

# Bones, Chronic Kidney Disease, and Cardiovascular Disease

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- One problem that can happen early in Chronic Kidney Disease (CKD) is called CKD-MBD (Chronic Kidney Disease-Mineral and Bone Disorder). This condition is impacted by how the body balances two minerals, calcium and phosphorus.
- CKD causes increased phosphorus in the blood, triggering 4 small glands in the neck, called the parathyroid glands, to produce parathyroid hormone (PTH).
- Due to the increase in phosphorus, PTH tells the body to move calcium out of the bones and into the blood stream to help balance the amount of phosphorus and calcium in the blood.
- If PTH production stays high the body will keep taking calcium out of the bones, causing them to become weak and brittle. Vitamin D hormone produced by the kidneys helps to lower PTH and help balance calcium. Decreasing the amount of phosphorus in the food you eat may also be important. Talk to your healthcare team about the need for prescription vitamin D and whether you need to be on a low phosphorus diet.
- Calcium that was pulled out of the bones will settle into bone-like deposits. These deposits can "harden" blood vessels and damage organs like the heart, causing CVD.

## Risk Factors for Cardiovascular Disease

**High blood pressure** is the second leading cause of Chronic Kidney Disease (CKD) because it can damage blood vessel walls over time. This can decrease the amount of oxygen that can get to organs like the kidneys and heart. The high pressure can also damage the tiny filters inside the kidneys which clean our blood. If a person with CKD develops high blood pressure it is more likely that their kidney disease will get worse and they will have heart problems - Cardiovascular Disease (CVD).

**Anemia** occurs when there are not enough red blood cells (RBCs) to carry oxygen to organs and cells. Healthy kidneys produce a hormone called erythropoietin (EPO) which helps to produce red blood cells. Damaged kidneys make less EPO so people with CKD produce fewer red blood cells and less oxygen is carried. This causes the heart to work harder to circulate the oxygen needed by the other organs and cells which can cause CVD.

**Abnormal calcium and phosphorus levels can lead to CKD-MBD** (chronic kidney disease mineral and bone disorder). Early in CKD there can be changes in how the body balances calcium and phosphorus. Extra phosphorus and calcium may be removed from the bones and be deposited in blood vessels and organs. These bone-like deposits (calcification) damage blood vessels and organs like the heart, leading to CVD.

**Fluid overload** is caused by kidneys that are no longer able to remove all of the extra fluids from our bodies. Because there is more fluid to pump, the heart has to work harder and faster. Over time, this increased work load and higher blood pressure weakens the heart and damages blood vessels.

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