Bone and Mineral Metabolism
VITAMIN D, DIABETES AND ENERGY METABOLISM

Low Levels of Vitamin D Are Associated With Markers of Immuno-Inflammatory Response and Clinical Outcome in Covid-19

Luigi di Filippo, md[1], Agnese Allora, MD[1], Mauro Doga, MD[1], Patrizia Rovere Querini, MD, PhD[2], Massimo Locatelli, MD[3], Stefano Frara, MD[1], Andrea Giustina, MD[1].
[1]Institute of Endocrine and Metabolic Sciences, Università Vita-Salute San Raffaele, Milan, Italy, [2]Unit of Internal Medicine, Division of Immunology, Transplantation and Infectious diseases, IRCCS Ospedale San Raffaele, Milan, Italy, [3]Laboratory Medicine Service, IRCCS Ospedale San Raffaele, Milan, Italy.

High prevalence of vitamin D (VD) deficiency in COVID-19 patients was reported by several studies. Since VD is a key regulating factor of both innate and adaptive immunity, it was hypothesized that VD deficiency may predispose to SARS-CoV-2 infection and lower levels of VD could be related to increased COVID-19 severity and worse outcome risks. However, to date, only few studies partially investigated the relationship between VD and inflammatory and immune response and clinical features of COVID-19 patients. The aim of this study is to evaluate the influence of vitamin D levels on COVID-19 inflammatory activity, clinical pattern and disease severity. Patients admitted to San Raffaele University Hospital for COVID-19 from February 2020 were enrolled in this study. We excluded patients with comorbidities and therapies influencing VD metabolism. 25OH-Vitamin D levels were evaluated at admission in hospital and VD insufficiency and deficiency were defined as VD level below 30 ng/mL and 20 ng/mL, respectively. A total of 88 patients were included in the study. Median (IQR) VD levels were 16.3 (11.2–23.9) ng/mL. VD insufficiency and deficiency were found in 88.6% and in 68.2% of patients, respectively. Linear regression analyses showed a positive correlation between VD levels and PaO2/FiO2 ratio (p=0.019; r=0.254), and negative correlations between VD levels and Neutrophil/Lymphocyte (N/L) ratio (p=0.04; r=-0.19), C-reactive protein (CRP) levels (p=0.047; r=-0.18) and Interleukin 6 (IL-6) levels (p=0.04; r=-0.22). Lower VD levels were found in patients affected by severe disease (needs for high-flow oxygen therapy and/or noninvasive mechanical ventilation, admitted to ICU and/or dead) than non-severe patients (13.4 ng/mL [10.37–19.15] vs 18.45 ng/mL [15.15–24.95]; p=0.007). Moreover, patients with VD deficiency had higher levels of CRP, LDH, IL-6, IFN-gamma (p=0.04, p=0.01, p=0.002, p=0.04; respectively), lower PaO2/FiO2 and higher N/L ratios (p=0.008, p=0.004; respectively), and higher rate of severe disease (65% vs 39%, p=0.02), as compared to VD non-deficient ones. In conclusion, low VD levels are widely found in hospitalized COVID-19 and may lead to increased disease severity through an excessive immune-inflammatory response. Our data suggest that reaching adequate vitamin D levels in risky population may contribute to prevention of COVID-19 occurrence and severity.

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Obesity, Dyslipidemia, Diabetes, and Vitamin D Levels

Elena A. Amoroso Moya, MD, Msc[1], Marcelo Nicolalde, MD, Msc[2], Herbarth Torres, MD, Msc[1].
[1]Rio Hospital, Riobamba, Ecuador, [2]ESPOCH, Riobamba, Ecuador.

Context: There are several studies that refer to an association between vitamin D levels and the prevalence of atherogenic dyslipidemia and diabetes 2, however these studies present different non-conclusive results. **Methods:** A cross-sectional study was carried out with a propositional sequential sample of 110 patients at Rio and San Juan Hospital Riobamba -Ecuador 2020. The sample was divided into three groups according to BMI and vitamin D levels; 25 hydroxycalciferol, by cluster analysis, the final groups G1(56), G2(59), and G3(16) had a similar BMI average of 27 kg/m2, and significant differences in the average of vitamin D: G1 = 13.6, G2 = 24.5 and G3 = 45.3 ng/dl. **Results:** The prevalence of dyslipidemia increased gradually as the average level of vitamin D of the group increased as follows: G1 = 12.5%, G2 = 18.6%, G3 = 18.8%, the same behavior was observed in the prevalence of type 2 diabetes per analysis group: G1 = 30.4%, G2 = 45.8% and G3 = 50%. The differences found in the prevalence of atherogenic dyslipidemia and diabetes 2 were not statistically significant p> 0.05. **Conclusion:** in the group of patients studied and divided by cluster analysis into three groups with different levels of vitamin D, there were no statistically significant differences with respect to the prevalence of atherogenic dyslipidemia and diabetes 2.

