
HRVATSKO DRUŠTVO
ZA SUPLEMENTACIJU
U MEDICINI
Hotel Sheraton,
Zagreb
22.-25.10.2026.
JESENSKA AKADEMIJA
SUPLEMENTACIJE
U MEDICINI
Liječenje pretilosti i vitamin D
dr. sc. Juraj Jug, dr. med. spec. obiteljske medicine

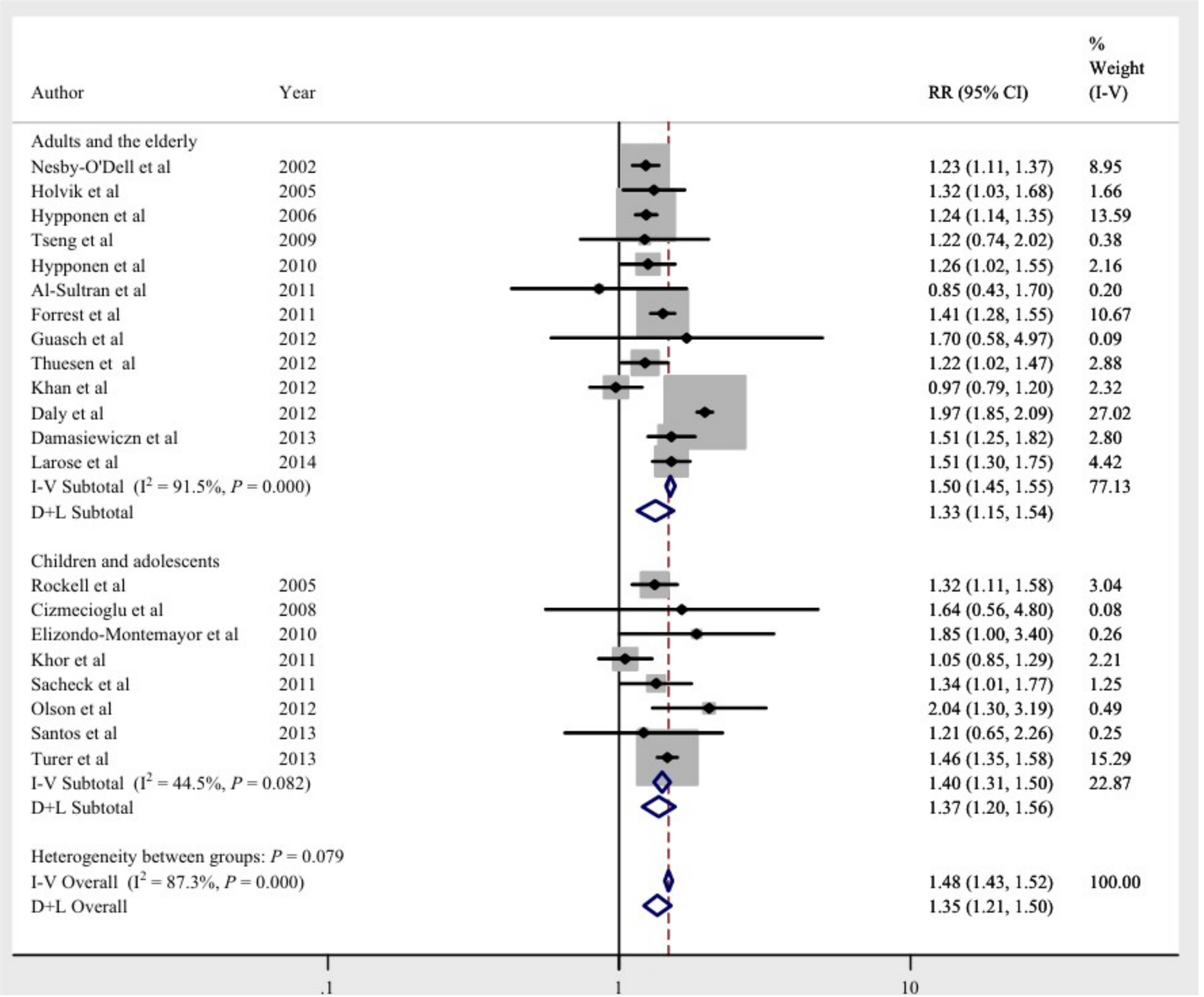
Razina vitamina D u pretilih osoba

35% niža u odnosu na one uredne tjelesne mase
24% niža u odnosu na preuhranjene osobe

- Neovisno o dobi, spolu, geografskoj lokaciji i referentnim vrijednostima

- Meta-analiza 23 istraživanja

Trebamo li onda svim pretilim osobama odrediti vitamin D?



