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Vitamin D and kidney disease

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1. **Title** – Vitamin D and Kidney Disease

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2. **Key Words** – calcium, vitamin D, parathyroid hormone (PTH), parathyroid hormone related protein (PTHrP), kidney

3. **Abstract**

Calcium and phosphorus are essential minerals required for many critical biologic functions including cell signaling, energy metabolism, skeletal growth and integrity. Calcium and phosphate homeostasis are maintained primarily by regulation of epithelial calcium and phosphate cotransport in the kidney and intestine, processes that are tightly regulated by hormones including 1,25 dihydroxyvitamin D ($1,25(\text{OH})_2\text{D}$), fibroblast growth factor 23 (FGF23) and parathyroid hormone (PTH). In patients with chronic kidney disease (CKD), as renal function declines, disruption of feedback loops between these hormones have adverse consequences on several organ systems, including the skeleton, heart and vascular system. CKD-associated mineral and bone disorder (CKD-MBD) is defined as a systemic disorder of mineral and bone metabolism due to CKD manifested by abnormalities of calcium, phosphorus, PTH or vitamin D metabolism, abnormalities of bone turnover, mineralization and volume, and ectopic soft tissue calcification. Complications of CKD-MBD include vascular calcification, stroke, skeletal fracture and increased risk of death. Increased FGF23 and PTH concentrations, and $1,25(\text{OH})_2\text{D}$ deficiency contribute to the pathogenesis of CKD-MBD. Therefore, treatment of patients with CKD-MBD is focused on restoring the feedback loops to maintain normal calcium and phosphate balance to prevent skeletal and cardiovascular complications.

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