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The Relationship between Vitamin D Concentrations and Knee Pain in Patients of Osteoarthritis

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Objectives: In older people Osteoarthritis (OA) and vitamin D deficiency are common health conditions. It controversial whether vitamin D concentration is associated with knee OA or not. In this study, we aimed to determine the association between serumconcentrations of vitamin D and osteoarthritic knee pain.

Subjects and Methods: Vitamin D concentrations were measured with the 25 hydroxy vitamin D test in patients presenting with clinical symptoms of primary kneeosteoarthritis. Osteoarthritis was graded on the Kellgren-Lawrence grading scale fromanteroposterior and lateral radiographs. Height, weight, and body mass index (BMI) were recorded. Patients completed a 10-cm visual analogue scale (VAS) for indicatingpain and the Western Ontario and McMaster Universities Arthritis Index (WOMAC).Vitamin D concentration was defined as severely deficient (<10 ng/mL), insufficient(10 to 19 ng/mL), or normal (20 to 50 ng/mL).

Results: Of 149 patients (133 women), the mean age was 62.7 years. Mean vitaminD concentration was 10.93 ng/mL, and 89% patients were vitamin D deficient. MeanWOMAC score was 56.9, and VAS pain score was 7.5. Kellgren-Lawrence grade was 3for 11 patients, grade 2 for 60, and grade 4 for 88. Mean BMI was 33.4. Mean values ofVAS, WOMAC, and BMI did not differ by vitamin D status.

Conclusion: Serum vitamin D concentration is not associated with knee pain in patientswith osteoarthritis.

Keywords: Pain, Knee Vitamin D, Osteoarthritis.

INTRODUCTION

The incidence of vitamin D deficiency is 25% in the general population and more than40% in the elderly population in US and it is a common health problem (Heath & Elovic,2006). Vitamin D is important to normal bone and cartilage metabolism. Insufficientconcentrations of vitamin D adversely affect calcium metabolism, osteoblastic activity, matrix ossification, bone density, and articular cartilage turnover.[6,11,22] Vitamin D can reduce bone turnover and cartilage degradation, thus potentially preventing the development and progression of knee osteoarthritis.[14,19] Epidemiological studies showed that low serum25-hydroxyvitamin D levels were associated with greater knee pain a higher prevalenceof radiographic knee osteoarthritis and higher risk of progression[2,19]. It has also anti-inflammatory properties, proinflammatorycytokine production in states of vitamin D deficiency might alter central pain processing, thereby increasing mechanical pain sensivity[20]. A cross-sectional study reported that the prevalence of vitamin D deficiency was 72% in patients with widespreadmusculoskeletal pain[4].

Osteoarthritis (OA) is a degenerative joint disease involving the cartilage and manyof its surrounding tissues. In addition to damage and loss of articular cartilage, there is remodeling of subarticular bone, osteophyte formation, ligamentous laxity, weakening ofperiarticular muscles, and, in some cases, synovial inflammation. Pain is the major clinicalsymptom in knee OA joint.

Osteoarthritis (OA) and vitamin D deficiency are common health conditions in olderpeople. Whether vitamin D concentration is associated with knee OA is controversial.Vitamin D concentrations have been associated with worsening OA, increase in cartilageloss, development of knee osteophytes, worse radiological grading, and poorer functionalstatus. It has been hypothesized that vitamin D supplementation might be a feasible andcost effective strategy for controlling symptoms and inducing structural improvementin patients with knee OA. However, results for the correlation between low bloodconcentrations of vitamin D and knee OA are conflicting.

We aim to determine whether there is a correlation between knee pain and serum vitamin D levels in patients with knee OA.

SUBJECTS AND METHODS

The study was approved by the institutional review board of VIMS Gajraula. All patients provided written informedconsent before being enrolled in the study.

In this cross-sectional study, all patients admitted to Orthopedics department with clinical and radiological evidence of knee OA between 1 June and 31 August2020, were eligible for enrollment. We excluded patients with underlying endocrinepathology, inflammatory diseases, patients who take medications affecting D vitamin status or a history of knee trauma and surgery.

Height and weight were measured in examination room by the same surgeon. Body massindex (BMI; weight (kg)/height (m2)) was calculated. Anteroposterior and weight-bearingradiographs of the knee were taken with the same radiographic equipment. The severity ofOA was determined by the Kellgren-Lawrence system from radiographs. Grades 1 and 2were considered to be mild and grades 3 and 4 as severe.

Knee pain was assessed by a self-administered questionnaire that include a 10-cm visualanalogue scale (VAS) and the Western Ontario and McMaster Universities Arthritis Index(WOMAC). The WOMAC consists of 24 items, each scored from zero to 4, yielding a totalscore from zero to 96. Higher scores indicate more severe disease. There are five items forpain, two for stiffness, and 17 for functional limitations, such as stair use, walking, gettingin or out of a bath, and household duties.

