

## **Analysis of Calcium Phosphate Product and Total Parathyroid Hormone in Pre- and Post-Dialysis Patients admitted in Selected Hospitals in Indore**

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### **Introduction**

Patients with chronic renal illness may exhibit abnormalities in their mineral metabolism (CKD). Patients with chronic renal disease are at greater risk for mineral and bone illnesses due to their increased likelihood of developing calcific cardiovascular abnormalities (MBD). Abnormalities in blood calcium, phosphorus, and intact parathyroid hormone (iPTH) have all been linked to CKD-MBD, which in turn has been linked to an increase in cardiovascular morbidity and mortality. According to the Kidney Illness Improving Global Outcomes recommendations, the clinical disease that includes mineral, bone, and calcific cardiovascular concerns as a result of CKD should be called CKD-MBD. Hyperphosphatemia, elevated iPTH, and decreased 1,25(OH)<sub>2</sub>D result when the kidneys are unable to excrete an adequate amount of phosphate load due to the progression of chronic kidney disease (CKD). When 1,25(OH)<sub>2</sub>D levels are low, calcium is taken into the body less efficiently in the intestines. Th

e iPTH plays a crucial role in regulating calcium and phosphorus levels. Patients in stage 3 of chronic renal disease should have their serum calcium, phosphorus, intact parathyroid hormone (iPTH), and alkaline phosphatase activity measured regularly. Recent studies done at many centres have indicated that only a small percentage of hemodialysis (HD) patients had calcium, phosphorus, and iPTH levels within the goal limits specified by the Dialysis Outcomes Quality Initiative of the National Kidney Foundation. However, despite the positive correlation between them, the average serum phosphorous and iPTH levels were negatively correlated with one another. In a study of nearly a hundred chronic HD outpatients, it was found that less than 10% of patients were simultaneously kept within the goal limits of these parameters. There is substantial evidence from observational studies showing that those with high levels of calcium-phosphate product and iPTH are at a higher risk of cardiovascular events and

fatalities. Patients with CKD who undergo dialysis and experience improvement serve as live evidence that the therapy is beneficial in keeping mineral levels within the normal range; hence, nephrologists and patients alike regard dialysis as the treatment of choice. This research aims to determine whether or not patients on renal dialysis have changes in their blood levels of calcium, phosphorus, and iparathyroid hormone (iPTH) (CKD).

## Methodology

From March of 2019 to March of 2020, researchers at many different hospitals in Indore participated in a cross-sectional observational study. The protocol for the study was approved by the local ethics board. All research procedures followed the principles outlined in the Declaration of Helsinki. Prior to patient recruitment, written informed permission was obtained from all participants. Random enrollment was used to divide patients with CKD stage 3 who were seen in the outpatient departments of certain Indore hospitals during the study period into two groups: those who had not yet begun dialysis and those who had been on the treatment for at least five months. Participants had to have an eGFR of 30 or lower as determined by the Cockcroft-Gault method, which is consistent with having CKD stage 3. Steroid use was also prohibited, and neither primary bone disease nor primary parathyroid condition were permitted to participate in the trial. We took down details like age, sex, height, and eGFR to get a general picture of the population. Using colorimetric techniques and automated equipment, serum calcium, phosphorus, and iPTH levels were regularly tested in clinical labs.

## Results

Two hundred patients were involved in the clinical trial, with one hundred assigned to the "pre-dialysis" group and the other hundred assigned to the "dialysis" group. In terms of demographics, we can say that patients' average ages were 51.02 years before they began dialysis and 50.73 years after they began the treatment. Patients between the ages of 49 and 60 constituted the bulk of this demographic. The proportion of men to women among the patients was quite similar across the two groups. Patients weighed an average of 64.27 kilogrammes before starting dialysis; after starting the treatment, they gained

an average of 2.8 kilogrammes, bringing their new weight to 68.16 kilogrammes. The majority of laboratory measurements, including eGFR, urea, and creatinine, showed similar mean values for both groups. Dialysis patients had significantly lower blood calcium levels than pre-dialysis patients (7.86 mg/dL vs. 7.54 mg/dL,  $P = 0.0283$ ). Despite the lack of statistical significance ( $P = 0.39$ ), calcium levels were similar between the two sets of patients. When comparing the two groups, there was no discernible difference in the mean serum phosphorus or calcium-phosphate product levels. Patients in the dialysis group had a significantly higher likelihood of having serum phosphorus levels above 4.5 mg/dL than those in the pre-dialysis group ( $P = 0.002$ ). High phosphorus levels ( $>4.5$  mg/dL) were 2.39-fold more common in the dialysis group compared to the pre-dialysis group (OR, 2.53; 95% CI, 1.22-31.0;  $P = 0.02$ ). The pre-dialysis group had significantly higher blood iPTH levels than the dialysis group. This was because pre-dialysis patients had already been on dialysis. Elevated iPTH levels were found to be more common among patients in the pre-dialysis group (89.0%) than among those in the post-dialysis group (47.0%;  $P = 0.001$ ). A difference in iPTH risk of 1442% was observed between the pre- and post-dialysis groups (OR, 14.42; 95% CI, 4.4-47.29;  $P = 0.001$ ).

There was no statistically significant correlation between the patients' phosphorus and calcium levels, as shown by the distributions of these two variables. In comparison to individuals with calcium levels below 8.6 mg/dL, those with calcium levels between 8.8 and 11.2 mg/dL had a 79.12 percent greater probability of having elevated iPTH levels ( $Z = 4.62$ ;  $P = 0.001$ ). There was a 2.79-fold increase in the likelihood of an elevated iPTH in those with calcium levels below 8.8 mg/dL compared to those with calcium levels between 8.8 and 11.2 mg/dL (OR, 2.79; 95% CI, 1.44-8.42;  $P = 0.01$ ). It was shown that the risk of an increased iPTH was 66.8% higher in individuals with phosphorus levels between 2.7 and 4.7 mg/dL compared to those with phosphorus levels above 5.2 mg/dL ( $Z = 3.48$ ;  $P = 0.001$ ), and it was 3.44 times higher in those with phosphorus levels above 4.5 mg/dL.

## Conclusion

The blood calcium and iPTH levels of CKD patients on dialysis are typically lower than those of CKD patients who do not undergo dialysis. Because of this, keeping serum calcium, phosphorus, and iPTH levels within the specified reference range

requires regular monitoring and appropriate intervention. Patients with CKD who are undergoing dialysis nevertheless have an elevated risk of developing mineral problems, illustrating the need for this method.

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