International Journal of
Endocrinology and Metabolic Disorders
ISSN 2380-548X | Open Access

EDITORIAL

Volume 4 - Issue 1 | DOI: http://dx.doi.org/10.16966/2380-548X.e106

Adjuvant Control of Diabetes without Further Expenses: Sun Ray Exposure

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Received: 22 Dec, 2017 | **Accepted:** 11 Jan, 2018 | **Published:** 17 Jan, 2018

Citation: Sliem HA (2018) Adjuvant Control of Diabetes without Further Expenses: Sun Ray Exposure. Int J Endocrinol Metab Disord 4(1): dx.doi.org/10.16966/2380-548X.e106

Diabetes Mellitus (DM) has become a significant worldwide healthcare difficulty and its reported incidence is increasing at an alarming rate. It is associated with significant morbidity and mortality due to related micro and macrovascular complications. Despite the advance in therapy and development of novel drugs, control of diabetes in most of the patients still remains scarce. That is more or less, due to high cost of therapy with consequent poor patients' compliance. Efforts are continuing toward disease prevention and search for more safe and cost-effective drugs.

Vitamin D is known as the sunshine vitamin. During exposure to sunlight the skin transforms 7-dehydrocholesterol into Vitamin D3. Daily requirement in addition to dietary sources could be obtained from sensible sun exposure. Amount of Vitamin D produced by personal effective solar Ultraviolet doses (about 20-30 minutes twice weekly) could exceed the recommended dose of 1000 IU/day [1].

Recently, increased interest has focused on the association between DM control and Vitamin D. Vitamin D is a potential immune system modulator and has been implicated in the pathogenesis of several autoimmune diseases including Type 1 DM [2]. Oral Vitamin D may serve as an adjuvant to insulin therapy for children with type 1 DM by augmenting residual beta-cell function and humanizing insulin secretion [3,4]. In addition, some studies have shown positive effects with a significant reduction in the percentage of glycated hemoglobin, insulin and glucose concentrations, changes in homeostatic model assessment-insulin resistance and beta cell, and quantitative insulin sensitivity check index [5,6]. Advising patients with higher HbA1c to test their Vitamin D level and correct any deficiency will result in better blood glucose control and benefit the patient's overall health where Vitamin D supplementation may improve the glycaemic control [7,8]. Moreover, high serum Vitamin D levels in youth, and from child to adult life, are associated with a reduced risk of developing type 2 DM in adulthood [9]. What is more, low Vitamin D concentrations are practically common in children and adolescents with Type 1 DM, treatment of which can potentially advance the glycaemic control [10].

Several studies documented associations between Vitamin D and diabetic complications. At hand, there is a statistically significant association between Vitamin D deficiency and diabetic peripheral neuropathy [11], diabetic retinopathy [12] and erectile dysfunction [13]. Vitamin D supplementation is associated with lower prevalence and improvement in stages of diabetic kidney diseases [14], an enhancement in endothelial function and reduced expression of urinary inflammatory markers in adolescents with Type 1 DM [15], and possibly will be a link between diabetes and tuberculosis vulnerability [16].

Although Vitamin D deficiency is common during pregnancy, there are conflicting reports on the effect of Vitamin D insufficiency on pregnancy complications, such as fetal growth restriction and gestational diabetes [17,18]. On argument, Bao *et al.* [19] set up increasing Vitamin D intake has prospective profit in the prevention of gestational DM in women of reproductive age.

Despite all the positive evidence emerging about the beneficial effect of Vitamin D for diabetics, Biologic plausibility in need to be clarified. Based on pre-clinical and ongoing studies, Vitamin D seems to take part in a dogmatic role in insulin release, beta-cell endurance and calcium flux within beta-cells. Insulin secretion is a calcium reliant process. As a result, alterations in calcium flux may possibly have an effect on insulin secretion. Vitamin D also regulates the function of Calbindin, a cytosolic calcium-binding protein found in pancreatic beta cells and acts as a modulator of depolarization-stimulated insulin secretion *via* regulation of intracellular calcium. Furthermore, potential effect of Vitamin D on insulin sensitivity might be exerted *via* its regulatory role in extracellular calcium concentration and flux through cell

membranes. Calcium is vital for insulin-mediated intracellular processes in insulin-responsive tissues and required for finest insulin-mediated functions. Changes in intracellular calcium in insulin target tissues may have a say to peripheral insulin resistance [20].

In conclusion, even with some authors like Lu Y *et al.* [21] who suggested "the relationship between Vitamin D and DM is fascinating and intriguing", it seems-in most studies and findings-that Vitamin D supplementation (oral or sun exposure) is a potentially simple and cost-effective approach for reducing risk of diabetes. It may play a pivotal role in regulating insulin secretion and insulin sensitivity. Furthermore, it is at the fingertips of all diabetics without further expenses. Therefore, actions are directly needed to protect the diabetics from Vitamin D deficiency. The message of indoor exercise and sun avoidance must be changed to acceptance of outdoor implement and non-burning sufficient sun exposure to achieve serum Vitamin D concentration of 30 ng/mL or higher in the sunny seasons [22,23]. In addition to the profit for diabetics, habitual exposure to ultraviolet ray contributes to have valuable effect for many other diseases like hypertension, disseminated sclerosis, and some types of cancers through immune modulation, formation of serotonin, nitric oxide, melatonin, inhibiting renin production, stimulating insulin secretion, motivating macrophage cathelicidin production, regulating up to 200 genes and the effect of sunlight on circadian clocks. As a final point, it is attractive to note, several factors can affect the amount of Vitamin D synthesis from exposure to the sun. Disclosure during the middle of the day is the most favorable, while dark skin color (excess melanin), clothes, glass, sunscreen, air pollution, and cloudy weather have off-putting effect [24].

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