

INVESTIGATIONS ON LIPID PEROXIDATION AND ANTIOXIDANT VITAMINS IN RHEUMATOID ARTHRITIS

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ABSTRACT: This study was done to determine and evaluate the level of lipid peroxidation product and vitamins C and E in rheumatoid arthritis. 150 rheumatoid arthritis and 150 healthy subjects between the ages of 45-60years attending General Hospital Owerri were selected in this study. Fasting venous blood was collected and was used for the estimation of lipid peroxidation product and vitamins C and E in rheumatoid arthritis. The result obtained showed that the level of lipid peroxidation product was significantly increased in rheumatoid arthritis when compared with the healthy control ($P<0.05$). On the other hand, the level of vitamins C and E were significantly reduced in rheumatoid arthritis when compared with the control ($P<0.05$). This observation showed that rheumatoid arthritis is prone to oxidative stress and the antioxidant vitamins are excessively used to scavenge free radicals. Hence, the levels of antioxidant vitamins are depleted.

KEYWORDS: Antioxidant Vitamin C and E, Lipid Peroxidation, Rheumatoid Arthritis.

INTRODUCTION

Rheumatoid arthritis refers to systemic disease whereby various joints are inflamed resulting to swelling, pains and stiffness as well as possible loss of function and activity. According to [Martin 1997](#), it is a disorder in which aches and pains affect the muscle joints. Typically involves the joints of the fingers, wrists, feet and ankles with later involvement of the hips, knees, shoulders and neck. In fact, it is a disease of the synovial lining of the joints. The joints are initially painful, swollen and stiff and are usually affected symmetrically. However, as the disease progresses, the ligaments supporting the joints are damaged and there is erosion of the bone resulting to deformity of the joints. It is most common after the age of fifty years but can occur at any age. Also, it is an inflammatory condition in which immunological mechanisms play an important role.

The chief symptom of rheumatoid arthritis is painful joint and stiffness especially on the first wakening morning but constitutional symptoms such as fatigue, anorexia and weight loss also occur. In acute condition, the affected joints are swollen and warm, tender to touch and painful in

motion. In advanced cases, there will be diminished range of joint movement, disuse atrophy of muscles and characteristic deformities including spindle-shaped swelling of the proximal interphalangeal joints, ulnar deviation at the metacarpophalangeal joints and flexion deformities of the wrists, fingers and knees ([Evans et al., 1991](#)).

Oxidative stress has been implicated in the pathophysiology of rheumatoid arthritis as it results in increased production of reactive oxygen species and lipid peroxides; hence causing damage to cells. Therefore, there is indisputable evidence that the normal role of this cell layer is severely compromised. These observations have given rise to increased interest in antioxidant. In this study, the levels of lipid peroxidation product as well as antioxidant vitamins were evaluated in rheumatoid arthritis patients to provide information on their status.

MATERIALS AND METHODS

2.1. Subjects

300 subjects attending General Hospital Owerri were selected (150 patients with rheumatoid

arthritis and 150 healthy subjects). They are between the ages of 45 and 60 years. Patients with past history of systemic disease like diabetes, renal disease and hypertension were excluded from the study. Their consent was obtained as ethical approval from the ethical committee of the hospital. The height and weight of the subjects were measured to calculate their body mass index (BMI). All patients in the study were clinically diagnosed through rheumatoid factor test and x-ray analysis of joint destruction

2.2. Blood collection

In all subjects, 5ml of fasting venous blood was collected into plain bottles. The serum was separated by centrifuging the whole blood in a westerfuge (model 684) centrifuge at 5000g for 5minutes.

2.3. Estimation of biochemical assay

Lipid peroxidation product that is malondialdehyde level was assayed based on MDA reaction with thiobarbituric acid (TBA) (Botsoglou1994). Plasma vitamin C was assayed by the 2,4-nitrophenylhydrazine method described by [Tietz, 1976a](#). The vitamin E was done by the method of [Tietz, 1976b](#); in which vitamin E caused the reduction of ferric to ferrous ion which then forms a red complex with α - α dipyridyl.

2.4. Statistical analysis

The results were expressed as mean \pm standard deviation and student t – test was used to calculate the level of significance.

RESULTS

Table 1: lipid peroxidation product, level, antioxidant vitamins C and E activities and BMI in rheumatoid arthritis and healthy subjects

Parameter	Rheumatoid arthritis (n-150)	Healthy control (n-150)
MDA (nmol/l)	2.94 \pm 0.69*	1.04 \pm 0.82
Vitamin C (mmol/l)	68.31 8.62*	51.81 \pm 9.21
Vitamin E (mg/l)	13.11 \pm 1.21*	8.97 \pm 2.43
BMI (kg/m ²)	24.51 \pm 4.21	24.91 \pm 3.92

*Significantly different from control.

DISCUSSION

Rheumatoid arthritis is autoimmune disease and alterations in the oxidant-antioxidant profile is known to occur in this condition ([Mohan and Priyan, 2010](#)).

In this present study, it was observed that lipid peroxidation product (MDA) was significantly increased in rheumatoid arthritis when compared

with control (P<0.05). The increase in lipid peroxidation is associated with excessive generation of free radicals. Oxidative damage as a result of free radicals is a pivotal mechanism of cell damage. This is in line with the work of [Nnodim et al., \(2012a\)](#). Several reports have documented that the levels of lipid peroxidation products are elevated in rheumatoid arthritis patients ([Sie, 1991](#); [Ozkan et al., 2006](#)). The uncontrolled production of lipid peroxidation products is an important factor in tissue damage ([Deborah, 2002](#)).

However, it was observed that the level of Vitamins C and E were significantly depleted in rheumatoid arthritis subjects when compared with the control (P<0.05). The reduced level of vitamin C is associated with excessive reactive oxygen species production and oxidative stress in rheumatoid arthritis. The Vitamin C protects, revitalizes cells and reduces the rate of cell damage. Vitamin C which is a water soluble vitamin and non-enzyme antioxidant serves directly by scavenging aqueous peroxy radicals. Also indirectly regenerate reduced vitamin E ([Ojiako and Nwanjo, 2007](#)). [Nnodim et al., 2012b](#) stated that vitamin C and E are antioxidants which scavenge and suppress the formation of free radicals. Also, they are chain breaking antioxidants and could stop the chain of oxidative reactions that lead to disease condition. [Kutlu et al \(2005\)](#); [Nwanjo and Ojiako \(2006\)](#) reported that the use of vitamin C and E coupled with moderate exercise have counteract oxidative stress effect; with the attendant decrease in lipid peroxidation which is a marker of oxidative stress.

In conclusion, there is a shift in the oxidant antioxidant balance in favour of lipid peroxidation in rheumatoid arthritis. Also, antioxidant vitamins may utilize to a greater extent to counteract lipid peroxidation of cellular components, hence resulting in the depletion of these antioxidant vitamins.

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