Pereira-Santos M, Costa PRF, Assis AMO, Santos CAST, Santos DB. Obesity and vitamin D deficiency: a systematic review and meta-analysis. Obesity reviews. 2014;16(4):341-9.

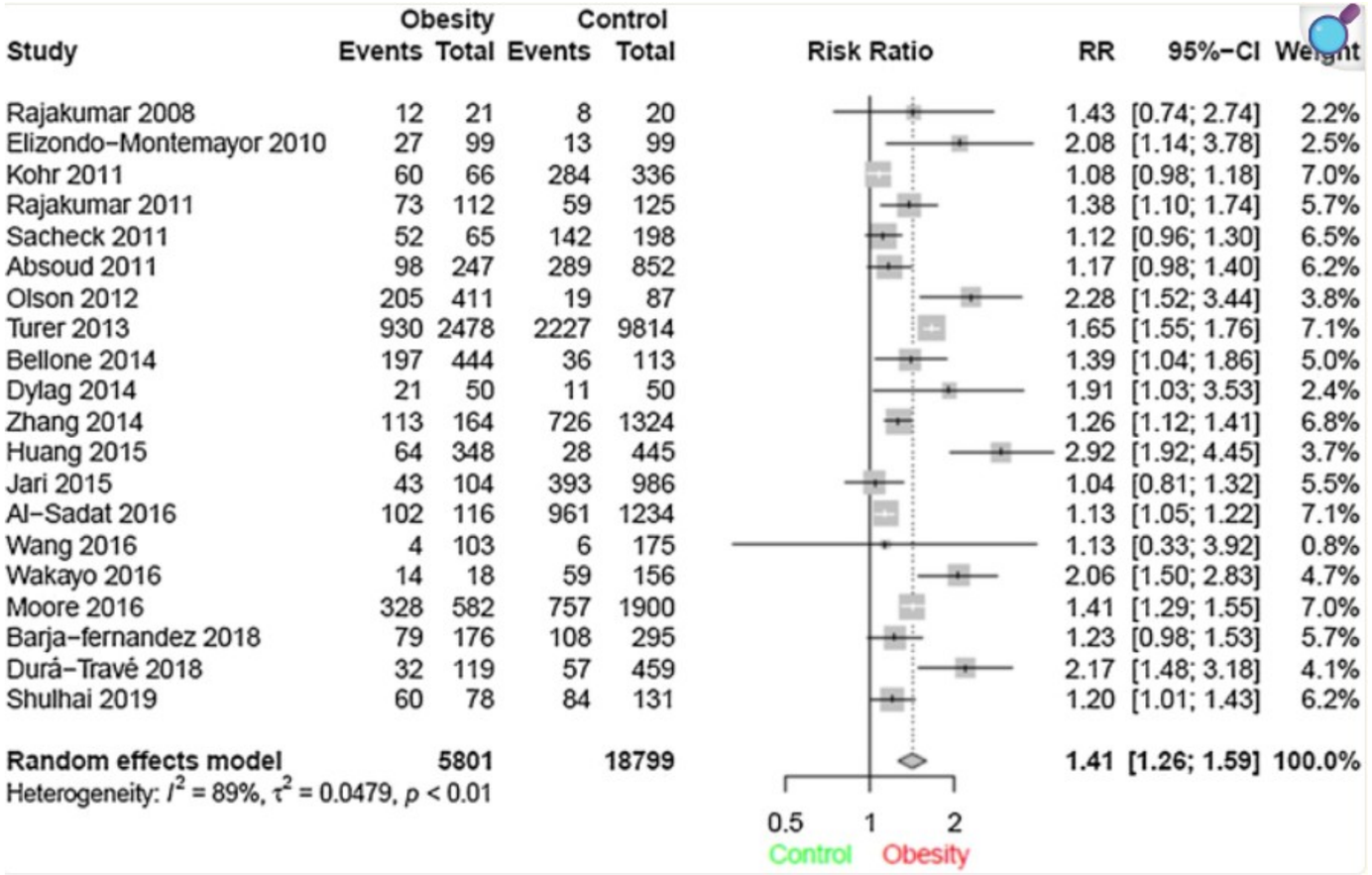
Razina vitamina D u pretile djece

41% niža u odnosu na one uredne tjelesne mase
Nije učinjena usporedba u odnosu na preuhranjenu djecu

- Neovisno o dobi, spolu, geografskoj lokaciji i referentnim vrijednostima

- Meta-analiza 20 istraživanja

Određujete li vitamin D djeci?

