Germany). *VDR* gene polymorphisms were analyzed using restriction fragment length polymorphism. Statistical analysis was performed using ANOVA, non-parametric methods with the Kruskal-Wallis H test, chi-squared test. Levels of vit D based on the joint effect of polymorphisms were analysed using Multifactor dimensionality reduction.
Results: The association of this variant TaqI with the level of vit D in CF patients was revealed: the concentration of vit D is statistically significantly lower in patients with the CC genotype (21.9 ng/ml) than with the TC genotypes (29.0 ng/ml, p = 0.017) and TT (29.9 ng/ml, p = 0.014). Significant differences in the level of vit D in CF patients having different genotypes according to variants FokI and BsmI have not been established. The association of vit D levels and the three studied variants of the *VDR* gene was investigated. In CF patients - carriers of the genotypes GG (BsmI) and TT (FokI), the level of vit D is higher by 13.4 ng/ml from the average, while in healthy people it increases by 6 ng/ml from the average. Among CF patients, a risk group for vit D deficiency is the genotypes GG (BsmI) and CC (FokI) (a decrease of 8.3 ng/ml from the average), in contrast to the healthy group (a decrease of 1.6 ng/ml from the average).
Conclusion: Thus, the severity of vit D deficiency in CF is determined not only by the influence of exogenous causes, but also by genetic factors.

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Height-adjustment methods for lumbar spine bone density in youth with cystic fibrosis

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Objectives: Areal bone mineral density (aBMD) from dual-energy X-ray absorptiometry (DXA) overstates bone deficits in short youth. As a result, ECFS recommends height adjusting DXA bone outcomes in youth with CF. How this should be done is unknown. We compared two height adjustment methods, bone mineral apparent density (BMAD) and height-for-age Z-score (HAZ) adjusted aBMD (BMD_{HAZ}), and their relationships with stature and age.
Methods: Secondary analysis of lumbar spine DXA obtained at 0 and 12 months in pancreatic-insufficient CF youth ages 5–18 y who participated in a nutritional supplement study. Subjects were categorized by HAZ (short: < −1; tall: >1; average: −1 to 1) and age (5-<10 y vs. ≥10 y). Sex- and age-specific BMAD and BMD_{HAZ} Z-scores were calculated using published Bone Mineral Density in Childhood Study reference data and compared using paired t-test and chi^2. Measurements were compared across groups based on HAZ (ANOVA) and age (t-test). Associations of BMAD-Z and BMD_{HAZ}-Z with HAZ were assessed using linear mixed-effects regression. Differences between baseline BMD_{HAZ}-Z and BMAD-Z were plotted against HAZ to assess for relative bias over the height spectrum.
Results: Data [mean(SD)] were available for 110 subjects [57% male, 88% Caucasian, 34% F508del/F508del] with baseline weight-Z = −0.39(±0.78), HAZ = −0.41(±0.92) and BMI-Z = −0.2(±0.77). Baseline BMAD-Z [−0.4(±1)] was lower vs BMD_{HAZ}-Z [−0.22(±1.1)], p < 0.01. 33% had BMAD-Z < −1 vs 21% with BMD_{HAZ}-Z < −1, p = 0.04. No significant difference across HAZ or age categories were found for either BMAD-Z or BMD_{HAZ}-Z. No significant associations with HAZ were found. Inspection of the plot of BMD_{HAZ}-Z minus BMAD-Z vs HAZ revealed a negative bias, with a larger absolute difference as HAZ increased.
Conclusion: BMAD-Z and BMD_{HAZ}-Z address stature-related confounding of aBMD outcomes in youth with CF but do not perform equivalently. Prospective studies could determine their ability to predict fracture.

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Impaired bone mineralisation in children with cystic fibrosis

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Objectives: Bone turnover during growth may be of value in the identification of individuals who may be at risk for osteoporosis later in life. But more attention should be given to the effects of the disease on bone turnover and bone mineral status especially in young patients with cystic fibrosis (CF).
Aim: Aim of the study was to assess bone formation and resorption process with bone markers in children with cystic fibrosis.
Materials and methods: The study included 25 clinically stable children with CF who regularly attended the Department for cystic fibrosis at the Institute for pulmonary diseases in Skopje, R. North Macedonia. Control group was presented with 21 healthy children at the same age. Serum osteocalcin (OC), β cross laps, 25OHD and PTH were determined by ELISA assays in CF group (mean age 8.25 ± SD1.9 y.) and in age-match controls (7.5 ± 1.9 y.).
Results: Vitamin D in CF group was (23.83 ± 10.9 ng/ml versus 25.6 ± 11.53 in control group, p = 0.57), OC (70.88 ± 34.24 ng/ml v.100.02 ± 47.98, p = 0.01) βcrosslaps (1.35 ± 0.72 ng/ml v.1.54 ± 0.73, p = 0.37) and PTH (37.39 ± 25.5 pg/ml v. 36.76 ± 25.73, p = 0.92). In the study we didn't find significant difference for 25OHD between CF and healthy controls. OC in children with CF correlates significantly with the control indicates a decreased formation rate whereas resorption rate is normal.
Conclusion: Our results suggest that there is a possibility of a very early onset of impaired bone mineralization in CF. Serum levels of osteocalcin can be used for predicting osteopenia in children with CF.

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Bone mineral density, dietary intake and physical activity in cystic fibrosis patients

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Objectives: The risk of low bone mineral density (BMD) in CF is increased due to poor nutritional status and increased inflammation. Our aim was to evaluate the correlations between BMD, dietary intake, physical activity and quality of life (QOL) in CF patients.
Methods: A prospective single centre study assessing BMD, lung functions, vitamin D levels. nutritional intake (food frequency questionnaire), hand-grip strength (HGS), 6 minute walk test (6MWT), habitual physical activity (smart watches worn for 7 days) and QOL (SF-36 questionnaire), as well as the correlations between BMD and the other parameters.
Results: Thirty-two CF patients, mean age 18.3 ± 8.3 years, FEV_1 75.3 ± 18.3% predicted, lung clearance index (LCI) 12.2 ± 3.5. Mean vitamin D levels were 29 ± 12.9 ng/ml, and 18 (56%) patients had levels < 30 ng/ml. Ten (31%) and 11 (34%) patients had osteopenia (BMD z-score < −1) and osteoporosis (BMD z-score<−2), respectively. Hip BMD z-score correlated with HGS (r = 0.438, p = 0.042) and marginally with FEV_1% predicted (r = 0.349, p = 0.059). Hip BMD (gr/cm^2), hip BMD z-score and spine BMD z-score correlated with SF-36 general health domain (r = 0.368, p = 0.038; r = 0.502, p = 0.005; r = 0.432, p = 0.014, respectively). No correlation was found between BMD, 6MWT results and physical activity (assessed by smart watches).
Conclusion: A substantial number of CF patients have low BMD. BMD correlated with muscle strength and quality of life, and did not correlate with physical activity, as assessed herein. Further larger multi-centre studies are warranted to evaluate the contribution of multifactorial etiologies to low BMD in CF.