

News and Views

Visakamutharasi M, Pravati Pal

Department of Physiology, Jawaharlal Institute of Post-graduate Medical Education and Research, Puducherry, India.

*Correspondence

Visakamutharasi M

Department of Physiology, Puducherry, INDIA

Email: dr.visaka@gmail.com

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NEWS

Role of Vitamin D in Cardiovascular Autonomic Function in Diabetes Mellitus

In India, the most encountered metabolic disorder is Type 2 Diabetes Mellitus (T2DM). T2DM is one of the chronic diseases, and there would be 80 million diabetic individuals in India by 2030.^[1] Even though it is usually of adult type, nowadays it is observed frequently in the younger age group. Almost all systems in our body are affected by this disorder.

Vitamin D is a fat-soluble vitamin present in sunlight and in certain foods. Vitamin D supports the immune system, cardiovascular system, and it also regulates insulin levels. Vitamin D is a neuroactive substance which stimulates central nervous system to keep the sympathetic and parasympathetic nervous system in balance with each other.^[2] Vitamin D Receptors (VDRs) are widely distributed in nerve fibres of the brain and spinal cord to which activated Vitamin D (1,25-dihydroxy vitamin D) binds to build up vagal activity, and this physiological function of Vitamin D is implemented by its potential to traverse the blood-brain barrier to reach the brain. Also, the biogenesis of neurotransmitters regulating cardiovascular autonomic function occurs proportionately with the help of Vitamin D.

The basal heart rate and blood pressure regulation by the sympathetic and parasympathetic nervous system are suppressed in case of low serum Vitamin D levels, and thus, Vitamin D deficiency has an adverse effect over cardiac autonomic functions.^[2] The onset and severity of cardiac autonomic neuropathy in T2DM is linked to Vitamin D.^[3] Autonomic dysfunctions like postural orthostatic tachycardia syndrome and orthostatic hypotension are associated with low Vitamin D levels.^[4]

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VIEWS

Vitamin D Deficiency is Associated with Cardiovascular Autonomic Dysfunction in Newly Diagnosed Type 2 Diabetes Mellitus

The importance of Vitamin D in pathogenesis of T2DM is well established. Hypovitaminosis D leads to a state of glucose intolerance which subsequently alters the production of insulin. This alteration in synthesis and secretion of insulin finally ends up in T2DM. The pathogenesis of hypovitaminosis D-induced T2DM is supported by the presence of any hereditary variations of VDRs and Vitamin D Binding Protein (DBP) genes, which follows the same sequence to end in T2DM. These findings are found not only in humans but also in animal experiments. To improve this pathological status caused by hypovitaminosis D, food fortification and Vitamin D supplementation were provided and improvement in glycemic status and improvement in insulin secretion were observed.

In patients with T2DM, any stress or injury that happens in the endothelium leads to its dysfunction followed by interference with nitric oxide production and release, which subsequently becomes a major pathogenesis of atherosclerosis development due to loss of its physiological action. Even the people in the prediabetic state are susceptible to atherosclerosis due to endothelial dysfunction. The course of progression to atherosclerosis occurs along with the time of progression of insulin resistance to T2DM. The inability of Autonomic Nervous System (ANS) to do normal functions and alteration of ANS activities lies behind the high mortality rate in T2DM with cardiovascular disease. Even in individuals diagnosed newly with T2DM, there was increased sympathetic and decreased parasympathetic activities.

Vitamin D supplementation can improve glucose tolerance and cardiovascular autonomic function and can thus reduce cardiovascular mortality among subjects with different stages of glucose intolerance and autonomic dysfunction. It is proven that high-dose Vitamin D supplementation (50,000 IU) every 2 weeks significantly decreases levels of insulin resistance in pregnant women with Gestational Diabetes Mellitus (GDM). Vitamin D is an important marker of sympathovagal balance, which was found to be low in newly diagnosed T2DM. Vitamin D deficiency leads to more significant sympathovagal imbalance in newly diagnosed T2DM, which is more evident with higher deficiency of Vitamin D. There are only few reports showing the association of Vitamin D status with cardiovascular autonomic function in newly diagnosed T2DM. Hence more studies on patients are needed so that Vitamin D can be suggested as an adjunct for newly diagnosed diabetes mellitus patients in the future in addition to conventional therapy for reducing cardiovascular mortality in DM.