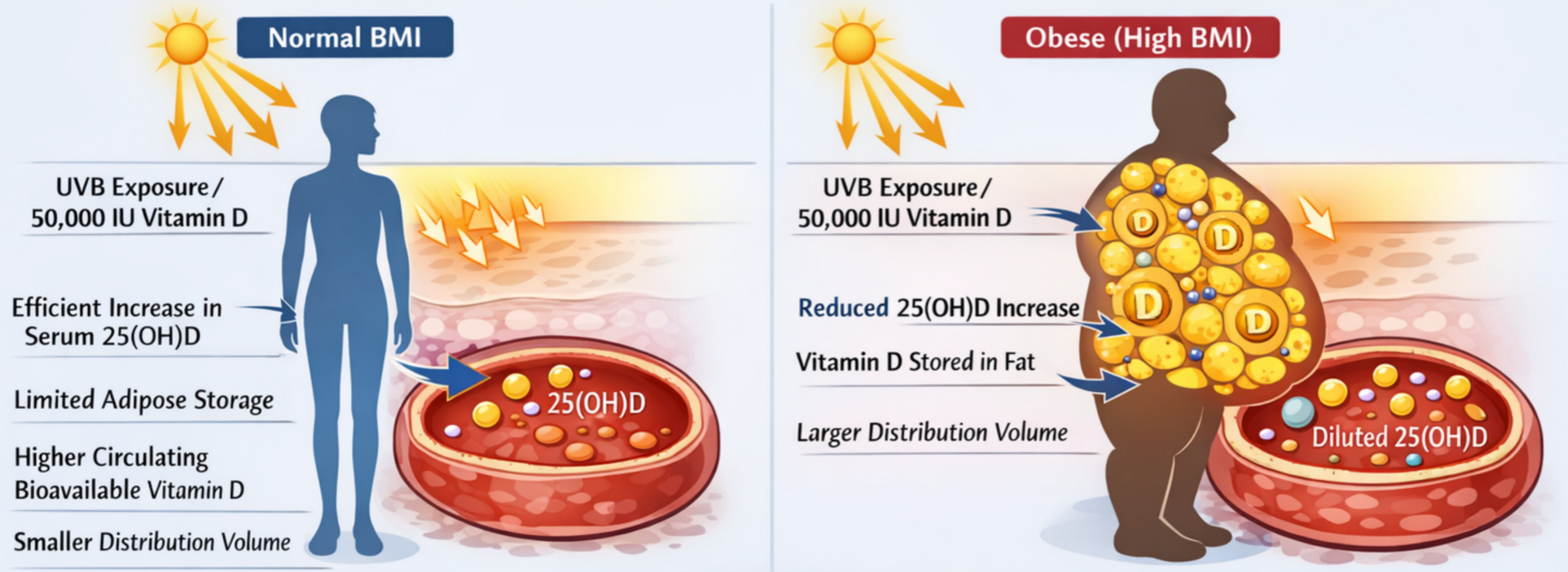


Fiamenghi VI, Mello ED. Vitamin D deficiency in children and adolescents with obesity: a meta-analysis. J Pediatr (Rio J). 2021 May-Jun;97(3):273-279. doi: 10.1016/j.jped.2020.08.006.

Impact of Obesity on Vitamin D Bioavailability:
Sequestration and Volumetric Dilution

Vitamin D Sequestration in Adipose Tissue:

In individuals with obesity, vitamin D is preferentially sequestered in adipose tissue, reducing its immediate bioavailability for metabolic activation and circulation. Slow release from fat leads to reduced increase 25(OH)D.



Volumetric Dilution Hypothesis:

Vitamin D is distributed across a larger total body mass in individuals with obesity, resulting in lower circulating 25(OH)D despite similar or greater vitamin D stores.



