



CORRELATION BETWEEN SERUM MAGNESIUM LEVEL AND SEVERITY OF KNEE OSTEOARTHRITIS

Orthopaedics

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ABSTRACT

Osteoarthritis is most prevalent chronic disease of joints worldwide causing morbidity in elders and causing burden on healthcare and productivity of people. Osteoarthritis of knee is more common in females than males and its prevalence increase with age and causes immobility hindering daily life routine. Magnesium is an important trace element helping in proliferation and differentiation of osteoblast and osteoclast, increases osteoblast activity which can facilitate bone synthesis, is beneficial to the proliferation and differentiation of chondrocytes and prevents cellular ageing of fibroblasts. The primary aim of this cross-sectional study is to establish relationship of serum magnesium level in severity of knee osteoarthritis and secondarily to establish an association of serum magnesium levels in various stages of knee osteoarthritis by analyzing the data collected from primary knee osteoarthritis patients. It was found that there was no relationship between serum magnesium level and age, gender, BMI, Kellgren Lawrence grade of Xray knee, ESR and CRP values of the patients. In conclusion it was found that there is no correlation between serum magnesium level and severity of knee osteoarthritis.

KEYWORDS

Serum Magnesium, Knee Osteoarthritis, Correlation

INTRODUCTION:

Osteoarthritis is the most common chronic disease of joints globally. This disease may either affect a single joint or multiple joints or it can be generalized. It is a chronic disease of joints which affects the joint globally including articular cartilage, lining of joint capsule and the underlying bone. In osteoarthritis there is loss of cartilage, formation of osteophytes, subchondral bone formation which causes pain, swelling, disability and decrease in life quality. Radiographic structural changes which are visible are joint space narrowing, formation of osteophyte and remodeling of bones around joints. Osteoarthritis may affect any synovial joint in the body but most affected joints are large joints like hip and knee, hands, and spine. Osteoarthritis is caused by mechanical and molecular changes in joint caused by injury, joint malalignment, obesity, ageing, and inflammation.¹

Osteoarthritis can be classified into two groups. Primary osteoarthritis can be localized or generalized. Generalized primary osteoarthritis is commonly found in postmenopausal women, with formation of Heberden's nodes. Secondary osteoarthritis has a cause, like trauma, obesity, Paget's disease, or inflammatory arthritis.²

Magnesium is an important trace element. We get magnesium from our diet as our body cannot produce magnesium by itself. Magnesium is found in grains, beans, and green leafy vegetables. Modern diet is nutrient poor, because of which deficient magnesium intake is prevalent in developed countries. The magnesium levels decrease further with increasing age. There is a possible reason for this magnesium deficiency in old people. Firstly, magnesium absorption from the gut decreases with age, and secondly magnesium deficiency is seen in some diseases like diabetes mellitus or overtake of diuretics and antihypertensive medications.^{3,5}

Magnesium can help in the proliferation and differentiation of osteoblasts and osteoclasts, cell types which are associated with bone formation. Magnesium ions increase osteoblast activity by increasing gap junction and intercellular communication among osteoblasts which can facilitate bone synthesis.³

Magnesium is beneficial to the proliferation and differentiation of chondrocytes which are found in cartilage. Magnesium also affects fibroblasts, as in magnesium deficiency causes cellular ageing of fibroblasts and is also important for mesenchymal stem cells interaction with extracellular matrix. Mesenchymal stem cells divide

multiple times to differentiate into skeletal tissues for example bone and cartilage has been shown to increase the gathering of synovial mesenchymal cells and then facilitate cartilaginous matrix formation.^{3,6}

Osteoarthritis is the second most common rheumatological disease and is also the most frequent disease of joints with a prevalence of 22% to 39% in India.^{7,8} Osteoarthritis is more common in the females than males, and its prevalence increases with age.⁹ About 45% of women older than age of 65 years have symptoms while it is radiologically present in 70% of females over 65 years.¹⁰⁻¹² Osteoarthritis of the knee is a major cause of mobility difficulties, especially among females.^{10,12} Osteoarthritis was estimated to be the 10th leading cause of nonfatal health burden.^{10,11}

Owing to the huge burden and no clear pathophysiology of osteoarthritis, with limited and contradictory literature over relationship between serum magnesium levels and severity of knee osteoarthritis we had done this study to find any correlation between serum magnesium levels and knee osteoarthritis to add some light into pathophysiology and to find better future management of knee osteoarthritis.

MATERIALS AND METHODS

1. Subjects Involved:

The study involved clinical examination of patients visiting orthopedic outpatient department.

2. Study Design: A cross sectional study

3. Source Of Data:

Patients presenting with knee osteoarthritis to the orthopedic OPD of AIIMS Raipur and satisfying inclusion criteria

4. Inclusion Criteria:

1. Patients with primary knee osteoarthritis
2. Age >40yrs
3. Patients willing to participate in study

5. Exclusion Criteria:

1. Patients with history of surgery or trauma to knee
2. Patients with secondary osteoarthritis due to infection rheumatoid arthritis etc.

