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Review

Vitamin supplements in type 2 diabetes mellitus management: A review

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is a major public health challenge that affects countries across the world. The use of pharmacological therapy is often limited in some patients due to a loss of effect over time or development of adverse effects such as weight gain or hypoglycaemia. This has prompted searches into the role of non-pharmacological therapies in T2DM. The availability and use of vitamin supplements in developed countries have increased significantly and there is evidence that certain vitamins may have roles in the management of T2DM. This review examines the literature assessing the use of vitamins A, C, E, D, K and the B group vitamins (B1, B3, B7, B6, B9, B12) in the management of T2DM. No clear evidence supporting the beneficial role of any specific vitamin in the treatment of T2DM was found. Thus, it is recommended that until further studies are conducted to clarify the role of such vitamins in T2DM management, they should not be routinely recommended in clinical practice.

Contents

1. Introduction

Type 2 diabetes mellitus (T2DM) is one of the greatest global public health challenges today with a steady increase in prevalence over the past three decades [1]. Management of T2DM involves the use of pharmacological agents such as oral hypoglycaemic drugs and insulin, which are effective in reducing glycaemic levels [2].

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Table 1
Summary of Results.

Study	Study Type	Participants	Intervention	Conclusion
Vitamin A				
Brazionis et al. [14]	Cross-sectional study	111 males aged 40–69 years with T2DM	Plasma concentration of carotenoid	Plasma carotenoid concentrations seem to be implicated in diabetic retinopathy, independent of established risk factors.
Rhee and Plutzky [11]	Review	Patients with acne vulgaris	Isoretinoin	Further randomised-controlled trials are required to determine the effects or retinoid treatment on insulin sensitivity and metabolism in humans.
Antioxidant Vitamins C & E				
Montero et al. [21]	Systematic review	T2DM patients	Vitamin E and/or C supplementation	Supplementation with vitamin E and/or C has no effect on endothelial function in T2DM subjects.
Afkhami-Ardekani et al. [22]	Randomised controlled trial	84 T2DM patients	500 mg or 1000 mg daily Vitamin C for 6 weeks	Consumption of 1000 mg supplementary vitamin C may be beneficial in decreasing blood glucose and lipids in patients with type 2 diabetes and thus reducing the risk of complications.
Dakhale et al. [23]	Double-blinded randomised trial	70 T2DM patients	Vitamin C 500 mg twice daily	Treatment with oral vitamin C with metformin was well tolerated and devoid of any side effects and associated with improved HbA_{1C}, making it a particularly attractive therapeutic adjuvant in treatment of T2DM.
Siavash and Amini [24]	Randomised trial	50 T2DM patients	Daily dose of 500 mg vitamin C for 3 month period	Vitamin C has similar effects to gemfibrozil on HDL-cholesterol, but no effects on other lipid concentrations
Bhatt et al [25]	Open-label randomised trial	62 T2DM patients	Daily dose 500 mg vitamin C for 3 month period	Supplementation with vitamin C resulted in a significant improvement in both total cholesterol and LDL cholesterol concentrations amongst the intervention group.
Rajanandah et al. [27]	Randomised controlled trial	92 patients with painful diabetic neuropathy	Vitamin E (400 IU) supplementation for 12 weeks	Supplementation of vitamin-E is effective in reducing some of the pain caused by diabetic neuropathy patients above 50 years of age.
Suksomboon et al. [28]	Systematic review	T2DM patients	Vitamin E supplementation in doses up to 1800 IU/day	There is no beneficial effect of vitamin E supplementation in improving glycaemic control in unselected patients with T2DM.
Lonn et al. [29]	Randomised, double-blind, placebo-controlled trial	9541 patients at high risk for cardiovascular events	Daily dose vitamin E (400 IU)	Supplementation did not lower the incidence of cancer or major cardiovascular events.
Shab-Bidar et al. [30]	Randomised controlled trial	71 T2DM patients	Daily vitamin E supplementation (800 mg) for 2 months	There was no difference in serum fasting glucose levels, HbA_{1C} and beta-cell function found between the supplemented and non-supplemented groups. The use of pharmacological doses of vitamin E does not confer additional benefits and has little clinical significance.
Vitamin B1				
Rabbani et al. [36]	Randomised controlled trial (pilot study)	40 T2DM patients	300 mg/day thiamine supplementation	Thiamine supplements may have a role in the regression of urinary albumin excretion in diabetic nephropathy.
Keogh et al. [37]	Randomised trial	84 T2DM patients	High dose supplementation 300 mg/day	Increased thiamine supplementation may be required in T2DM patients commencing a weight-loss program.
Vitamin B3: Niacin				
AIM-HIGH trial [40]	Randomised, multi-centre, prospective clinical trial	3414 participants with established cardiovascular disease	Extended-release niacin added to intensive statin therapy with mean follow-up period 3 years	There is no incremental clinical benefit from the addition of niacin to statin therapy during a 36-month follow-up period amongst patients with atherosclerotic cardiovascular disease and LDL-C levels less than 70mg per decilitre.
HPS2-THRIVE trial [41]	Randomised, double-blind, multicentre trial	25,673 adults with vascular disease	2 g extended release niacin and 40 mg laropiprant or placebo daily	Among participants with atherosclerotic vascular disease, the addition of extended-release niacin-laropiprant to statin-based LDL cholesterol lowering therapy did not significantly reduce the risk of major vascular events but did increase the risk of serious adverse events
Pang et al. [42]	Randomised trial	T2DM patients on statin therapy	Adjunctive extended release niacin	ER niaicin therapy may provide cardiovascular disease risk benefits to patients with T2DM by increasing HDL concentrations.
Vitamin B7: Biotin				
Revilla-Monsalve et al. [47]	Randomised, double-blind control trial	18 T2DM subjects; 15 non-diabetic subjects	Daily dose 61.4 μmol biotin or placebo for 28 days	Vitamin B7 significantly reduces plasma triacylglycerol and very-low-density-lipoprotein (VLDL) concentrations.
Vitamin B6, B9, B12				
HOPE 2 Study [50]	Randomised, double-blind, placebo-controlled trial	5522 participants had vascular disease or diabetes	Daily administration of B-vitamin therapy (B9 2.5 mg, B6 50 mg, B12 1 mg)	Daily administration of the B-vitamin therapy reduced homocysteine concentrations by 25%, but no beneficial effects on major vascular events were observed except for a significant reduction in the incidence of stroke.
House et al. [52]	Multi-centre randomised double-	238 participants with diabetic nephropathy	High-dose vitamin B supplement or placebo	Among patients with diabetic nephropathy, high doses of B vitamins compared with placebo resulted in a greater decrease in GFR and an increase in vascular events.

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