Jirků J, Kršáková Z, Křížová J. Vitamin D in Obesity: Mechanisms and Clinical Impact. Obesities. 2026; 6(1):12. https://doi.org/10.3390/obesities6010012

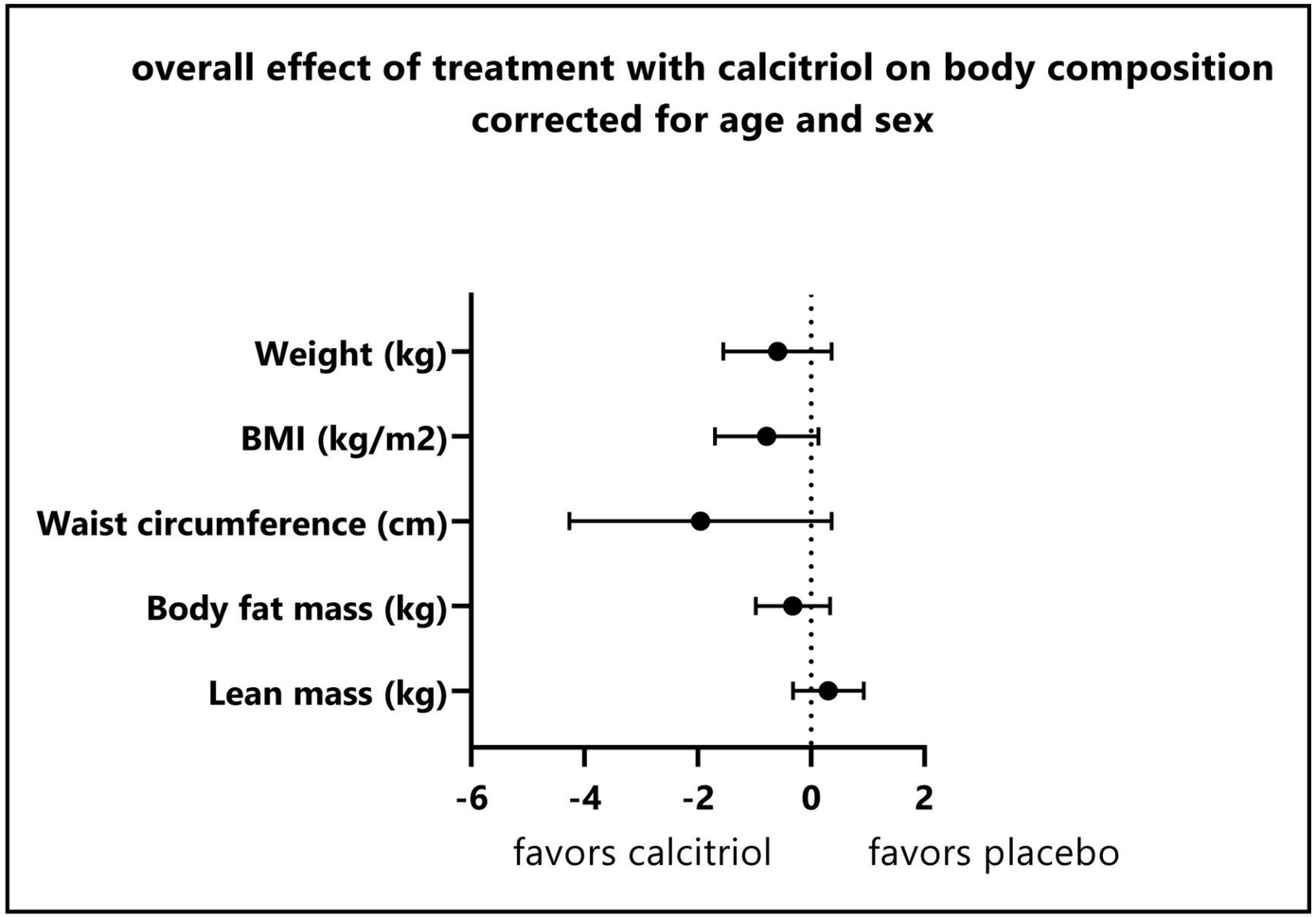
Utječe li vitamin D na tjelesnu masu?

Istraživanje provedeno s kalcitriolom (kako bi se uklonio učinak hidroksilacije)

411 pretilih pacijenata (206 kalcitriol i 205 placebo) sa šećernom bolesti i/ili KBB – praćeni 11 mjeseci

Rezultati su neovisni o spolu i dobi

Koje su ciljne vrijednosti da bi suplementacija imala smisla?



