ASSOCIATION OF LEVELS OF CALCIUM (CA\textsuperscript{++}) AND URIC ACID (UA) LEVELS WITH OSTEOARTHRITIS (OA) IN IRAQI PATIENTS

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ABSTRACT

Osteoarthritis is a prevalent degenerative deficiency of the articular cartilage linked with hypertrophic bone changes. Present study was designed to examine effect serum levels of Ca\textsuperscript{++} and UA in development of OA in Iraqi patients. Total of 75 subjects were enrolled in current study, 50 patients with OA and 25 healthy subjects controls. Serum levels of Ca\textsuperscript{++} and UA were measured in each volunteer. Current study showed significant elevation (p value < 0.05) in UA and nonsignificant differences in Ca\textsuperscript{++} compared to controls group. Our results revealed no effects to serum Ca\textsuperscript{++}, while UA may has important role in emergence of OA in Iraqi patients.

Keywords: Osteoarthritis, uric acid, serum calcium

How to cite this article: Hamoodi Aldabagh MA, Saed MR, et al (2020): Association of levels of calcium (CA\textsuperscript{++}) and uric acid (UA) levels with osteoarthritis (OA) in Iraqi patients, Ann Trop Med & Public Health; 23 (4): S492. DOI: http://doi.org/10.36295/ASRO.2020.2348

INTRODUCTION

Osteoarthritis (OA) is a degenerative disorder of the joints which is characterized by declination of articular cartilage, synovitis, and changes to subchondral bone which manifest changed remodeling\textsuperscript{[1]}\textsuperscript{[1]}. It is a main popular matter as it is one of the prime causes of disability and morbidity, thereby laying a massive medical and economic load on health resources\textsuperscript{[2]}\textsuperscript{[2]}. In spite of these attentions, the pathogenesis of OA remains ambiguous. A combination of regional joint-specific agent acting in the case of systemic tendency may lead to the development of OA\textsuperscript{[3]}\textsuperscript{[3]}. It is hypothesized that nutritional disturbance is also implicated in the pathogenesis of OA. The magnitude of nutrition in the conservation of joint health is now excessively recognized \textsuperscript{[4]}\textsuperscript{[4]}. Serum magnesium (Mg) levels may have reverse relation with OA\textsuperscript{[5]}\textsuperscript{[5]}. Calcium, within the same family in the periodic table as Mg, shares the same homeostatic regulating system that includes the calcium sensing receptor as well as (re)absorption with calcium \textsuperscript{[6]}\textsuperscript{[6]}. Crystal formulation and sedimentation of calcium pyrophosphate or monosodium urate in the joints is substantial and popular give rise of acute arthritis. In aging, calcium pyrophosphate dihydrate deposition disease (CPPD) is the main reason of acute arthritis. The highest hazard sets for CPPD,
aside from elderly, are persons with history of trauma, osteoarthritis, genetic and metabolic disturbances, hypomagnesemia and hyperparathyroidism. The prevalent kinds of calcium-containing crystals that are connected with joint and periarticular disorders are basic calcium phosphate (BCP) crystals and calcium pyrophosphate dihydrate (CPP). Hyperuricemia is a prevalent condition, and in a subcategory of patients lead to development of gout, the most widespread inflammatory arthritis. Osteoarthritis is the most prevalent form of arthritis. The risk of disability and mobility due to OA alone is greater than any other medical disorder among elderly. The prevalence of OA that are symptomatic ranges between 7 and 26% dependent on the location and definition of OA. Worldwide, the load of OA has been elevated in the past two decades, and its prevalence is imagined to be about double in the next decade. Gout is a crystal-induced arthritis results from precipitation of the monosodium uric acid crystal (MSU) correlated to long time with hyperuricemia. Also, it is a popular inflammatory arthritis affecting about 5% of the middle-aged as well as elderly population worldwide. The correlation of OA and uric acid has long been founded, and a pathological relation between OA and gout has been hypothesized. Obesity and aging are significant risk conditions shared by both of OA and gout, and may be confound the relationship between both disorders. The pathological relation between these two prevalent conditions stay elusive. Whether gout cause of OA is particularly related to OA research. In this study, the possible pathological mechanism and association between hyperuricemia and OA will investigated. Hence, thorough investigation of serum calcium and UA levels in Iraqi patients with OA can make further insight about probable correlation between serum calcium and UA with development of OA in a different geographic setting. Present study, designed a case-control study pursued to further evaluate the relation of the prevalence of OA with serum studied markers.

MATERIAL AND METHODS

Present study was carried in Haditha general from July 2019 to August 2019. Clinical samples were collected in Rheumatology & Rehabilitation Consultation Department. Seventy-five volunteers (unrelated) were enrolled in case control study, 50 patients (58.2±8.1 years) from both sex diagnosed with osteoarthritis, control group composed of 25 apparently healthy individuals (57.2±7.9 years). Venous blood (without tourniquet) serum were collected from each participant. Using biochemical kits, serum Ca++ and UA tests were done for each sample. Conducted study was approved by Research Ethical Committee of College of Medicine/AL-Nahrain University. All the volunteers were provided with written informed consent to enroll in this study.

