

Features of changes in Vitamin D and carbohydrate metabolism in girls with hyperandrogenia syndrome during puberty

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Keywords:

Vitamin D supplementation · PCOS · RCT · Insulin resistance · Glucose sensitivity

ABSTRACT

Vitamin D status may be associated with insulin resistance and other key features of polycystic ovary syndrome (PCOS), but data from preliminary randomized controlled trials (RCTs) are conflicting. Therefore, we aimed to investigate the effects of vitamin D supplementation on plasma glucose area under the curve (AUC_{gluc}, primary outcome measure) and on other metabolic and endocrine parameters (secondary outcome measures). This study was a single-center, double-blind, randomized placebo-controlled trial conducted between December 2011 and July 2017 at the Medical University of Graz, Austria. One-hundred and eighty women with PCOS and 25-hydroxyvitamin D [25(OH)D] concentrations <75 nmol/L were randomized in a 2:1 ratio to either receive 20,000 IU of cholecalciferol weekly or placebo over 24 weeks. Primary outcome was the between-group difference in AUC_{gluc} at study end while adjusting for baseline values. In total, 123 participants completed the study [age 25.9±4.7 years; BMI 27.5±7.3 kg/m² baseline 25(OH)D 48.8±16.9 nmol/L, baseline fasting glucose 84±8 mg/dL]. Vitamin D supplementation led to a significant increase in 25(OH)D [mean treatment effect 33.4 nmol/L 95% confidence interval (CI) 24.5 to 42.2; p<0.001] but had no significant effect on AUC_{gluc} (mean treatment effect -9.19, 95% CI -21.40 to 3.02 p=0.139). Regarding secondary outcome measures, we observed a significant decrease in plasma glucose at 60 min during oral glucose tolerance test (mean treatment effect -10.2 mg/dL 95% CI -20.2 to -0.3 p=0.045). Vitamin D supplementation had no significant effect on metabolic and endocrine parameters in PCOS with the exception of a reduced plasma glucose during OGTT.



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1. Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder among women of reproductive age [1]. PCOS is a very heterogeneous condition with potential implications for reproductive, metabolic, and psychological features [2]. While vitamin D deficiency itself is very common in the general population,

it is even more prevalent in PCOS patients [3– 5]. As vitamin D status appears to be closely linked to insulin resistance, one of the key features of the PCOS phenotype, vitamin D supplementation might improve insulin sensitivity [6– 8]. Vitamin D may lead to a suppression of proinflammatory cytokines and increase the expression of the insulin receptor, thereby enhancing insulin synthesis and release [4], [9]. Insulin resistance is associated with an increased risk of several metabolic disturbances, including type 2 diabetes mellitus and cardiovascular disease [10], [11]. Furthermore, metabolic disturbances in PCOS are related to ovarian physiology [12], leading to the assumption that vitamin D supplementation may also have a positive impact on menstrual frequency and serum androgen levels. This is underscored by the ubiquitous expression of the vitamin D receptor (VDR) within the female reproduction system [13– 15]. The current treatment options for PCOS mainly consist of lifestyle intervention, hormonal contraceptives and insulin sensitizers [16]. Considering the high-prevalence of vitamin D deficiency in PCOS, vitamin D supplementation could be a simple and low-risk add-on to these therapies if its positive effects on metabolic and endocrine features were proven to be true. Thus, several studies in the recent past including some randomized-controlled trials (RCTs) aimed to evaluate the effects of vitamin D supplementation on characteristics of the PCOS phenotype. However, these studies have mostly yielded mixed results and were, at least in part, limited due to their varying study design or the small number of study participants [17].

2. References

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