Oussaada SM, Akkermans I, Chohan S, Limpens J, Twisk JWR, Winkler C, Karalliedde J, Gallagher JC, Romijn JA, Serlie MJ, Ter Horst KW. The effect of active vitamin D supplementation on body weight and composition: A meta-analysis of individual participant data. Clin Nutr. 2024 Nov;43(11):99-105. doi: 10.1016/j.clnu.2024.08.031.

Utječe li opseg struka na vitamin D i obrnuto?

5 istraživanja – meta analiza na 7997 pacijenata:
Najviša skupina opsega struka imala je 42% veći rizik od nastanka insuficijencije (< 50 nmol/L)

Druga meta-analiza – suplementacija
947 ispitanika u 11 istraživanja, praćeni 12 mjeseci, primijenjen je kolekalciferol

Bi li rezultati bili bolji da je korišten kalcitriol?

Table 4.

Effect of cholecalciferol supplementation on waist circumference.

Study	Cholecalciferol			Placebo				Total
	Mean	SD	Total	Mean	SD	Total	Weight	Mean Difference iv Random, 95%CI
Esmaeil et al., 2018	−1.51	0.48	30	−0.05	0.5	28	38.1%	**−1.46 (−1.71, −1.21)**
Khosravi et al., 2018	−2.3	1	26	0.3	1.5	27	32.9%	**−2.6 (−3.28, −1.92)**
Salehpour et al., 2012	−0.3	4.3	42	0.4	4.1	43	17.3%	**−0.7 (−2.49, 1.09)**
Zitterman et al., 2009	−6.5	9.6	82	−7.5	5.8	83	11.7%	**1 (−1.42, 3.42)**
Total (95%CI)			296			296	100%	**−1.42 (−2.41, −0.42)**

* Bold represents Mean Differences (MD) and CI95%.

Hajhashemy Z, Foshati S, Saneei P. Relationship between abdominal obesity (based on waist circumference) and serum vitamin D levels: a systematic review and meta-analysis of epidemiologic studies. Nutr Rev. 2022 Apr 8;80(5):1105-1117. doi: 10.1093/nutrit/nuab070
Perna S. Is Vitamin D Supplementation Useful for Weight Loss Programs? A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Medicina (Kaunas). 2019 Jul 12;55(7):368. doi: 10.3390/medicina55070368.

Može li vitamin D smanjiti rizik od kardiovaskularnih događaja?

5 istraživanja (objavljena između 2017. i 2023.) – meta analiza na 57 201 pacijentu – sveukupno nema razlike u pacijenta koji koriste i ne koriste vitamin D

ALI – analiza podgrupa je pokazala statistički značajno manje MACE u pretilih i preuhranjenih pacijenata na suplementaciji vitaminom D

Trebaju li onda baš svi pretili pacijenti biti liječeni vitaminom D, kojom dozom i koje su ciljne vrijednosti?

