# Study finds low vitamin D levels in northern California residents with metabolic syndrome

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Researchers from the UC Davis Health System have found that compared with healthy controls, blood levels of vitamin D are significantly reduced in patients in the Sacramento area with metabolic syndrome, a constellation of disease risk factors that affects about one in three U.S. adults and predisposes them to diabetes, heart disease and stroke.

The study is the first to examine vitamin-D status in patients with metabolic syndrome living in Northern California, where the many hours of sunshine make the vitamin-D deficiency finding surprising. The study, entitled "Low vitamin D levels in North American adults with the metabolic syndrome," was published online today and will appear in the January 2011 issue of the journal *Hormone and Metabolic Research*.

"In spite of our great sun exposure in Northern California, 30 percent of patients with metabolic syndrome have vitamin-D deficiency, and even many subjects in the control group had inadequate levels," said Ishwarlal Jialal, the study's principal investigator and professor of pathology and laboratory medicine at the UC Davis Health System. "Considering our climate and healthy lifestyles here, these findings were unexpected."

The study measured serum vitamin D levels in 44 people with metabolic syndrome and compared them to 37 healthy controls matched for age and gender. They found that 30 percent of subjects with metabolic syndrome were deficient in vitamin D compared with eight percent of controls. The difference between the groups was statistically significant

and could not be explained by differences in sun exposure or other factors that are known to alter vitamin-D levels, such as kidney disease and amount of body fat. Furthermore, the low levels correlated with risk of diabetes such as insulin resistance and plasma glucose levels.

Metabolic syndrome has become highly prevalent in the United States with the obesity epidemic. The syndrome is characterized by having at least three of the following risk factors: a large waistline, a high blood-triglyceride level, a low-blood level of high-density lipoprotein (HDL) cholesterol, high-blood pressure and high-fasting blood sugar. These factors indicate disturbances in the body's metabolism, conferring at least a five-fold increased risk of developing diabetes and doubling the risk for developing cardiovascular diseases, including heart attack and stroke.

Vitamin D is a nutrient that has come under increased scrutiny in recent years as more of its roles in the human body are discovered. It has long been known to be important for healthy bone growth and maintaining normal calcium levels in the blood. More recent studies have also linked low vitamin-D levels to an increased risk of diabetes and cardiovascular disease as well as many cancers. Reduced vitamin D levels are also associated with higher fasting blood sugar, more insulin resistance and increased body fat, components of the metabolic syndrome.

Vitamin D is obtained naturally through sun exposure as well as through certain foods, including fish, liver and eggs. It can also be taken through supplements, and many dairy products, margarines and cereals are fortified with it. Although most people in California are traditionally thought to receive adequate vitamin D through routine outdoor activity, this study indicates that this is not the case in Northern California. A similar study recently conducted in Southern California found no difference in vitamin-D levels between subjects with and without metabolic syndrome, and in Florida, even diabetics do not tend to have

low vitamin-D levels. These results indicate that vitamin D levels are probably adequate for most people living in those sunny latitudes, and that metabolic syndrome and diabetes arise mostly because of other factors in those areas.

"That our results were so different from the study undertaken in Southern California was amazing to us," said Jialal, who also serves as director of the Laboratory for Atherosclerosis and Metabolic Research at UC Davis. "The difference in latitude is not that great, but apparently sun exposure in southern California is adequate and in northern California it is not."

Controversy exists surrounding optimum blood levels of vitamin D. Current government guidelines for sufficient blood levels of vitamin D as well as daily intake are based on those required for bone health and are much lower than what are now believed by many experts to help prevent cancer, diabetes and cardiovascular disease. National Institutes of Health guidelines recommend a minimum blood level of 15 ng/mL as adequate for bone and overall health. However, many experts now feel that 30 to 100 ng/mL should be the goal. Levels above 150 ng/mL are potentially toxic and can be life-threatening.

In this study, vitamin D levels averaged 23.1 ng/mL among people with metabolic syndrome and 27.8 ng/mL in healthy controls, a difference that was found to be significant. Vitamin D deficiency in this study was defined as less than 20 ng/mL, and was found in 30 percent of subjects with metabolic syndrome and 8 percent of healthy controls. "Insufficiency" was defined as less than 30 ng/mL: 84 percent of the metabolic syndrome group and 67 percent of controls were found to have insufficient levels.

Jialal's team intends to continue to investigate the connections between vitamin D and metabolic syndrome. They plan to study diets of subjects

with and without metabolic syndrome to determine whether vitamin D intake is adequate. According to Jialal, it is possible that people with metabolic syndrome have higher than average needs for vitamin D. Because the vitamin is fat-soluble, it tends to get sequestered in fat, making it less likely to circulate in the blood and to be available to other tissues.

They also plan to undertake a study on vitamin D supplementation for people with metabolic syndrome to see if it lowers fasting blood sugars and increases insulin sensitivity, trends that would lower the risk of developing diabetes.

"We have the potential to significantly delay or prevent the emergence of diabetes, heart attacks and strokes in people with metabolic syndrome through vitamin D supplementation," said Dr. Jialal. "This may offer a very simple yet powerful weapon to combat this burgeoning health problem in our society."

Provided by University of California - Davis Health System