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Secondary Hyperparathyroidism, Bone Density and Bone Turnover After Bariatric Surgery: Differences Between Roux-en-Y Gastric Bypass and Sleeve Gastrectomy

Narriane Chaves Pereira Holanda, Ms, MsC[1], Heloisa Calegari Borges, Ms, Student[2], Caio Chaves de Holanda Limeira, Mr, Student[2], Louise Raya Bezerra, Student[1], Silvane Katarine Medeiros Lima, Student[1], Carolina Cabral Carvalho, Student[3], Kaue Tavares Menezes, Student[3], Nara Nóbrega Crispim Carvalho, MsC[4], Ana Carla Montenegro, PhD[5], Francisco Farias Bandeira, FACE, MD[6].
[1]Universidade Federal da Paraíba, João Pessoa, Brazil, [2]UNIVERSIDADE POTIGUAR, Natal, Brazil, [3]Faculdade de Medicina Nova Esperança, João Pessoa, Brazil, [4]Universidade Federal da Paraíba, JOAO PESSOA, Brazil, [5]Universidade de Pernambuco, Recife, Brazil, [6]University of Pernambuco Medical School, Recife PE, Brazil.

Introduction: Although malabsorption of nutrients and changes in intestinal adipokines and gut hormones induced by Roux-en-Y gastric bypass (RYGB) are considerably different than sleeve gastrectomy (SG), little is known about the consequences on bone health resulted by these two procedures. **Objective:** to compare the prevalence of secondary hyperparathyroidism (SHPT), bone mineral density (BMD), bone turnover markers and serum leptin in obese

patients undergoing RYGB and SG, according to the time of surgery and percent weight loss. **Methods:** we studied 117 patients (91% female, 51% RYGB, mean age 41.8 ± 6.7 years, mean time of surgery 4.3 ± 3.4 years) who were divided into two groups according to the surgical procedure adopted (SG vs. RYGB). They were evaluated at different times after surgery (1–2 years, > 2 and <5 years and ≥5 years) and according to the percentage of weight loss (10–20%, >20% and <40%, ≥40%). Anthropometric measurements, body composition and BMD, bone parameters (PTH, corrected serum calcium, 25OHD, alkaline phosphatase -AP, C-telopeptide - CTX), and biochemical tests were compared. **Results:** The prevalence of SHPT (PTH ≥ 65pg/ml) was 26%, higher in the RYGB vs. SG (35% vs. 17%, respectively, p = 0.039), despite no significant differences in serum 25OHD (28.5 ± 7.3 vs. 27.6 ± 7.7 ng/ml, p=0.519) and corrected serum calcium (9.8 ± 0.6 vs. 9.8 ± 0.5 mg/dl, p = 0.466) between the groups. Mean serum PTH, CTX and AP was higher in the RYGB vs. SG (61.3 ± 29.5 vs 49.5 ± 32.3 pg/mL, p = 0.001; 0.596 ± 0.24 vs. 0.463 ± 0.23 ng/mL; 123.9 ± 60.8 vs. 100.7 ± 62.0 U/L, respectively). There were 13.5% decreases in femoral neck BMD in all patients, over the study period. After 5 years of surgery, the RYGB group showed greater bone loss in total body BMD (1.016 vs. 1.151g/cm^2, -8.1%, p = 0.003) and total femur BMD (1.164 vs. 1.267g/cm^2, - 11.7%, p = 0.007). Mean serum leptin was lower in the RYGB group, when compared to SG (7.6 ± 5.8ng/mL vs. 14.0 ± 9.9, p = 0.001), with no correlation with BMD in any site. There were no significant differences between the RYGB and SG regarding the other metabolic parameters. **Conclusion:** We found a more deleterious effect of RYGB on bone health up to 5 years postoperatively in comparison with SG.