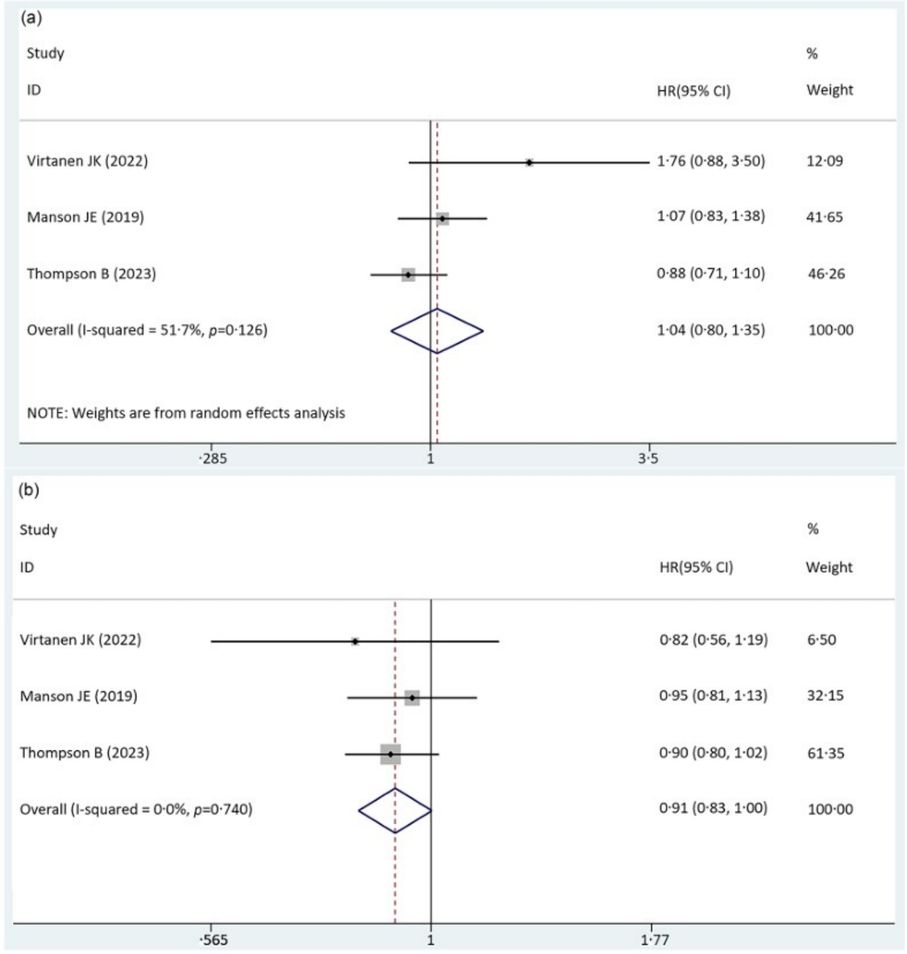


Figure 4. Forest plots of the association between vitamin D supplementation and incidence of MACE in BMI subgroups ((a): BMI < 25 kg/m^2, $P = 0{\cdot}782$, random-effect model; (b): BMI ≥ 25 kg/m^2, $P = 0{\cdot}055$, fixed-effect model). MACE, major adverse cardiovascular events.

Cheng X, Chen Z, Fang Y, Zhang Q, Chen B, Xi W, Pan Z, Guo L. Effect of vitamin D supplementation for major adverse cardiovascular events: a meta-analysis based on randomised controlled trials. Br J Nutr. 2025 Jul 28;134(2):124-133. doi: 10.1017/S0007114525103954.

Ostale spoznaje o vitaminu D kod pretilih osoba

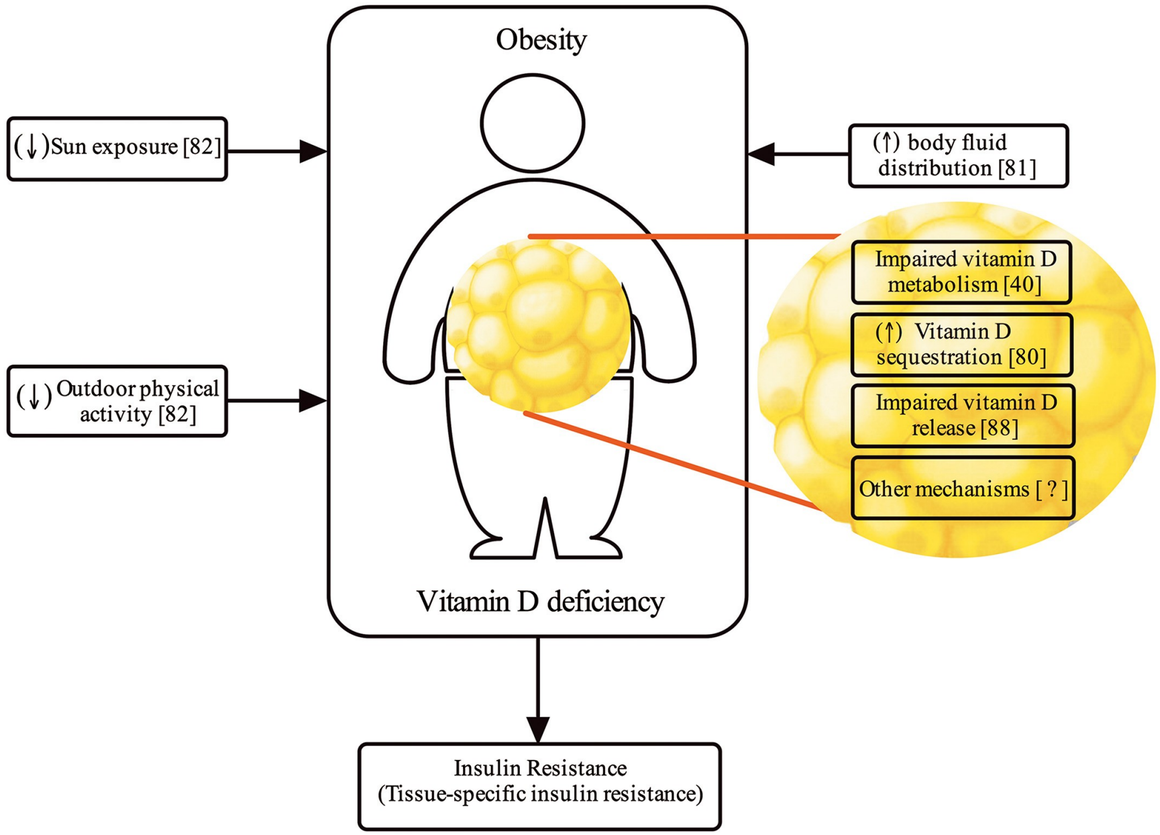
Doza od 50000 IU tjedno može smanjiti razinu triglicerida, ali ne utječe na LDL ni HDL kolesterol

