

RESEARCH ARTICLES

ASSOCIATION OF 25(OH)D SERUM LEVEL WITH DEGREE OF WOMAC INDEX IN ELDERLY FEMALE PATIENTS WITH KNEE OSTEOARTHRITIS AT KPKM FK UIN JAKARTA

Ananda H Wahyudi¹, Achmad Zaki^{2*}, M. Djauhari Widjajakusumah³, Syarief H Lutfie⁴, Muniroh⁵.

¹Faculty of Medicine, Syarif Hidayatullah State Islamic University of Jakarta

²Department of Surgery, ³Department of Physiology, ⁴Department of Physical Medicine and Rehabilitation,

⁵Departement of Clinical Pathology, Faculty of Medicine, Syarif Hidayatulloh State Islamic University of Jakarta

*Corresponding Author: achmad.zaki@uinjkt.ac.id

ABSTRACT

Background: Osteoarthritis (OA) is a chronic, progressive, degenerative disease which incidence increase with age and occurred majority in female. Pain in OA occurs due to accumulative process of degradation, repairment, and inflammation that causes symptoms of pain accompany with decrease in joint activity and function. These symptoms in elderly people, count about 9,8% of Indonesian population in 2020 which is muslim in majority, often causing complaints of difficulties to perform certain movements in shalat. Vitamin D is a nutritional factor which is known would inhibit progressive joint destruction and relief of painful symptoms. Thus promising to help the elderly to perform the shalat without knee joint problems. This research aimed to determine the association between 25(OH)D serum level and the degree of WOMAC index of

pain, stiffness, and functionality of knee OA in elderly female patients at Public Health Clinics.

Methods: Analytic Cross-Sectional design was used, with 106 elderly female as respondents, whose pain degree, stiffness, and functionality were measured using the WOMAC questionnaire of Knee OA and 25(OH)D serum level was examine.

Results: Chi Square Fisher statistical analysis showed that there is no significant statistical association found (p 0,689) between 25(OH)D serum level and the degree of WOMAC index of knee OA.

Conclusion: There is no significant statistical association found between serum vitamin D level and degree of WOMAC index of knee OA in elderly female patients.

Keywords: osteoarthritis, vitamin D Serum, WOMAC, elderly female.

INTRODUCTION

Osteoarthritis (OA) is a degenerative disease with pain during activity as the most frequent complaint felt by the patient. The symptoms often restrict individual mobilization at more severe degree. The prevalence of OA in Indonesia reaching 15.5% in men and 12.7% in women.¹ Factors affecting the disease are age, genetics, obesity, metabolic disease, inflammatory joint disease, and nutrition (especially low vitamin D intake).² With increasing numbers of elderly population among Indonesian people, around 9,8 % in 2021 compare with only 7,6% in 2010 – which is moslem in majority - knee joint pain when performing shalat becoming most frequent problems arise. Vitamin D deficiency is found mainly in postmenopausal women with an incidence of up to 92.5% in elderly population in Jakarta.^{3,4} According to the Institute of Medicine, a person has a deficiency of vitamin D

level if the serum 25-hydroxyvitamin-D or 25(OH)D level is below 20 ng/ml (normal value 30-100 ng/ml).⁵ McAlindon, et al. (1996) found that individuals with low level of serum 25(OH)D (<27 ng/ml) are three times more likely to suffer from progressive knee OA than individuals with higher levels.⁶ Thus, vitamin D level monitoring is promising to be a determining factor for knee OA.

Knee radiological examination use to establish the diagnosis of OA disease and determine the severity degree by the Kellgren-Lawrence criteria. The related symptoms of knee OA can be examined by filling out several types of questionnaire. The most widely used questionnaire is the Western Ontario and McMaster's Universities Osteoarthritis Index (WOMAC).^{7,8,9} WOMAC questionnaire index is a disease-specific measurement that is filled independently by patients with knee and hip OA consisting of 24 items to assess pain, stiffness and function. The higher value

obtained, the greater functional limitations experienced by the patient. While a low value indicates an improvement in the patient's joint functional ability.^{10,11} Examination using WOMAC index has been carried out in several research with good validity in defining limitations of the knee or hip OA.¹² The theory regarding association between OA and vitamin D has indeed been widely discussed, but research regarding the subject is still rare in Indonesia, especially in elderly female patients with knee OA.

METHODS

Design

This study was using cross-sectional analytic using medical records of knee OA patients at Public Health Care Clinics (KPKM) Medical Faculty of Syarif Hidayatullah State Islamic University (FK UIN) of Jakarta during period of 2018.

Study Population

This research was conducted at the KPKM FK UIN Jakarta, with 106 elderly female patients as respondents, and has been approved by the committee of ethical research of FK UIN Jakarta. Determination of sample size was using the formula of estimating difference between two-proportions by Lemeshow (1990). The inclusion criteria for this study were female aged >60 years who were diagnosed with knee

OA by x-ray examination of Kellgren-Lawrence grade 1 to 3, 25(OH)D serum level <125 nmol/L and filled out the WOMAC index questionnaire. Research subjects were excluded if incomplete research data were found.

Data Analysis

The variable of this study were the 25(OH)D serum level and the results of WOMAC index questionnaire. All variable data from the recruited patients were included in the analysis. Comparisons among groups was performed using two-way analysis of variance Chi Square (Yates) or Fisher's Exact Test, whichever applicable, and a $p < 0.05$ was considered as statistically significant.

