been treated for hypophosphatasia and have subsequently been recommended for genetic testing. **Conclusions:** Hypophosphatasia is an uncommon condition with a highly variable presentation often resulting in a missed diagnosis. Surveillance of practices by identifying patients with low ALP levels is a reasonable screening approach to identifying potential patients with hypophosphatasia.

Bone and Mineral Metabolism
PARATHYROID AND RARE BONE DISORDERS

Total, Free and Bioavailble 25 OH D and Bone Disease in Primary Hyperparathyroidism

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Background: Low levels of vitamin D 25OHD are frequently described in PHP patients. The aim of this study was to evaluate bone parameters and vitamin D status in PHP patients and controls. **Methods:** Prior to surgery, 64 PHP patients and 63 healthy matched control subjects regarding age, gender and body mass index were enrolled in this study along 18 months. 25OHD and PTH were measured using Roche® Immunoassays. Bone mineral density (BMD) by dual X-ray absorptiometry (DXA) (Hologic QDR 4500) and TBS (InSight™) were determined in all patients and controls. Distribution of total, bioavailable and free (calculated) 25OH and its correlation with TBS and DXA in both groups was evaluated. DBP (vitamin D binding protein) SNPs genetic analysis was performed by ABI 7500 real time PCR System. None of the patients and controls were taking vitamin D supplements before the study. **Results:** PHP patients had lower BMD values than controls in all sites (p<0.01). TBS measurements were also reduced in PHP patients compared to controls, as expected (1233 vs 1280, p=0.04). There was no statistical difference in free, total and bioavailable 25OHD measurements between the PHP and the control group, mean±SD: 3.4±1.7 vs 3.1±1.7 pg/mL (p=0.44), 22.6± 6.1 vs 20.6± ng/dL (p=0.13) 1.53±0.66 vs 1.41±0.61 ng/mL (p=0.28), respectively. Likewise, there was no statistical difference in DBP haplotypes 1s/1s, 1f/1f, 1s/1f, 2/2, 1s/2, 1f/2 analysis between groups. There was no correlation with 25OHD and DXA measurements in both groups. However, total 25OHD presented statistical significant correlation with TBS measurements in the PHP group (r=0.28; p=0.02) and total, free and bioavailable 25OHD measurements with TBS in the control group (r=0.42; r=0.42; r=0.43; p<0.01). **Conclusion:** Vitamin D status correlates with TBS, but not with DXA, highlighting the relation of the vitamin D with the microarchitecture bone parameters in both PHP patients and controls. However, this correlation was more evident among controls than in PHP patients, spotlighting the primary hyperparathyroidism effects in bone.

Bone and Mineral Metabolism
VITAMIN D, DIABETES AND ENERGY METABOLISM

A Comparison of Free and Total 25-hydroxyvitamin D Levels as Functional Indicators of Bone Health in Healthy Children

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Abstract Context: The "free hormone" hypothesis suggests that the free 25-hydroxyvitamin D ($25OHD_{Free}$) level may usefully indicate bone health. **Objective:** To determine which vitamin D measure is optimally correlated with clinical and bone parameters in healthy children. **Design and Participants:** A cross-sectional study including 146 healthy children (71 boys, 9.5±1.9 years) at a tertiary medical center. **Main Outcome Measures:** We used a multiplex liquid chromatography-tandem mass spectrometry-based assay to simultaneously measure vitamin D metabolites. The $25OHD_{Free}$ level was directly measured (m-$25OHD_{Free}$) or calculated using genotype-constant or genotype-specific affinity coefficients of vitamin D-binding proteins (con-$25OHD_{Free}$ or spe-$25OHD_{Free}$). Bone mineral content (BMC) and density (BMD) were assessed via dual-energy X-ray absorptiometry. **Results:** The concentrations of total 25OHD ($25OHD_{Total}$), the three forms of $25OHD_{Free}$, and 24,25-dihydroxyvitamin D_3 correlated with parathyroid hormone levels (all p<0.01). Serum $25OHD_{Total}$ and m-$25OHD_{Free}$ levels reflected age, puberty, season, body mass index (BMI), daylight hours, and vitamin D intake (all p<0.05). The con-$25OHD_{Free}$ level better reflected puberty and daylight hours than did the spe-$25OHD_{Free}$ level (both p<0.01). The association between the $25OHD_{Total}$ level and bone parameters varied according to the BMI (interaction p<0.05). In 109 normal-weight children, the con-$25OHD_{Free}$ level correlated with BMC and BMD (both p<0.05), but the $25OHD_{Total}$ and 24,25-dihydroxyvitamin D_3 levels were associated with BMC (both p<0.05). No association was found in overweight or obese children. **Conclusions:** In healthy children, total and free 25OHD levels comparably reflected lifestyle factors. In normal-weight children, the con-$25OHD_{Free}$ level reflected BMC and BMD, whereas the $25OHD_{Total}$ level was associated with BMC.

Bone and Mineral Metabolism
VITAMIN D, DIABETES AND ENERGY METABOLISM

Association Between Population Vitamin D Status and SARS-CoV-2 Related Serious-Critical Illness and Deaths

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Background: Vitamin-D population status may have possible unappreciated consequences to the COVID-19 pandemic. A significant association between vitamin-D sufficiency and reduction in clinical severity and inpatient