ABSTRACT

Vitamin D Deficiency (VDD) is recognised as a global pandemic. It is associated with many acute and chronic illnesses and linked with pathogenesis and progression of diabetes mellitus, hypertension, and cardiovascular diseases (CVDs) through vitamin-D receptors present on various tissues and organs in the body. Diabetes mellitus (DM) is a chronic medical disorder. With explosive increase in its prevalence DM constitutes a health problem of paramount concern for a large proportion of the world's population. In the course of few decades vitamin D has evoked researcher's interest as a tool in prevention and management of DM. Evidence shows that vitamin D status is important to regulate some pathways related to diabetes development, thus making VDD even more evident in diabetic subjects. Also obesity, a condition co-exisitng with CVD and DM, is associated with a low vitamin-D status. Recent data shows, vitamin-D supplementation may improve metabolic profile in type-2 Diabetes Mellitus (T2DM) subjects. However data on the optimum dose schedule of vitamin D and for how long the improved vitamin D levels can be sustained in T2DM subjects is sparse. In view of the available literature the present study was planned in four phases in Vadodara city of Gujarat State, western India.

Phase-I was a cross sectional study in which 129 subjects of age 30-60 years were enrolled from free-living population to map the prevalence of VDD and identify the determinants for vitamin-D status. About 88% of the subjects were found to be vitamin-D deficient, with females having significantly higher prevalence of VDD as compared to males. Female gender, high BMI, high waist circumference and high WSR showed significantly higher odds for poor vitamin-D status among the subjects. The determinants thought of being related with poor vitamin-D status like sun exposure, vegetarian diet, history of fractures, skin complexion and presence of clinical conditions did not shown significant association. However percent body fat, age, TSH, haemoglobin level, total cholesterol, T3 and FBS emerged as significant predictors for the vitamin-D status among the subjects in the accepted model of multiple linear regression.

Phase-II was a clinical randomised control trial to observe the impact of vitamin-D supplementation on the serum vitamin-D levels, biophysical measurements and biochemical profile of T2DM subjects of age 30-65 years and also to examine its washout effect at the end of sixteen weeks on their cardio-metabolic profile. A total of 209 T2DM subjects were enrolled of whom, ninety-four subjects with vitamin-D level <20ng/mL,

were randomly divided into the supplementation and control groups. A drop out of twenty-four subjects was reported and hence this phase was carried on seventy subjects (40 in supplementation group & 30 in control group). The supplementation group received 60,000 IU weekly vitamin-D3 (cholecalciferol) granules for eight weeks while the control arm didn't receive any intervention. A significant rise ($p<0.001$) in serum 25(OH)D levels was observed among the supplementation group as compared to controls. However, after the washout period of eight weeks, the serum 25(OH)D levels decreased significantly ($p<0.001$) in the group. At eight weeks, the supplementation group had significantly lower levels for total cholesterol and LDL-C as compared to the control group, but none of the lipid parameter could sustain the favourable decline after the washout period. HbA1c reduced non-significantly in both the groups after the supplementation period. Among all the biophysical measurements, only waist circumference showed a significant decrease from baseline to washout period.

In Phase III of the study a comparison was made between the diabetic and non-diabetic population for biophysical measurements and biochemical parameters. A high prevalence of deficiency (around 88%) was mapped among the subjects of both the populations due to suboptimum vitamin-D levels among them. The diabetic population showed higher prevalence of almost all the metabolic conditions like anemia, hypertriglyceridemia, altered atherogenic indices, high levels of inflammatory marker Hs-CRP and metabolic syndrome as compared to the non-diabetic group. Indices of central obesity, thyroid dysfunction and LDL-C emerged as common significant suppressors of vitamin-D levels in both the populations.

In the Phase IV of the study a NHE was developed keeping in mind all the issues of vitamin D metabolism, its role in diabetes mellitus and the lifestyle changes to be adopted for preventing and managing the conditions.

Hence it could be concluded that an alarmingly high prevalence of vitamin D deficiency was observed in both the healthy and diseased population of Vadodara city. Thus creating awareness regarding the situation among all the groups of society is the need of the hour and getting the serum 25(OH)D routinely checked should be propagated. Vitamin D supplementation can be considered as a beneficial strategy to combat this epidemic among T2DM patients, however the importance of maintenance dose should be emphasised as the levels are not sustained over a period of time.

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