Pacijenti s OSAS imaju najniže vrijednosti vitamina D od svih pretilih pacijenata

Vitamin D ne utječe na HbA1c, inzulinsku osjetljivost i HOMA indeks

Suplementacija je naročito važna kod pacijenata u kojih se planira barijatrijska operacija

Pružaju li nam sva dostupna istraživanja dovoljnu razinu dokaza za donošenje konkretnih zaključaka u ovom trenutku?



Oliveira INN, Macedo-Silva A, Coutinho-Cruz L, Sanchez-Almeida J, Tavares MPS, Majerowicz D. Effects of vitamin D supplementation on metabolic syndrome parameters in patients with obesity or diabetes in Brazil, Europe, and the United States: A systematic review and meta-analysis. J Steroid Biochem Mol Biol. 2024 Oct;243:106582. doi: 10.1016/j.jsbmb.2024.106582.
Yu K, Song W, Tu X, Zhou K, Prabahar K. The effect of vitamin D on the lipid profile in individuals with overweight or obesity: A meta-analysis and systematic review of randomized controlled trials. Prostaglandins Other Lipid Mediat. 2025 Jan;176:106938. doi: 10.1016/j.prostaglandins.2024.106938.
Loh HH, Lim QH, Kang WH, Yee A, Yong MC, Sukor N. Obstructive sleep apnea and vitamin D: an updated systematic review and meta-analysis. Hormones (Athens). 2023 Dec;22(4):563-580. doi: 10.1007/s42000-023-00481-3.
Giustina A, di Filippo L, Facciorusso A, Adler RA, Binkley N, Bollerslev J, Bouillon R, Casanueva FF, Cavestro GM, Chakhtoura M, Conte C, Donini LM, Ebeling PR, Fassio A, Frara S, Gagnon C, Latella G, Marcocci C, Mechanick JI, Minisola S, Rizzoli R, Santini F, Shaker JL, Sempos C, Ulivieri FM, Virtanen JK, Napoli N, Schafer AL, Bilezikian JP. Vitamin D status and supplementation before and after Bariatric Surgery: Recommendations based on a systematic review and meta-analysis. Rev Endocr Metab Disord. 2023 Dec;24(6):1011-1029. doi: 10.1007/s11154-023-09831-3. Epub 2023 Sep 4. Erratum in: Rev Endocr Metab Disord. 2024 Apr;25(2):447-448. doi: 10.1007/s11154-023-09837-x.

Kako onda ispravno dozirati vitamin D u pretilih osoba?

Loading dose:

Author	Predictive Equation	Example of Calculation
Zittermann et al. [30]	Incremental change in 25(OH)D (nmol/L) = 49.4 + 16.5 × $\log_{10}$[dose (IU/day)] − 0.42 × BMI	To increase 25(OH)D by 25 nmol/L (~10 ng/mL) in an individual with BMI 30, a daily dose of approximately 2000 IU is required.
Drincic et al. [31]	Vitamin D_3 dose (IU/day) = [body weight (kg) × Δ25(OH)D (ng/mL)] × 40	To increase 25(OH)D by 25 nmol/L (~10 ng/mL) in a person weighing 80 kg: 80 × 10 × 40 = 32,000 IU/week (≈4500 IU/day).
van Groningen et al. [32]	Loading dose of cholecalciferol (IU) = 40 × (75 − baseline 25(OH)D [nmol/L]) × body weight (kg)	For an individual with baseline 25(OH)D = 40 nmol/L and body weight 80 kg: 40 × (75–40) × 80 = 112,000 IU (can be divided into weekly doses).

