# Changes in Patients with End Stage Renal Disease on Maintenance Haemodialysis and Newly Diagnosed End Stage Renal Disease (2005)

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**Background**

Secondary hyperparathyroidism and renal bone disease are invariable consequences of chronic kidney disease. Calcitriol deficiency, hypocalcemia and hyperphosphatemia are responsible for raised parathyroid hormone and renal bone disease in both pre-dialysis and maintenance dialysis patients. Calcitriol therapy and control of serum phosphate with protein restricted diet and phosphate binders result in correction of hyperparathyroidism and reversion of the renal bone histology. Since the initiation of nephrology service in Nepal, these therapies are practiced in all chronic kidney disease patients without any studies on the severity of hyperparathyroidism, renal bone disease and the beneficial and adverse effects of these drugs. So this study was carried out to initiate the study on renal bone disease and to see the degree of hyperparathyroidism, hypocalcemia, hyperphophatemia and the radiological changes in Nepalese patients with end stage renal disease on maintenance haemodialysis (ESRD on MHD) and newly diagnosed end stage renal disease (NESRD) and to evaluate the beneficial effect of haemodialysis on secondary hyperparathyroidism.

**Methods**

Twenty three (16 male, 7 female) end stage renal disease on maintenance haemodialysis patients with twice a week dialysis for 6 to 78 (22 + 3, mean + SEM) months with protein restricted diet and calcium acetate as a phosphate binder but without calcitriol therapy and twenty three ( 16 male, 7 female) newly diagnosed end stage renal disease patients without protein restricted diet, phosphate binder and calcitriol therapy were included in this study and fasting blood samples were collected for estimation of serum intact parathyroid hormone (PTH), calcium, phosphate and alkaline phosphatase and all were subjected to X-ray hands A/P view and X-ray lumbosacral spine lateral view.

**Results**

Serum intact parathyroid hormone was found to be significantly lower (z = -4.251, p <0.0001) in end stage renal disease on maintenance haemodialysis (mean + SD) 118.7 + 195.8 pg/ml than in newly diagnosed end stage renal disease (mean + SD) 335.0 + 214.3 pg/ml. On grouping of study population according to K/DOQI guide line with serum intact parathyroid hormone 150-300 pg/ml as the optimal level, sub optimal parathyroid hormone level was found in 82.6% maintenance haemodialysis (<100 pg/ml in 65.2%) and 30.4% newly diagnosed end stage renal disease patients, optimal parathyroid hormone in 4.3% maintenance haemodialysis and 26.1% newly diagnosed end stage renal disease patients and hyperparathyroidism in 13% of maintenance haemodialysis and 43.5% of newly diagnosed end stage renal disease patients. In newly diagnosed end stage renal disease patients parathyroid hormone level was found to be >100 pg/ml in all but one patient. On grouping of end stage renal disease on maintenance haemodialysis patients according to dialysate calcium concentration, mean parathyroid hormone level was found to be significantly lower (F=7.984, p < 0.05) in high dialysate calcium (1.75 mmol/l) group [45.3 + 40.8 pg/ml (mean + SD)] than in low dialysate calcium (1.25 mmol/l) group [256.4 + 289.9 pg/ml (mean + SD)]. Serum calcium was found to be significantly higher (t = 6.86, p<0.00001) in maintenance haemodialysis (mean + SD) 9.6 + 1.2 mg/dl than in newly diagnosed end stage renal disease (mean + SD) 6.9 + 1.4 mg/dl. On grouping of study population according to serum calcium level, end stage renal disease on maintenance haemodialysis patients showed hypocalcemia in 17.4%, normocalcemia in 56.5% and hypercalcemia in 26.1% patients and newly diagnosed end stage renal disease showed severe hypocalcemia with serum calcium (mg/dl) of 6.6 + 1.1 (mean + SD) in 91.3% patients. Serum phosphate was found to be significantly lower (t = -2.43, p<0.05) in end stage renal disease on maintenance haemodialysis (mean + SD) 7.9 + 2.3 mg/dl than in newly diagnosed end stage renal disease (mean + SD) 10.3 + 4.1 mg/dl. On grouping according to K/DOQI, normal serum phosphate of 3.5 – 5.5 mg/dl was found in 8.7% of end stage renal disease on maintenance haemodialysis and 13% of newly diagnosed end stage renal disease. Hyperposphatemia was observed in 91.3% end stage renal disease on maintenance haemodialysis patients with serum phosphate (mg/dl) of 8.2 + 2.3 (mean + SD) and in 87% of newly diagnosed end stage renal disease patients with serum phosphate (mg/dl) 11.2 + 3.6 (mean + SD). Parathyroid hormone showed negative correlation with serum calcium and positive correlation with serum phosphate in both groups but statistically significant positive correlation of parathyroid hormone and phosphate was observed only in newly diagnosed end stage renal disease patients. Osteopenia and osteoarthritis were the dominant radiological findings along with tuft erosion, radius bone erosion, rugger jersey spine and vascular calcification. None of these findings showed any relation with parathyroid hormone level in both groups.

**Conclusions**

Hypocalcemia, hyperphosphatemia and hyperparathyroidism are the invariable consequences of chronic kidney disease and it becomes severe in advanced renal failure if not treated earlier. Maintenance haemodialysis and calcium containing phosphate binder therapy can control the hypocalcemia, hyperphosphatemia and secondary hyperparathyroidism even without calcitriol therapy. Hyperphosphatemia still remains a significant problem in maintenance haemodialysis patients. Undue suppression of parathyroid hormone has occurred in maintenance haemodialysis and probably it is related to high dialysate calcium with calcium containing phosphate binder therapy. Plain X-rays have not been found helpful to diagnose renal bone disease.

**Keywords:** calcitriol deficiency; end stage renal disease; haemodialysis; hyperparathyroidism; hyperphosphatemia; hypocalcemia; parathyroid hormone; renal bone disease.