Fasting morning blood samples were obtained from all patients and were anti-coagulatedwith EDTA. The plasma was separated by centrifugation. Plasma 25-OH D concentration was determined by radioimmunoassay kits via Elisa (Anti 25(OH) Vitamin D monoclonal, Beckman Coulter, Oslo, Norway). Vitamin D concentration was defined as severe deficient (<10 ng/mL), insufficient (10 to 19 ng/mL), or normal (20 to 50 ng/mL).

STATISTICAL METHODS

Frequencies and percentages were compared among the three vitamin D status groups withChi-square tests. Correlations between vitamin D concentrations and WOMAC, VAS painscores, and BMI were assessed with multiple stepwise regression analysis. Alpha was setat 0.05. Data were analyzed with the

Statistical Package for Social Sciences (SPSS) version17.5. All data conformed to the assumptions of the test used to analyze them.

RESULTS

Of the 142 enrolled patients (126 woman), mean age was 64 years. Vitamin D status was deficient in 75, insufficient in 53, and normal in 14. Kellgren-Lawrence grade was 2 in 10patients, 3 in 57 patients, and 4 in 85.

Aside from a borderline-significant difference in age, there were no statistically significantor clinically important differences among the three vitamin D status groups.

Age was weakly but significantly correlated with Kellgren-Lawrence grade, vitamin Dconcentration, WOMAC score, and BMI. WOMAC scores were moderately andsignificantly correlated with pain scores and Kellgren-Lawrence grade.

DISCUSSION

The most importing finding of our study was there was no correlation between knee painand vitamin D concentrations in knee OA patients. Effect of vitamin D on knee OA and pain have controversial results in literature. Although large cohort studies demonstratedthat serum vitamin D levels is an independent predictor of knee pain progression [21],small to moderate effect on pain control revealed by Diao, Yang & Yu (2017) Cakar et al[7] in patients with knee OA via vitamin D supplemantation. They also conclude that effect of vitamin D supplemantation on knee pain is no more than 10% improvement.

Vitamin D sufficiency may affect cartilage metabolism. Preliminary evidence suggeststhat vitamin D directly affects chondrocytes in osteoarthritic cartilage, and vitamin Dreceptors are found in human articular chondrocytes of osteoarthritic cartilage [28, 3].

The association of vitamin D deficiency and musculoskeletal conditions has been wellstudied, especially that for musculoskeletal pain, low back pain, fibromyalgia, and kneeand hip OA. However, results for the correlation between low blood concentrations ofvitamin D and knee OA are conflicting. Heidari, Heidari & Hajian-Tilaki (2011) reported a high prevalence of vitamin D deficiency and a significant positive association between thisdeficiency and knee OA in patients less than 60 years of age. Ding et al. (2009) determinedfrom radiographs and magnetic resonance imaging that vitamin D concentrations wereassociated with knee pain and decreased knee cartilage loss. So vitamin D supplementationcould be used for knee OA pain. Vitamin D supplementation for six months reducedoxidative protein damage, decreased pain (VAS), improved quality of life, and improvedgrip strength and physical performance in osteoarthritis patients, and improves lowerextremity functions[17, 25.] However Sanghi et al. (2013)assert a reason for the positive effect of vitamin D, which in many studies only OA patientswith insufficiency vitamin D, the group most likely benefit from supplementation.

Pain is a common presenting symptom in patients with OA of the knee. However, whysome people with knee OA report greater pain intensity than others, even when radiographicevidence of disease severity is comparable, remains unclear. Pain sensitization, is animportant concept to explain this difference. Sensitization of the peripheral and centralpathways that process nociceptive information is also an important contributor to theclinical presentation of pain in knee OA[10].Pain suppression by thecentral nervous system including top down inhibition of musculoskeletal pain might alsobecome dysfunctional if vitamin D is low[23]. In our study we found no correlation between knee pain and vitaminD deficiency,

but all of our patients were Kellgren-Lawrence grade 2 or more which couldbe a late phase in learned pain and pain sensitization. This does not mean than low levels ofvitamin D play a critical role in OA pathogenesis and progression. Straube et al. suggestedthat the evidence for treating chronic painful conditions with vitamin D supplementation inadults is poor (Straube et al., 2015), although others have reported that moderate vitamin Ddeficiency independently predicts incident, or worsening of knee pain over 5 years[16].

We found no study reporting that serum vitamin D concentration predicted pain inknee OA. Studies that did evaluate vitamin D and pain looked at changes in pain over time.

Limitations of the Study

The number of patients was small. Due to natural selection of knee OA patients, themajority of our patients were female and overweight. We did not use magnetic resonanceimaging, which could have provided us with more information about early knee OA. Therecould be many factors which could affect the perception of pain so we could not be surethat the pain scores were directly due to knee pain. A control group with knee OA that doesnot have knee pain could be more appropriate for a comparison. Also, due to the crosssectional design of the study, we did not follow up on the patients' knee OA progressionsand vitamin D levels.

CONCLUSION

We found no evidence that vitamin D concentrations measured at the first visit of patientswith OA of the knee were associated with knee pain based on our data. Low levels ofvitamin D may not play a critical role in OA pathogenesis and progression. More studiesare needed for vitamin D role in OA pathophysiology and pain perceptions.

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