

# Renal osteodystrophy

**Renal osteopathy** (renal osteodystrophy) is a collective name for the skeletal changes within the complex *disorder of phosphocalcium metabolism* that occur in chronic kidney disease. Today it is classified among the three components of CKD-MBD (bone and mineral disorder in chronic kidney disease). The clinical picture is very multifaceted due to the fact that individual factors apply to each patient at a given time in different intensity. Manifestations include osteopenia, osteomalacia, secondary hyperparathyroidism and growth retardation.

## Pathogenesis

Skeletal changes are caused in renal failure by three mechanisms:

### Tubular Dysfunction

Low pH due to renal acidosis unbinds calcium and phosphorus ions from the hydroxyapatite structure. This results in demineralization of the bone matrix and osteomalacia.

### Generalized renal failure

It leads to a decrease in phosphate excretion due to insufficient renal elimination, thus creating chronic hyperphosphatemia. Hyperphosphatemia stimulates the parathyroid glands, which contributes to secondary hyperparathyroidism.

### Decreased production of enzymes and growth factors

The kidneys secrete an enzyme (1-hydroxylase) that converts vitamin D into an active form and also secrete the protein BMP-7. A decrease in active vitamin D3 (calcitriol) leads to hypocalcemia and contributes to secondary hyperparathyroidism. Calcitriol deficiency increases the secretion of parathyroid hormone (PTH), which activates 1-hydroxylase, thereby adjusting the level of calcitriol in the blood, but hyperparathyroidism occurs. However, with progressive failure, this compensatory mechanism is insufficient and hypocalcemia occurs. BMP-7 produced by renal tubular cells induces osteoblast proliferation and differentiation. Its reduced production thus leads to osteopenia.

## Links

### Related Articles

- Renal failure
- Hyperparathyroidism
- Osteopenia
- Osteomalacia
- Hyperphosphatemia

### References

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- VIKRANT, Sanjay – PARASHAR, Anupam. Prevalence and severity of disordered mineral metabolism in patients with chronic kidney disease: A study from a tertiary care hospital in India. *Indian J Endocrinol Metab* [online]. 2016 Jul-Aug, vol. 20, no. 4, p. 460-7, Available from <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4911834/?tool=pubmed>>. ISSN 2230-9500 (print), 2230-8210.