6. Sample Size:

This cross-sectional study was done on 300 cases of primary knee osteoarthritis attending outpatient department. The sample size has been determined by the following calculations.

$$n = Z^2 PQ / E^2, \text{ where}$$

$$n = \text{sample size}$$

$$Z = 1.96$$

$$P13 = \text{prevalence} = 22\% - 39\%$$

$$Q = 100 - p$$

$$E = \text{error} = 5\%$$

7. Sampling Technique:

After identifying the patients and taking informed and written consents, clinical examination, X-rays of knee joint in antero-posterior and lateral views and blood investigation were done.

8. Duration Of Study:

Approximately 18 Months

9. Brief Methodology:

All patients with knee osteoarthritis fulfilling the inclusion criteria were included in the study. Included patient's history taking, physical examination, x-rays of knee joint in antero-posterior and lateral view, and blood investigations for serum magnesium levels, ESR, CRP, RA factor were taken.

Patient's knee x-rays were graded according to Kellgren and Lawrence system of classification for knee osteoarthritis, and their serum magnesium levels, ESR, CRP, RA factor was measured. Collected data were analyzed for any correlation.

RESULTS

In our study there were total 300 patient out of which 98 were male and 202 were females and all were above the age of 40.

There was no relationship between serum magnesium levels and age of patients. Strength of association between the two variables was 0.06 (Little/No Association).

No difference was found in different groups of Gender (p value = 0.157). Strength of association between the two was 0.09 (Little/No Association).

No difference was found among different groups of BMI (p value = 0.710). Strength of association between the two variables was 0.08 (Little/No Association).

No difference was found in different groups of Kellgren Lawrence Grading for knee osteoarthritis (p value = 0.452). Strength of association between the two variables was 0.07 (Little/No Association).

Thus, in this study we found that some patients having even less severe osteoarthritis were having low serum magnesium levels and patient with more severe osteoarthritis were having higher levels of serum magnesium but overall serum magnesium levels were within normal range. Same findings were found when serum magnesium levels were compared to the age, gender, BMI, ESR and CRP of the patients. Based on these findings, we conclude that there is no correlation between serum magnesium level and severity of knee osteoarthritis.

Table – Correlation between serum magnesium levels and various parameters

	SERUM MAGNESIUM		p value
	< 1.7 mg/dL (n = 14)	> 1.7 mg/dL (n = 286)	
Age (Years) 55.50 ±	55.50 ± 10.49	57.03 ± 9.83	0.5421
40-49 Years	4 (28.6%)	65 (22.7%)	
50-59 Years	5 (35.7%)	103 (36.0%)	
60-69 Years	3 (21.4%)	86 (30.1%)	
70-79 Years	2 (14.3%)	28 (9.8%)	
80-89 Years	0 (0.0%)	4 (1.4%)	
Gender			0.157
Male	2 (14.3%)	96 (33.6%)	
Female	12 (85.7%)	190 (66.4%)	
BMI (Kg/m ²)	28.00 ± 1.88	27.34 ± 2.43	0.285

<18.5 Kg/m ²	0 (0.0%)	3 (1.0%)	
18.5-22.9 Kg/m ²	0 (0.0%)	8 (2.8%)	
23.0-24.9 Kg/m ²	0 (0.0%)	15 (5.2%)	
25.0-29.9 Kg/m ²	11 (78.6%)	225 (78.7%)	
30.0-34.9 Kg/m ²	3 (21.4%)	35 (12.2%)	
KL Grade	3.50 ± 0.52	3.40 ± 0.66	0.723
Grade 2	0 (0.0%)	27 (9.4%)	
Grade 3	7 (50.0%)	117 (40.9%)	
Grade 4	7 (50.0%)	142 (49.7%)	
S. Magnesium (mg/dL)	1.44 ± 0.17	1.99 ± 0.15	<0.001
S. Calcium (mg/dL)	9.31 ± 0.55	9.48 ± 0.57	0.378
ESR (mm/Hr)	48.86 ± 43.38	36.97 ± 29.65	0.161
≤20 mm/Hr	3 (21.4%)	112 (39.2%)	
>20 mm/Hr	11 (78.6%)	174 (60.8%)	
CRP (mg/L)	8.54 ± 12.35	6.03 ± 11.29	0.225
≤5 mg/L	7 (50.0%)	200 (69.9%)	
>5 mg/L	7 (50.0%)	86 (30.1%)	
RA Factor	6.61 ± 3.07	8.14 ± 9.90	0.566
≤18	14 (100.0%)	280 (97.9%)	

DISCUSSION

The study titled “*Correlation between Serum Magnesium levels and Severity of knee Osteoarthritis*” was conducted in OPD of Department of Orthopaedics, AIIMS Raipur with aim to establish an association of serum magnesium levels in various stages of knee osteoarthritis and to analyze data collected from the patients of primary osteoarthritis of the knee.

X-ray of bilateral knee joints was done in standing position in antero-posterior and lateral views and classified using Kellgren and Lawrence system of classification for knee osteoarthritis.

Blood investigations of the patient were conducted to measure serum magnesium levels along with ESR and CRP. BMI of patients was also calculated.

Data obtained from patients were compared using tests like non-parametric tests (Wilcoxon-Mann-Whitney U Test), Chi-squared test and Fisher's exact test.

We concluded that there is no correlation between serum magnesium levels and the severity of knee osteoarthritis.

There was no definite association between serum magnesium levels and gender, BMI, and various inflammatory markers like ESR and CRP.

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