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VITAMIN D STATUS, INFLAMMATORY MARKERS AND PAIN IN EARLY KNEE OSTEOARTHRITIS

Monal Velangi[1], Subhadra Mandalika[2] and Surendra Shukla[3]

[1]Department of Foods, Nutrition and Dietetics, College of Home Science, Nirmala Niketan, Mumbai, Maharashtra, India; [2]Department of Diet, K. J. Somaiya Hospital and Research Centre, Mumbai, Maharashtra, India; [3]Department of Orthopaedics, K. J. Somaiya Medical College, Hospital and Research Centre, Mumbai, Maharashtra, India.
Email: monalvelangi@hotmail.com

Abstract:
Prevalence of knee osteoarthritis (OA), a degenerative joint disease with cartilage degeneration and inflammation; and vitamin D deficiency are observed to rise in India. However, the association between vitamin D with Knee OA is less explored. Hence, present study was aimed at assessment of vitamin D status, inflammatory markers and pain in early Knee OA. Fifty adult early Knee OA patients (30-65years) were selected from K.J. Somaiya Hospital and Research Centre, Mumbai using purposive sampling technique. They were assessed for serum vitamin D status (serum 25 (OH) D, serum calcium, phosphorus and alkaline phosphatase -ALP), inflammation (erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) and pain (Visual Analogue Scale -VAS). Data was analysed using SPSS 16.0. 86% of the participants showed low Vitamin D status (< 30 ng/ml). Grade 2 Knee OA patients showed significantly higher CRP levels than grade 1 ($p<.01$). A negative correlation was observed between serum vitamin D level and the Knee OA grade and CRP. Moreover, serum vitamin D was positively correlated with ESR, serum calcium, phosphorus and ALP levels. A highly significant negative correlation between serum Vitamin D and pain score ($p\leq .001$) indicates the positive effect of vitamin D on pain. Results of this study indicated that early Knee OA patients are at the risk of vitamin D deficiency and supplementation with the anti-inflammatory nutrient vitamin D would be beneficial to reduce pain, inflammation and arrest disease progression in the Knee OA patients.

Key words: Knee osteoarthritis, Vitamin D, C-reactive protein, Inflammation

INTRODUCTION:

Knee osteoarthritis (OA) is degenerative joint disease with cartilage degeneration and inflammation, associated pain and stiffness limits the daily functional abilities. It is the 4th leading cause for disability among adults[6]. Prevalence of Knee OA is rising at an alarming rate globally and in India. OA has various causative factors such as aging, obesity, repetitive joint use, stress, smoking, low bone mass density, and deficiencies of proteins, vitamins –A, D, E, K, calcium, magnesium zinc, boron and selenium. Inflammation of synovium and extracellular matrix degradation in articular cartilage caused by small protein mediators and cytokines has been reported in osteoarthritis[15].

Low vitamin D status is seen across the world [14]. North and South India have equally high incidence of moderate to severe vitamin D deficiency[12]. Vitamin D deficiency affects calcium absorption, resulting in low serum calcium levels causing skeletal resorption thus ultimately affecting the bone structure leading to osteopenia and osteomalacia[8,19]. Vitamin D is also an anti-inflammatory nutrient.

However, there is a lack of research on correlation between Vitamin D with inflammatory markers in Knee OA. Hence, this study was aimed at assessment of vitamin D status, inflammatory markers and self-perceived pain of early Knee OA patients.

MATERIALS AND METHODS:

Research Design: This study was a randomized survey conducted at K.J.Somaiya Hospital and Research Centre, Mumbai and has obtained ethical clearance from Medical Ethics Committee of K.J. Somaiya Medical College. An informed consent was also obtained from the participants in the comprehensible language.

Participants: Fifty adults (30-65 years) including males and females suffering from early osteoarthritis grades 1 and 2 as per Kellgren- Lawrence grading[13] were selected using purposive sampling technique from K.J.Somaiya Hospital and Research Centre, Mumbai Orthopaedic and Diet outpatient department.

