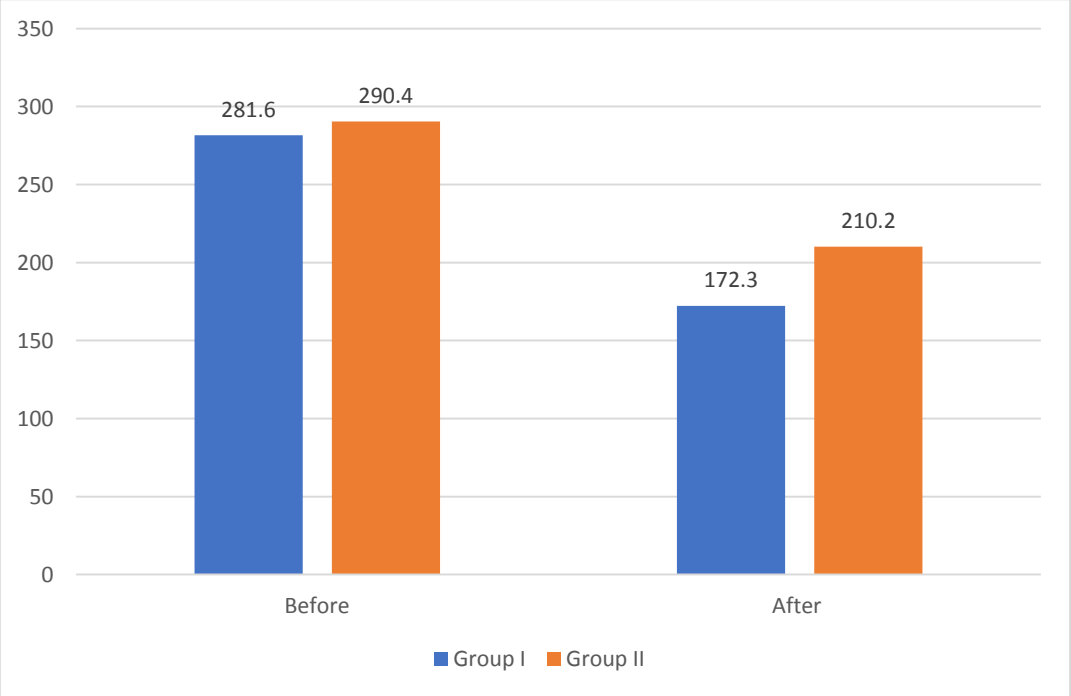
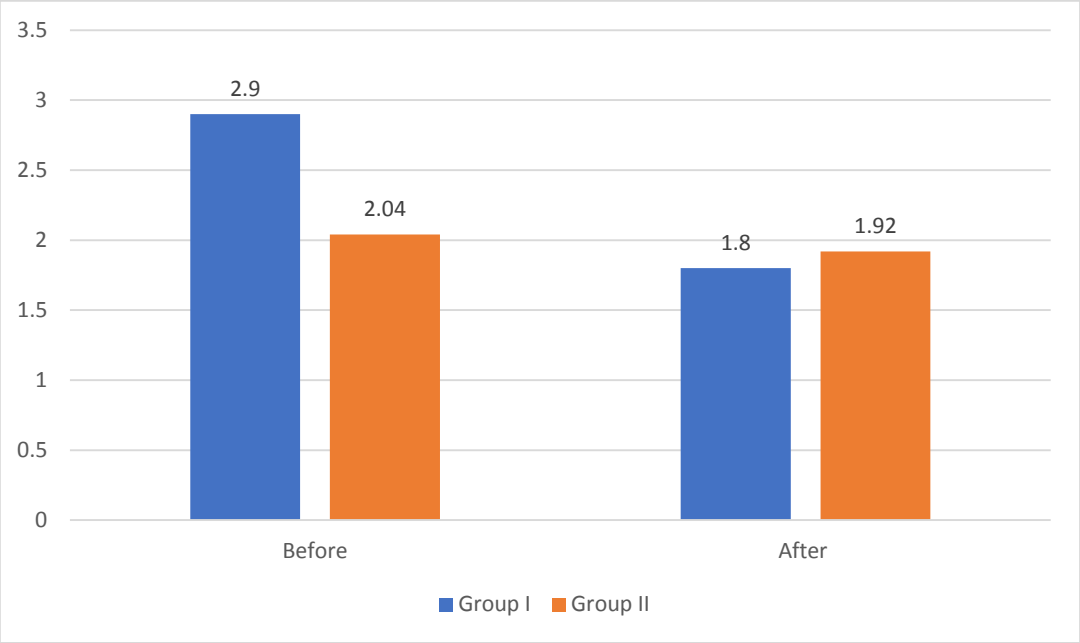


