

Comparative Study of Dialysis Patients' Total Parathyroid Hormone and Calcium Phosphate Product

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Introduction

Patients with chronic renal illness may exhibit abnormalities in their mineral metabolism . Patients with chronic renal disease are at greater risk for mineral and bone illnesses due to their increased likelihood of developing calcific cardiovascular abnormalities . Abnormalities in blood calcium, phosphorus, and intact parathyroid hormone 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)₂D 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)₂D 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 parathyroid hormone.

Methodology

From February 2022 to March 2022, many hospitals in Madhya Pradesh, India, took part in cross-sectional observational research. There was approval for the study's methodology from the relevant institutional review board. The Declaration of Helsinki was followed in all of the research. Before enrolment, every individual gave their written approval. During the study period, patients with CKD stage 3 who attended the outpatient clinics of participating hospitals in Indore were recruited at random and subsequently divided into two groups: those who had not yet begun dialysis and those who had been on the treatment for at least five months. Stage 3 chronic renal disease is associated with an eGFR threshold of 30 according to the Cockcroft-Gault method. In addition to steroid users, patients with primary parathyroid disease or metabolic bone disease were not allowed to participate in the research. Data including age, sex, height, and eGFR were collected to provide a general idea of the population (eGFR). Clinical labs often tested serum calcium, phosphorus, and iPTH levels using colorimetric techniques and automated equipment.

Results

A total of 300 patients took part in the study, 100 of them were placed in the "pre-dialysis" group and 200 in the "dialysis" group. The average age of patients was 42.03 years before beginning dialysis and 49.15 years after commencing treatment. Numerous patients were in their 50s and 60s, although the median age was above 40. The percentage of male patients was comparable across the two groups. Patients weighed a mean of 62.31 kg before beginning dialysis and gained an average of 3.2 kg throughout the first three months of treatment, bringing their total weight to 64.24 kg. Generally speaking, the lab results for the two groups were quite comparable. Blood calcium levels in dialysis patients were considerably lower than in nondialysis patients (8.17 mg/dL vs. 8.28 mg/dL, $P = 0.052$). Calcium levels did not vary significantly ($P = 0.52$) between

the two patient groups, indicating that they were comparable. The average blood concentrations of phosphorus and calcium-phosphate products were similarly low in both study groups. Patients on dialysis were more likely to have blood phosphorus levels over 4.5 mg/dL compared to those who weren't on dialysis. Dialysis patients had a hyperphosphorusemia prevalence 3.21 times higher than the general population. There was a significant difference in iPTH levels between the pre-dialysis and dialysis groups. This is due to the fact that people in pre-dialysis have previously undergone the dialysis procedure. Patients with high iPTH levels were found to be more prevalent in the non-dialysis group (87.12%) than in the dialysis group (10.58%). Those who had had dialysis had a 15.51 percentage point lower occurrence of iPTH than those who had not.

Distributions of phosphorus and calcium in the patients showed no statistically significant relationship. Compared to individuals with calcium levels below 6.8 mg/dL, those with calcium levels between 6.8 and 10.7 mg/dL were 70.14 percent more likely to have increased iPTH levels. If your calcium level is less than 8.1 mg/dL, your risk of having an elevated iPTH is 3.16 times higher than if it were between 8.4 and 10.3 mg/dL. In comparison to those with phosphorus levels above 5.1 mg/dL, the risk of an elevated iPTH was 68.1% greater in those with phosphorus levels between 3.6 and 5.6 mg/dL ($Z = 4.11$ $P 0.001$), and the risk was 8.99 times higher in those with phosphorus levels above 4.5 mg/dL.

Conclusion

Blood calcium and iPTH levels were often lower in CKD patients on dialysis compared to those on maintenance treatment alone. Thus, serum calcium, phosphorus, and iPTH levels must be monitored regularly and adjusted as necessary to stay within the acceptable reference range. Patients with CKD who undergo dialysis are at a higher risk of developing mineral deficiencies, highlighting the need for this strategy.

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