Methods: Participants were screened for their vitamin D status by E-CLIA method[11] and those with low serum vitamin D3 level were categorized as patients with insufficiency (≤ 30 ng/ml) as well as deficiency (≤ 20 ng/ml) according to Institute of Medicine guidelines. They were also investigated for serum Ca (Arsenzao III)[2], serum P (phosphomolybdate method)[4], serum ALP (P-nitrophenyl

phosphate method)[5,15]. Inflammation among the participants was assessed by estimation of ESR count and serum CRP (Rhelax slide test)[17]. The pain score was assessed by using Visual Analogue scale[10].

Statistical Analysis: The collected data was analysed by using SPSS 16.0. The difference between the grades of Knee OA with respect to the biomarkers and pain parameters was analysed by independent sample t test and correlation between vitamin D, pain and inflammation was analysed by Pearson's correlation coefficient.

RESULTS AND DISCUSSION:

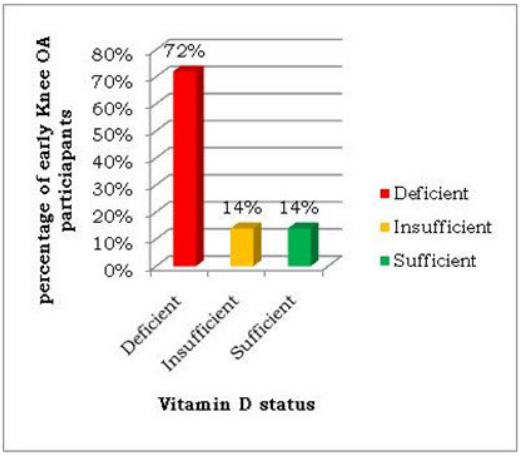

Figure 1: Vitamin D Status in Early Knee OA

As per Institute of Medicine guidelines, overall, 86% of the participants were reported to have low Vitamin D status, i.e. serum 25 (OH) D levels were less than < 30 ng/ml. As seen in Figure 1, 72% of the participants were found to be deficient (< 20 ng/ml) , where as 14% had insufficient serum vitamin D levels (20-30 ng/ml). Researchers have also shown an association between low 25-(OH) D levels and progression of osteoarthritis [4,8].

Table 1: Correlation of Serum Vitamin D with Inflammatory markers and pain

Parameters	r value
CRP	-.091
ESR	.100
VAS	-.505***
Ca	.188
P	.116
ALP	.224
Knee OA grade	-.043

As seen in Table 1, a highly significant (p ≤.001) negative correlation (r= -.505***) was observed between serum Vitamin D and the pain score, indicating the positive effect of vitamin D on pain. Also, a negative correlation was observed between serum vitamin D level and the grade of Knee OA and CRP. Moreover, serum vitamin D was positively correlated with ESR, serum calcium, phosphorus and ALP levels. Recent studies have reported low serum vitamin D levels in relation to pain in Knee OA[13]. A highly significant (p≤.01) positive correlation (r= .394**) was observed between the grades of Knee OA and serum CRP levels. Interestingly, participants with grade 2 Knee OA were observed to have mean CRP levels 1.01 mg/dl ± .79, grade 1 Knee OA participants were found to have mean CRP levels of 0.40 mg/dl ± .69 ; indicating a highly significant difference (p <.01) in serum CRP levels as Knee OA progresses from Grade 1 to 2. However, there was no significant difference in the ESR across the grades.Studies have reported low levels of increases in serum CRP levels as the Knee OA progresses[1,16]. Hence, the increasing trend in CRP levels with Knee OA progression, suggests CRP may be a prognostic marker for early diagnosis of Knee OA.

CONCLUSION:

Results of this study indicated that early Knee OA patients are at the risk of vitamin D deficiency. Vitamin D being anti-inflammatory in nature would be beneficial to reduce pain, inflammation and arrest disease progression suggesting its protective role in arthritis[3].

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