Pengaruh Suplementasi Vitamin D terhadap Fungsi Sel Beta Pankreas pada Diabetes Melitus Tipe 2. Kajian terhadap SOD, IL-6, Ekspresi PDX-1, dan Resistensi Insulin = Effect of Vitamin D Supplementation on Pancreatic Beta Cell Function in Type 2 Diabetes Mellitus. Study on SOD, IL-6, PDX- 1 Expression, and Insulin Resistance

Alvina, author

Abstrak

Diabetes mellitus (DM) merupakan penyakit metabolik yang disebabkan berkurangnya sekresi hormon insulin, menurunnya sensitivitas insulin atau kombinasi keduanya. DM tipe

2 merupakan salah satu jenis diabetes melitus yang paling banyak penyandangnya. Defisiensi vitamin D sering dikaitkan dengan kejadian DM tipe 2. Vitamin D merupakan salah satu vitamin yang berpotensi untuk memperbaiki sintesis dan sekresi insulin. Penelitian ini bertujuan untuk menilai pengaruh suplementasi vitamin D 5.000 IU/hari selama 3 dan 6 bulan terhadap fungsi sel beta pankreas yang dilihat dari penanda antioksidan (SOD), inflamasi (IL-6), PDX-1, HbA1c dan resistensi insulin (HOMA-IR) serta keamanan pemberian vitamin D yang dilihat dari peningkatan kadar 25-(OH)D dan ekspresi VDR.

Penelitian ini menggunakan desain double blind randomized controlled trial mengikutsertakan 94 penyandang DM tipe 2 dengan usia 3580 tahun di Puskesmas Kecamatan Mampang Jakarta Selatan. Hasil randomisasi terdapat 47 subjek kelompok kontrol dan 47 subjek kelompok vitamin D. Kelompok kontrol mendapatkan plasebo sedangkan kelompok vitamin D mendapatkan plasebo dan vitamin D 5.000 IU selama 6 bulan. Studi dilakukan mulai bulan JanuariDesember 2022. SOD, IL-6, PDX-1, VDR, HbA1c, glukosa darah, insulin puasa, 25-(OH)D, HOMA-IR diperiksa pada awal penelitian, pascasuplementasi 3 dan 6 bulan. Analisis statistik dengan SPSS 20 menggunakan uji ANOVA general linear repeated measurement dan Mann Whitney.

Karakteristik subjek penelitian pada kelompok vitamin D dan kelompok kontrol pada awal penelitian menunjukkan kedua kelompok setara baik pada karaktersitik demografis, laboratorium, dan asupan nutrien. Pascasuplementasi vitamin D selama 3 dan 6 bulan terdapat perbedaan bermakna kadar 25-(OH)D (p = 0,000), tidak terdapat perbedaan bermakna HbA1c dan glukosa darah (p = 0,360 dan p = 0,296) antara kelompok kontrol dan kelompok vitamin D. Terdapat perbedaan bermakna kadar insulin pasca suplementasi 3 dan 6 bulan (p = 0,034 dan p = 0,013) serta perbedaan bermakna HOMA-IR pasca suplementasi 3 dan 6 bulan (p = 0,033 dan p = 0,031) antara kelompok kontrol dan kelompok vitamin D. Kadar insulin pada kedua kelompok mengalami peningkatan tetapi peningkatan kadar insulin pada kelompok kontrol lebih tinggi. HOMA-IR pada kedua kelompok mengalami peningkatan tetapi peningkatan HOMA-IR pada kelompok kontrol lebih tinggi. Terdapatnya kadar insulin dan HOMA-IR yang lebih rendah pada kelompok vitamin D menunjukkan adanya perbaikan resistensi insulin.Untuk PDX-1 tidak terdapat perbedaan bermakna pasca suplementasi 3 dan 6 bulan (p = 0,464 dan p = 0,499) antara kelompok kontrol dan kelompok vitamin D. Vitamin D tidak terbukti meningkatkan SOD dan VDR serta tidak terbukti

menurunkan IL-6.

Simpulan: Suplementasi vitamin D 5.000 IU/hari selama 6 bulan dapat meningkatkan kadar 25-(OH)D dalam batas normal, serta dapat memperbaiki resistensi insulin melalui penurunan HOMA-IR dan penurunan sekresi insulin. Efek terhadap HbA1c, SOD, IL-6, PDX-1, dan VDR tidak terbukti.
.....Diabetes mellitus (DM) is a metabolic disease that is caused by reduced insulin secretion, reduced insulin sensitivity, or a combination of the two. Type 2 DM is one of the types of diabetes mellitus with the greatest number of cases. Vitamin D deficiency is frequently associated with the incidence of type 2 DM. Vitamin D is one of the vitamins with the potential to improve insulin synthesis and secretion. This study aimed to evaluate the effect of supplementation of vitamin D at 5.000 IU/day for 3 and 6 months on pancreatic beta cell function from the perspective of antioxidant (SOD) and inflammatory (IL-6) markers, PDX-1 expression, HbA1c concentration, and insulin resistance (HOMA-IR), and the safety of vitamin D administration as shown by 25-(OH)D concentration and vitamin D receptor (VDR) expression. This study was a double blind randomized controlled trial involving 94 patients with type 2 DM aged 3580 years at Mampang District Public Health Center, South Jakarta. Randomization resulted in 47 subjects in the control group and 47 subjects in the vitamin D group. The control group received placebo whereas the vitamin D group received placebo and vitamin D at 5.000 IU for 6 months. The study was conducted from JanuaryDecember 2022. SOD, IL-6, PDX-1, VDR, HbA1c, blood glucose, fasting insulin, 25-(OH)D, and HOMA-IR were determined at baseline and after supplementation for 3 and 6 months. Statistical analysis by SPSS 20 used ANOVA general linear repeated measurement and Mann-Whitney tests. Characteristics of study subjects in the vitamin D and control groups at baseline showed that both groups were similar in demographic characteristics, laboratory measures, and nutrient intake. After supplementation of vitamin D for 3 and 6 months there were significant differences in 25-(OH)D concentration ($p = 0.000$), but no significant differences in HbA1c and blood glucose ($p = 0.360$ and $p = 0.296$) between control and vitamin D groups. There were significant differences in insulin concentration after supplementation for 3 and 6 months ($p = 0.034$ and $p = 0.013$) and significant differences in HOMA-IR after supplementation for 3 and 6 months ($p = 0.033$ and $p = 0.031$) between control and vitamin D groups. Insulin concentrations increased in both groups but the increase insulin concentrations was higher in the control group. HOMA-IR increased in both groups but the increase in HOMA-IR was higher in the control group. The lower insulin concentrations and decreased HOMA-IR in the vitamin D group indicated improve insulin resistance. With regard to PDX-1 there were no significant differences after supplementation for 3 and 6 months ($p = 0.464$ and $p = 0.499$) between control and vitamin D groups. Vitamin D was not proven to increase SOD and VDR, and was not proven to reduce IL-6.

Conclusion: Supplementation of vitamin D at 5.000 IU/day for 6 months was able to increase 25-(OH)D concentration within normal limits and was able to improve insulin resistance through reduction in HOMA-IR and decreased insulin secretion . Effects on HbA1c, SOD, IL-6, PDX-1, and VDR were not proven.