RESULTS

Baseline Characteristics

The characteristics of subjects were summarized in Table 1. A hundred and six medical record of elderly female patients with knee OA were obtained and analyzed. None of them were excluded. Vitamin D insufficiency was found in majority 67 respondents (63,2%), with 18 patients (16,9%) have deficient level of vitamin D. The WOMAC questionnaire result show that majority 95 respondents (89.6%) have pain, stiffness and functional score from 0-40 which is mild and there was no respondents with severe degree of WOMAC index.

Table 1. Baseline Characteristics of Vitamin D Serum and Degree of WOMAC Index

	Variable	Frequency (%)
Vitamin D Serum	Sufficient (>50-125 nmol/L)	21 (19.8%)
	Insufficient (25-50 nmol/L)	67 (63.2%)
	Deficient (<25 nmol/L)	18 (16.9%)
Degree of WOMAC Index	Mild (0-40)	95 (89.6%)
	Moderate (40-70)	11 (10.3%)
	Severe (70-96)	0 (0%)

Vitamin D Serum Level and Degree of WOMAC Index

The statistical association between vitamin D serum level and WOMAC index result were summarized in Table 2. From the result between the two variables found that respondents with abnormal (insufficient and deficient) vitamin D serum level (<25-50 nmol/L) are more likely to

have mild degree of WOMAC index (88.24%) compare with moderate degree. Although about 90% of patients in moderate category have abnormal vitamin D serum level. There is no significant statistical association found between level of serum Vitamin D and degree of WOMAC index ($p > 0,05$).

Table 2. Comparison Between Vitamin D Serum Levels and WOMAC in Elderly Women With OA Knee.

Vitamin D serum level	Degree of WOMAC Index		P Value
	Mild	Moderate	
Sufficient	20 (95.24%)	1 (4.76%)	0.689
Insufficient + Deficient	75 (88.24%)	10 (11.76%)	
Total	95	11	106

DISCUSSION

Vitamin D is a hormone that has a major role in calcium homeostasis and regulation of bone metabolism. Deficiency of vitamin D level can cause decrease in calcium and phosphate levels and increase in PTH levels in the body.^{13,14} Vitamin D Receptors (VDR) which mediated the activity of vitamin D in the tissue and cells are found in chondrocyte cells of the knee joint and hold the role of regulating metalloproteinase matrix and prostaglandin E2 (PgE2) secretion and also function in producing proteoglycans which work to regulate bone cartilage.^{14,15,16} Degenerative bone remodeling can be inhibited with vitamin D role in metabolizing subchondral bone.^{17,18} With the presence of VDR in cartilage cells, 1,25(OH)₂D₃ and 24,25(OH)₂D₃ are thought to have a role in the differentiation and maturation of cartilage calcification. Recent research also show that vitamin D deficiency was found to have deteriorating effect on the resting zone & upper proliferative cells from cartilage. Administration of 25(OH)₂D₃ and 24,25(OH)₂D₃ to chondrocytes and resting zone showed that vitamin D can directly influence cartilage cell metabolism.^{19,20} Research conducted by Tetlow & Woolley (2001) showed that cartilage specimens of knee OA patients have tested positive for VDR in the chondrocytes and none in specimens of patients without knee OA. Vitamin D Receptors and MMP-3 were also found in chondrocytes of knee OA specimens by in-situ dual immunolocalization.

Tetlow & Woolley also found that 1--25(OH)₂D₃ have important role in the regulation of MMP-3 production. In the contrary, treatment with 1--25(OH)₂D₃ was significantly suppressed the production of MMP-9 and PGE₂ induced by PMA.²¹ Other studies have shown that 1,25(OH)₂D can inhibit the effects of cytokines pro-inflammatory such as IL-1, IL-2, IL-6, and IL-8. Therefore vitamin D had showed to provide direct anti-inflammatory effects.^{22,23} Research by Gao (2017) showed that vitamin D supplementation in patients with knee OA was able to reduce the degree of pain and improve function based on the degree of WOMAC index.²⁴

This study found that there was no statistical significant association between vitamin D serum level and degree of WOMAC index. Several factors could explained the intriguing result of this study compare with the previous research. The severe degree knee OA of KL 4 was not included in this study due to the main research inclusion criteria. The normality of data distribution between categories of WOMAC index degree was unequal (no respondents in severe category), information bias and other confounding factors also not included in this research.

LIMITATIONS OF THE STUDY

The quantity of patients in this study was small, due to the natural selection of elderly female knee OA patients. We also utilized secondary data from medical records as our

sources. There could be numerous components which could affect the vitamin D serum levels and degree of WOMAC severity index, such as hereditary, consumption of vitamin D, exposure to the sun, physical activity level and body composition. Additionally, due to the cross-sectional design of the study we did not follow up the knee OA progressions and vitamin D levels all through the time.

CONCLUSION

We found no statistically significant evidence that vitamin D serum level on elderly female patients with knee OA were associated with degree of WOMAC index

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Conflicts of Interest

We declare that there is no conflicts of interest in this study

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Competing Interests

The authors declare that there are no competing interests.

Human Ethics

The study was approved by the Ethics of Committee and Human Studies Review Board of Faculty of Medicine, Syarif Hidayatullah Islamic State University of Jakarta.

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