

# *THE EFFECT OF MAGNESIUM, VITAMIN D, VITAMIN B12, AND PHOSPHATE ON COVID-19*

About 25 million Americans have been infected with COVID-19 and about 400,000 have died because of it.

The severity of COVID-19 varies among individuals and this could be due to the variability in peoples immune system and its ability to fight it.

The human immune system is powerful and protective, but nutritional deficiencies can weaken its abilities.

One way to help boost the immune system is to have the optimal amounts of magnesium and vitamin D levels in the body.

In addition to vitamin D, magnesium is important because it activates vitamin D in the body, which helps the immune system.

In the US, about half of the adults do not consume enough magnesium.

Magnesium can help improve white blood cells (the blood cells that fight infections) function to find and kill germs/infections.

In patients with COVID-19, low magnesium and vitamin D levels have been seen.

There are inexpensive and safe ways to get these levels back up by taking nutritional supplements, which will result in a strengthened immune system.



# *COVID-19 affect on nutrients*

*Magnesium plays an important role in Vitamin D metabolism and vitamin D plays a role in calcium, phosphate and magnesium metabolism.*

*Being deficient in magnesium can compromise the status of vitamin D.*

*Phosphate and magnesium play an important role in energy metabolism. All of them are interconnected and are important for the immune system.*

*Energy metabolism is impacted in people with COVID-19.*

*Researchers have discussed how COVID-19 might cause a depletion of ATP in the cells and a dysfunction of immune cells. To regenerate ATP, phosphate and magnesium are needed.*

*When an infection is present, immune cells are activated and require higher ATP (energy) demands. To supply these demands, components like phosphate and magnesium are mobilized from stored reserves in bones and muscles. The breakdown of the muscles and bones leads to an inflammatory response but also supports the immune cells. These active immune cells use the phosphate and ATP that are available, which leads to a decrease in the amount available, and in turn leads to more break down of muscle cells to get the intracellular (inside cell) phosphate and magnesium into the extracellular (outside cell) space to be used.*

*When there isn't much of these nutrients to start with, because of age or disease, there can be an increase in breakdown of cells or a severe depletion in ATP which results in a less active/effective immune system.*

*Most of the risk factors for more severe cases of COVID-19 are associated with a deficiency in phosphate or magnesium. For example, type 2 diabetes and/or obesity increases your risk of being deficient in both phosphate and magnesium. In addition, prescribed diuretics for hypertension can increase risk of phosphate and/or magnesium deficiency. With the increase in age, the ability to reabsorb phosphate and magnesium in the kidneys decreases, which can put older adults at risk of deficiency*

*When compared to white Americans, African America had two times higher death rates from COVID-19 and twice the incidence of magnesium and vitamin D deficiency, which could be due to the increase in melanin in their skin.*

*Phosphate deficiency diminishes a molecule (2,3-bisphosphoglycerate) in red blood cells, which is needed for the release of oxygen from hemoglobin (oxygen carrying molecule). In addition, both phosphate and magnesium deficiency impedes ATP (energy) production. The decrease in the molecule in red blood cells can lead to hypoxia (low oxygen levels) in the tissues.*

*Some complications that have been seen in COVID-19 patients that are also seen when deficient in phosphate include: thrombocytopenia, coagulopathy, dysfunction of liver and kidneys, neurologic disturbances, immunodeficiency, delayed weaning from a respirator, rhabdomyolysis, failure of heart and lungs, multiorgan failure. In addition, there are some complications from being deficient in magnesium that have been seen in COVID-19 patients including cardiac arrhythmia and seizure.*

*When phosphate and magnesium are low it can result in low levels of intracellular ATP, which can result in cells dying from necrosis, membrane instability, and ATP being released into the extracellular space. The extracellular ATP can act as a danger signal and start an over-activation of the immune system.*

*In a study, patients with COVID-19 were supplemented with vitamin D, magnesium, and vitamin B12. The results showed that significantly less patients required oxygen support and/or intensive care support.*

*The study concluded that when deficient, supplementing with vitamin D, magnesium, and phosphate might diminish complications or possibly help prevent COVID-19.*



# *Magnesium*

Some individuals who get COVID-19 suffer from serious cardiac damage and can develop hypertension (high blood pressure).

Magnesium has been known to protect the heart, it has anti-arrhythmic (keeps heart rhythm normal), anti-oxidative (keeps oxidative stress/damage low), and anti-apoptotic (protects against cellular death) effects.

Magnesium's anti oxidation property helps decrease the risk of abnormal cardiovascular function.

## *Magnesium, Vitamin D, & Vitamin B12*

*Magnesium plays a role in vitamin D metabolism and has bronchodilator and vasodilator activity.*

*Vitamin D plays a role in the protection of respiratory structures and function.*

*Vitamin B12 helps gut bacteria health, which is important for a healthy and effective immune system.*

*In a study done on COVID-19 patients, half the patients were given vitamin D, magnesium, and vitamin B12 for about two weeks. The results showed that with the supplementation, the odds of requiring oxygen went down.*

*Concluding that nutritional supplementation could be beneficial to help with COVID-19, especially for those in low to middle income countries that might not be able to afford vaccines.*

*In addition, these vitamins and minerals might be equally effective for other viral infections.*

## *References*

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