Table III Comparison of magnesium level in both groups

Magnesium level (µg/L)	Group I	Group II	P value
Before	2.9	2.04	0.81
After	1.8	1.92	0.91
P value	0.05	0.17	

Table III, graph II shows that mean magnesium level before dialysis in cases was 2.9 µg/L and after was 1.8 µg/L. In group II, the mean magnesium level before dialysis was 2.04 µg/L and after was 1.92 µg/L. The difference was significant in group I (P< 0.05).

Graph II Comparison of magnesium level in both groups



DISCUSSION

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.[6] Zinc deficiency in CRF may also be partly due to impaired intestinal absorption, alterations in tubular transport or loss of ion-transporting plasma proteins. Nutritional intervention for CRF is complicated. A complex diet, combined with sickness and reduced food intake, puts the patient at risk of malnutrition.[7] The goals for nutritional intervention are to maintain or improve nutritional status and prevent malnutrition, to implement an appropriate diet and nutritional prescriptions based on nutritional status, and to facilitate compliance with the nutritional intervention through education and monitoring.[8] The diet and nutritional prescriptions should be individualized to make it easy for the patient to follow. The prescription is based on the nutritional requirements and the patient's food preferences and clinical conditions.[9] The present study was conducted to assess serum magnesium and zinc level in patients with chronic renal failure.

In present study, group I had 42 males and 30 females and group II had 45 males and 27 females. Ahmadipour et al[10] compared the levels of Zn and Mg in a group of hemodialysis patients and normal individuals. Fifty-three hemodialysis patients and 51 control individuals were randomly analyzed for Zn and Mg serum levels. Comparison of before or after dialysis and with normal individuals was done and receiver operating characteristics (ROC) curves were plotted to evaluate the analytical sensitivity and specificity of Zn and Mg determination. Zinc serum levels were decreased after hemodialysis insignificantly ($P = 0.201$) but Mg levels were decreased significantly ($P = 0.000$). Both Zn and Mg levels, before and after hemodialysis were meaningfully lower than normal controls ($P < 0.05$). ROC analysis showed that the area under the curve was high for Zn levels both before and after hemodialysis but it was high for Mg only before hemodialysis. Current study shows that serum Zn and Mg measurements can have clinical importance. Both before and after hemodialysis, serum Zn = 297.5 µg/L and Mg = 2.295 µg/L are proposed as cut-off values with about 90 % specificity, for monitoring of these two element in hemodialysis patients. It is suggested that clinicians consider the measurement of these trace elements for hemodialysis patients routinely or periodically as clinical chemistry tests.

We found that mean zinc level before dialysis in cases was 281.6 µg/L and after was 172.3 µg/L. In group II, the mean zinc level before dialysis was 290.4 µg/L and after was 210.2 µg/L. Sanchez et al[11] determined whether 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). At the start of the study 1 participant in the control group and no

participants in the instructed group had hypomagnesaemia (< 1.8 mg/dL) whereas 2 participants in the control group, and 5 in the instructed group had hypozincaemia (Zn < 70 µg/dL). After the intervention we 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 (changes in the instructed group were significant; $p < 0.05$).

We found that mean magnesium level before dialysis in cases was 2.9 µg/L and after was 1.8 µg/L. In group II, the mean magnesium level before dialysis was 2.04 µg/L and after was 1.92 µg/L. Hsieh et al[12] evaluated serum concentrations of Cu, Se, Zn, Mn, and Ni in a relatively large population of hemodialysis patients compared with healthy age-matched controls. Comparisons were also done by duration of hemodialysis treatment to see whether length of treatment correlates with severity of imbalance. Patients had significantly lower concentrations of the three elements Se, Zn, and Mn. Patients had significantly higher concentrations of Ni, and there was a positive correlation between duration and severity of imbalance for this one element. There was no difference in Cu concentrations between patients and controls.

CONCLUSION

Authors found that level of zinc and magnesium fall significantly after dialysis especially in patients with chronic renal failure, hence there is need to assess the level of these trace elements periodically.

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