Statistical analysis

Using software of SPSS program (version 20), collected data were analyzed by student’s t-test to match means of Ca++ and UA levels between cases and control. Levels of measured parameters expressed as (Mean±Standard deviation). In all tests, significance was set at 0.05 (P ≤ 0.05).

RESULTS

Serum levels (Mean±SD mg/dl) of calcium in OA patients (9.023±0.55 mg/dl) showed non-significant differences (p value: 0.095) compared to control group (9.016±0.38 mg/dl) (Fig. 1). Regarding serum levels of
UA showed significant elevation in OA patients (6.58±1.48 mg/dl, p value: 0.011) compared to control group (5.2±0.92 mg/dl) (fig. 1).

![Figure 1: Histogram showing serum level of calcium (Ca++) and uric acid (UA) in patients and control groups.](image)

**DISCUSSION**

Present study showed non-significant differences in serum calcium levels in patients with OA compared to control group. Yazmalar et al found that levels of serum calcium were not significantly associated with OA.[20] Furthermore, the results of other studies consent with present studies.[21,22] Wang et al concluded that old aged with asymptomatic hyperuricemia correlated with risk of knee OA[23]. In vitro studies have inspected the pathophysiological function of calcium on chondrocyte. In chondrocytes, calcium is engaged in synthesis of matrix, also involve in cytoskeletal remodeling, cell hyperpolarization, as well as cell death. Indeed, Intracellular calcium release has been engaged for upregulation of gene in response to static pressure in cartilage[24]. Cell experience also has shown a demand for calcium to typical post-translational modifications of glycosylation step and foreword of secretory proteins[25,26]. Other study reposed that extracellular calcium may be substantial for maintaining of calcium homeostasis as well as cell viability over time[27].

Although there is no explicit proof found that calcium has a role in the OA pathogenesis, accumulated studies support that calcium is implicated in physiological as well as pathological processes of chondrocyte. Functions of chondrocytes may be harmed under calcium insufficiency conditions. Indeed, studies are yet required to obviously understand the mechanisms of action and efficacy of calcium. Furthermore, significant differences were showed across all of serum calcium level in terms of alcohol drinking ratio, ratio of hypertension, the ratio of diabetes as well as female ratio. These findings were in correspondence with many studies which referred that serum calcium levels are significantly associated with alcohol drinking[28], gender difference[29], diabetes mellitus[30,31] hypertension condition[32,33].

Regarding UA, current study showed that serum uric acid is significantly elevated and related to development of OA, the main focus of current project which designed to examine the relation of uric acid concentration and the
severity of radiographic OA. Cheryl and Ying reported that higher concentrations of UA is positively associated with the severity of radiographic OA, while concluded that there is no definite causal relation between uric acid, OA and gout thus far\cite{34}. In \textit{vitro} study Chhana et al reported that cartilage degradation my developed due to the direct effects of MSU crystals. MSU crystals have been shown to inhibit human chondrocyte viability and function\cite{35}. Individuals with OA in different sites had elevated levels of serum uric acid compared to group of controls. In cross-sectional study, showed independent correlation between serumic acid level with OA\cite{36}. Several following cross-sectional studies\cite{37,38} as well as cohort studies\cite{39-41} concluded significant associations of uric acid level with OA. In a cross-sectional study, showed that levels of serum uric acid correlated with generalized OA in patients with arthroplasty for hip OA, but not with those who had arthroplasty for knee OA\cite{42}. Other study concluded that women with the elevated uric acid showed the high degree of radiographic features revealing of knee OA\cite{43}. Recently, Also, in study of knee OA patients without gout revealed that serum uric acid concentrations significantly outstanding non-progresses from progresses determined by joint space narrowing on radiography\cite{44}. It is substantial to distinguish between gout and hyperuricemia, wherever gout is the clinical event generate from MSU deposition. Co-localization of nodular hand OA and gout has long been concluded\cite{45}. The first metatarsophalangeal joint, knee, mid-foot, as well as distal interphalangeal joint of digit that was influenced by gouty condition had increased of having OA that was clinically assigned. Roddy et al. reported that joints influenced by gouty arthritis were more predispose to obvious chronic pain symptoms of OA\cite{46}. The presence of gout was correlated with sharper structural knee OA on radiography and further involvement of frequent bilateral knee. However, the variation between the group of hyperuricemia and group of control and/or group of gout did not obtain statistical significance\cite{47}. The cross-sectional design of all the above studies cannot differentiate whether gout predisposes to the development of OA or joints with OA facilitate the localized deposition of MSU crystals in presence of hyperuricemia.

**CONCLUSION**

Hyperuricemia has significant association with development of OA, while serum levels of calcium not revealed such association with OA development.

**ACKNOWLEDGMENTS**

My greatest appreciation to all staff members at the Chemistry and Biochemistry Department and medical research unit, College of Medicine, Al-Nahrain University for their help and cooperation.

**ETHICAL CLEARANCE**

The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

**CONFLICT OF INTEREST**

The authors declare that they have no conflict of interest.

**FUNDING:** Self-funding
REFERENCES


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