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Effect of vitamin D supplementation on the mitochondrial activity and glucose uptake level of skeletal muscle cells growing in hyperglycemic condition

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Recently vitamin D has been to show its association with diabetes. As per different studies, an adequate level of vitamin D is important for various cellular activities such as insulin secretion, insulin signaling and glucose uptake by target cells. In addition to vitamin D deficiency, the mitochondrial defect is also known to be an important factor causing hyperglycemia. Though vitamin D deficiency and mitochondrial defects have the same consequence on glucose metabolism, however, there are very few reports available which suggests that vitamin D also affect the mitochondrial defects. Hence our current study aims to understand the possible mechanism and link between vitamin D deficiency leading to mitochondrial defects and further causing the hyperglycemia. The rat skeletal muscle cells (L6) were grown in normal (8 mM) and high (25 mM) glucose concentration. The cells were further supplemented with MTT optimized dose of vitamin D (10-9 M) and grown at different till different time intervals of 24, 48 and 72 hrs. As a result we have demonstrated that vitamin D supplementation to L6 cells have shown the improved calcium uptake which is a preliminary parameter for vitamin D activity. Ca++ being an important cofactor of different enzymes of Kreb's cycle, also showed the improved mitochondrial enzyme activity in correlation with increased calcium uptake. The calcium uptake and NADH oxido-reductase activity was also in coordination with improved mitochondrial membrane potential, improved catalase activity and increased glucose uptake by these cells and different time intervals, when supplemented with vitamin D. Thus as per or study we conclude that vitamin D deficiency initially affect the mitochondrial metabolism which ultimately affect the glucose uptake by target cells and causes hyperglycemia. Thus vitamin D supplementation can be suggested as a part of therapy to the patients suffering from diabetes.

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