Imamo li jasne smjernice za dijagnostiku i liječenje vitamina D?
Hrvatske smjernice su iz 2016. godine
Što je s pacijentima koji liječe pretilost GLP-1 agonistima?

Jirků J, Kršáková Z, Křížová J. Vitamin D in Obesity: Mechanisms and Clinical Impact. Obesities. 2026; 6(1):12. https://doi.org/10.3390/obesities6010012

Domain	Endocrine Society (2024) [69]	Polish Guidelines (2023; 2025 *) [54,70,71]
Screening (measurement of 25(OH)D)	Routine screening is not recommended in obese individuals without other indications (e.g., hypocalcemia, malabsorption, liver or kidney disease).	Routine population screening is not recommended, but obesity is listed among high-risk conditions—testing is advised, particularly in symptomatic patients or those with comorbidities.
Risk of deficiency	Obesity increases the risk of low 25(OH)D levels (often <50 nmol/L). Bariatric surgery further exacerbates the risk.	Obesity (especially BMI > 30, and particularly >40) is identified as a clear risk factor for vitamin D deficiency; bariatric surgery represents a specific high-risk condition requiring monitoring.
Supplementation—general	Routine supplementation solely on the basis of obesity is not recommended. Empirical supplementation may be considered in at-risk individuals.	Supplementation is explicitly recommended in obese individuals, with doses approximately twice those of the general population of the same age.
Dosage—daily intake	Standard doses (e.g., 800–2000 IU/day in adults); no specific dose escalation for obesity, though the response to supplementation is attenuated.	Adults with obesity: 2000–4000 IU/day (i.e., approximately double the standard age-specific dose). If 25(OH)D levels (30–37.5 nmol/L) initiate vitamin D therapy with 20,000 IU twice weekly or 50,000 IU once weekly; reassess serum 25(OH)D and calcium after 1 month to guide further dose adjustment. *
Upper safe limit (UL)	UL for adults: 4000 IU/day.	In obese individuals: UL increased to 10,000 IU/day (250 µg).
Monitoring	Measurement should be performed only when clinically indicated.	In obese individuals, reassessment is recommended after 1–3 months of deficiency treatment to verify achievement of optimal levels.
Form of supplement	Cholecalciferol (vitamin D_3) preferred; parenteral administration only exceptionally.	Cholecalciferol (D_3) preferred; calcifediol may be used when faster correction is required.
Clinical outcomes of supplementation	Large RCTs in obese populations have not demonstrated a clear benefit regarding fracture, CVD, or mortality reduction.	The goal is to maintain optimal serum levels (75–125 nmol/L), as deficiency is associated with higher skeletal and metabolic risk.

Bouillon, R.; Bilezikian, J.P.; Bikle, D.; Diab, D.L.; Kiely, M.E.; Lazaretti-Castro, M.; McCartney, C.R. Vitamin D for the prevention of disease: An Endocrine Society clinical practice guideline. J. Clin. Endocrinol. Metab. 2024, 109, 1094–1150.
Milewicz, A.; Kos-Kudła, B.; Ruchała, M.; Hubalewska-Dydejczyk, A.; Kajdaniuk, D.; Marek, B. Is vitamin D deficiency a risk factor for obesity-related morbidity, prediabetes, and type 2 diabetes—A literature review and proposals from the experts of the Polish Society of Endocrinology. Endokrynol. Pol. 2025, 76, 580–590.
Płudowski, P.; Kos-Kudła, B.; Walczak, M.; Fal, A.; Zozulińska-Ziółkiewicz, D.; Sieroszewski, P.; Misiorowski, W. Guidelines for preventing and treating vitamin D deficiency: A 2023 update in Poland. Nutrients 2023, 15, 695.
Pludowski, P. Supplementing vitamin D in different patient groups to reduce deficiency. Nutrients 2023, 15, 3725.


I've been feeling tired, my mood is low and I'm worried I might be vitamin D deficient... Should I get tested? Maybe I should take supplements?
You don't need to check your vitamin D levels or take supplements.
You should get enough vitamin D from sun exposure.
VITAMIN D
HEALTHY BONES
HEALTHY YOU