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The Effect of Vitamin D Supplementation on Severe COVID-19 Outcomes in Patients With Vitamin D Insufficiency

Corinne Levitus, DO[1], Sweta Chekuri, MD[2], Andrei Assa, MD[2], Laurel Mohrmann, MD[2], Alexandra Zindman, MD[3], Vafa Tabatabaie, MD[1], Fabrizio Toscano, MD[3], Masud Ahmed, PA-C[2], Sarah W. Baron, MD[2].

[1]Albert Einstein College of Medicine and Montefiore Medical Center, Department of Internal Medicine, Division of Endocrinology, Bronx, NY, USA, [2]Albert Einstein College of Medicine and Montefiore Medical Center, Department of Medicine, Division of Hospital Medicine, Bronx, NY, USA, [3]Albert Einstein College of Medicine and Montefiore Medical Center, Department of Internal Medicine, Residency Training Program, Bronx, NY, USA.

Introduction: Coronavirus Disease 2019 (COVID-19) deaths have surpassed one million worldwide with limited treatment modalities, and physicians are relying on alternative methods, such as Vitamin D supplementation, to prevent or halt disease progression without direct evidence. Research has proven that vitamin D supplementation can prevent inflammation based on its role in innate immune response; however, there have been limited studies regarding vitamin D supplementation in COVID-19. We aimed to determine whether vitamin D supplementation in vitamin D insufficient patients was associated with fewer severe COVID-19 outcomes, defined as mechanical ventilation or death. **Methods:** Retrospective study that analyzed data from all adult patients admitted to our tertiary care center between March 2020 and July 2020 with a positive RT-PCR for SARS CoV-2 and a serum 25-hydroxyvitamin D (25[OH]D) level measured within 90 days prior to the index admission. Patients with 25(OH)D <30 ng/mL were considered vitamin D insufficient and patients ordered for least one weekly dose of ≥1,000 units of ergocalciferol or cholecalciferol were considered supplemented. Supplemented vitamin D insufficient patients were compared to non-supplemented vitamin D insufficient patients in terms of severe COVID-19 disease as defined by mechanical ventilation or death. **Results:** 129 COVID-19 patients with a vitamin D level <30 ng/mL were identified, with a median vitamin D level of 21.4 ng/mL. A total of 43 patients (33.3%) had severe COVID-19 outcomes. 65 (50.4%) patients with vitamin D insufficiency were supplemented and 64 (49.6%) were not supplemented. Vitamin D supplementation with ≥1,000 units (OR 0.6, 95% CI 0.28 - 1.40; p=0.25), ≥5,000 units (OR 0.5, 95% CI 0.26 - 1.23; p=0.15), or ≥50,000 units (OR 1.0, 95% CI 0.42–2.20, p=0.92) weekly had no statistically significant effect on severe COVID-19 outcomes. The odds of severe COVID-19 outcomes in supplemented patients were non-significantly reduced at lower cutoff values for vitamin D insufficiency (<20 ng/mL and <12 ng/mL) for all supplementation amounts. Conclusion: Vitamin D supplementation in patients with vitamin D insufficiency did not significantly reduce severe COVID-19 outcomes; however, vitamin D supplementation was associated with non-statistically significant reduced odds of severe COVID-19 outcomes at lower cutoff values of vitamin D level. These results demonstrate that Vitamin D supplementation may have a protective effect against severe COVID-19 outcomes in patients with lower baseline levels of vitamin D.

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The Impact of Glucose Tolerance States on Bone Mineral Density and Fracture Rate

Maria Chang Villacreses, MD[1], panadeekarn panjawatanan, MD[2], Rudruidee Karnchanasorn, MD[3], Horng-Yih Ou, MD & PhD[4], Wei Feng, MD[5], Raynald Samoa, MD[6], Lee-Ming Chuang, MD, PhD[7], Ken C. Chiu, MD[8].

[1]CITY OF HOPE NATIONAL MEDICAL CENTER, Duarte, CA, USA, [2]Bassett Medical Center, Cooperstown, NY, USA, [3]The University of Kansas Medical Center, Kansas City, KS, USA, [4]National Cheng-Kung University Medical Center, Tainan, Taiwan, [5]City of Hope National Medical Center, San Gabriel, CA, USA, [6]City of Hope National Medical Center, Duarte, CA, USA, [7]NATL TAIWAN University, Taipei, Taiwan, [8]City of Hope National Medical Center, Santa Monica, CA, USA.

It is generally acknowledged that fracture rate is higher in diabetic subjects than non-diabetic subjects. However, the impact of diabetes on bone is less clear due to contradictory results of bone mineral density (BMD) and fracture rate. To date, most of reports were based on the studies