



## STUDY OF OXIDATIVE STRESS IN OSTEOARTHRITIS AND RHEUMATOID ARTHRITIS

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### ABSTRACT

Osteoarthritis is one of the most common age-related degenerative joint disorders. Rheumatoid arthritis is an autoimmune inflammatory disease of the joints affecting 1% of world wide population. The present study was undertaken to evaluate the status of oxidative stress marker (lipid peroxidation) and antioxidants level in Osteoarthritis and Rheumatoid arthritis. The study was conducted by taking 50 Osteoarthritis patients, 50 Rheumatoid arthritis patients and 50 healthy individuals (controls) in Hi-Tech medical college and hospital, Bhubaneswar. Levels of lipid peroxidation marker (malondialdehyde) and antioxidants like superoxide dismutase, vitamin E, vitamin C were measured in all the study groups. Significant increase in malondialdehyde was found in both Osteoarthritis and Rheumatoid arthritis as compared to controls showing evidence of oxidative stress in this diseases. Significant increase in superoxide dismutase activity was found in both Osteoarthritis and Rheumatoid arthritis might be an adaptive response. Significant decrease in vitamin E, vitamin C was found in Osteoarthritis and Rheumatoid arthritis showing impaired activity of antioxidant system. Therefore, antioxidants therapy will be beneficial in this disease

**KEY WORDS :** Osteoarthritis, Rheumatoid arthritis, oxidative stress, antioxidant



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## INTRODUCTION

Osteoarthritis is a slow progressive disorder of synovial joints. This joint disorder is characterized by a loss of balance between synthesis and degradation of the articular cartilage constituents leading to subsequent erosion of joint cartilage remodeling of the underlying bone osteophyte formation and variable degree of Synovitis.<sup>1</sup> Osteoarthritis is the most common form of arthritis with disease of the knee and hip affecting about 3.8% of people as of 2010.<sup>2,3</sup> Rheumatoid arthritis is an autoimmune inflammatory disease affecting joints. It is characterized by erosive synovitis, which causes cartilage and bone destruction and systemic complications including cardiovascular, pulmonary, psychological and other skeletal disorders.<sup>4</sup> The prevalence of Rheumatoid arthritis is 1% of the world wide population and women are more affected.<sup>5</sup> The study was undertaken to determine the level of oxidative stress marker (lipid peroxidation) and antioxidants in Osteoarthritis and Rheumatoid arthritis.

## MATERIALS AND METHODS

The study was conducted in Hi-Tech medical college and hospital, Bhubaneswar after taking ethical committee clearance of this hospital. Informed consent was taken from all the patients. All the patients were clinically evaluated. Inclusion Criteria – Subjects with normal nutritional habits without supplementing with any

vitamins included in the study. Exclusion Criteria – Those subjects who were alcoholic, chronic smoker, suffered from any Systemic diseases like hypertension, Diabetes mellitus or taking any anti-inflammatory drugs were excluded from the study. The subjects were categorized into 3 groups: Control group (age 30-70 years)- Normal healthy individuals, Study group1 (age 30-70 years)- Patients suffering from Osteoarthritis, Study group 2 (age-30-70 years)-Patients suffering from Rheumatoid arthritis. The study population consisted of 50 osteoarthritis patients, 50 Rheumatoid arthritis patients and 50 controls. The blood was collected from all the subjects. The following parameters were measured. Oxidative stress marker (lipid peroxidation) assayed by Malondialdehyde (MDA)-By method of Utley et al<sup>6</sup> Superoxide dismutase (SOD)- By method of Marklund and Marklund<sup>7</sup> Vitamin C-By the method of Burtis et al,<sup>8</sup> Vitamin E- By the method of Engel et al

## RESULTS

Statistical analysis was done using unpaired Student's t-test. Table -1 showed significantly increased level of MDA in both Osteoarthritis and Rheumatoid arthritis as compared to controls. From Table-2 it was observed that the activity of SOD was significantly increased in both Osteoarthritis and Rheumatoid arthritis as compared to controls. There was a significant decrease of serum Vitamin E and Vitamin C in Osteoarthritis and Rheumatoid arthritis as compared to Controls.

**Table-1**  
**Status of lipid peroxidation in Osteoarthritis and Rheumatoid arthritis**

Parameter	Controls Mean±SD	Osteoarthritis patients Mean±SD	Rheumatoid arthritis patients mean±SD
MDA(nmol/ml)	1.687±0.994	2.19±1.21	4.64±0.229
p-value		<0.001	<0.001

**Table-2**  
**Status of antioxidants in Osteoarthritis and Rheumatoid arthritis**

Parameters	Controls Mean±SD	Osteoarthritis patients Mean±SD	Rheumatoid arthritis patients mean±SD	p- value
SOD (µmol/gm of Hb)	2166±45	2377±38.5	2450±40.1	<0.001
Vitamin E (Mg/dl)	0.907±0.25	0.45±0.03	0.33±0.02	<0.001
Vitamin C (Mg/dl)	0.87±0.25	0.53±0.07	0.64±0.06	<0.001

## DISCUSSION

The present study revealed that there is increased extent of lipid peroxidation in both Osteoarthritis and Rheumatoid arthritis as shown by significantly increased level of serum MDA. The same result was reported from Ruby et al<sup>10</sup>, Mane et al<sup>11</sup>, Tiku et al<sup>12</sup>, Chandankhede<sup>13</sup>, Gonzalez et al<sup>14</sup> etc. Significant increase in SOD activity was found in Osteoarthritis and Rheumatoid arthritis patients compared to controls. This might be an adaptive response. This result is correlated with study from Maneesh et al<sup>15</sup>. Our study showed a significant decrease in the serum level of vitamin E and Vitamin C in both Osteoarthritis and Rheumatoid arthritis patients

as compared to controls due to impaired activity of antioxidant system. The same result was reported from other co-workers.<sup>14,15,16,17</sup> From the study it is presumed that Oxidative stress is involved in the pathogenesis of Osteoarthritis and Rheumatoid arthritis which results due to increased free radical production. The articular chondrocytes produce excess amount of reactive oxygen species as well as proinflammatory cytokines and chemokines.<sup>18,19,20</sup> These catabolic factors are thought to accelerate the progression of bone and joint degeneration with aging. A fivefold increase in mitochondrial reactive oxygen species production in whole blood of Rheumatoid arthritis patients as compared to controls suggest that Oxidative stress is a pathogenic hall mark in Rheumatoid arthritis. The free

radicals play an important role as second messengers in inflammatory and immunological cellular response in Rheumatoid arthritis.<sup>21</sup>

## CONCLUSION

There is a shift in the oxidant and antioxidant balance in favour of lipid peroxidation, which can lead to tissue damage observed in these diseases. The treatment with

antioxidant at the initial stage of the disease may be useful as secondary therapy to prevent the further oxidative damage and deterioration of the associated musculoskeletal deficits in Osteoarthritis and Rheumatoid arthritis.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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