

## Effect of yoga on Free radical and Antioxidant status in Healthy Adults

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### Abstract

**Background:** Yoga is an ancient Indian philosophy, Yoga has shown to improve various physiological and biochemical parameters when practiced regularly. However whether yoga improves the free radical and antioxidant status in individuals is largely unknown. The aim of present study was to assess the free radical and antioxidant status in healthy adult males.

**Methods:** This study was conducted in Mamata Medical College and Hospital, Khammam on 30 healthy adult male volunteers denoted as Group I they received 12 weeks of yoga training under guidance of certified Yoga teacher. Another 30 adult males were taken as control and designated as Group II they did not receive any training they followed their regular routine work. Samples were obtained from both groups for comparison. **Results:** the mean values for Malondialdehyde (MDA) nmol% in Group I prior to undergoing training were  $253.12 \pm 21.74$  and Group II were  $252.8 \pm 26.5$  the Post training values for MDA levels in Group I recorded were  $314.16 \pm 36.84$  and Group II were  $271.70 \pm 25.08$  the p values for MDA were found to be significant. whereas the uric acid mg% mean values in Group I pre yoga readings were  $4.60 \pm 1.52$  and post yoga training were  $6.76 \pm 2.66$  and Group II pre were  $4.34 \pm 0.85$  and post were  $4.55 \pm 1.06$  the p value was not significant. **Conclusion:** Regular yoga training can decrease free radical formation and increase antioxidant system and yoga should be considered one of the therapeutic methods for relieving stress and over all well being of the individual.

**Keywords:** Yoga, Malondialdehyde (MDA), Uric Acid

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### Introduction

Yoga is an ancient system of Indian philosophy. It has been practiced for health and well being. Several researches have shown that regular practice of yoga improves health and well being.<sup>[1-3]</sup> There has been extensive research conducted on yoga in recent past. It has been reported that yoga can increase muscular efficiency, endurance and aerobic capacity.<sup>[4, 5]</sup> Sustained practice of yoga can lead to increased stimulation of parasympathetic system and decreases the activity of sympathetic system which ultimately decreases the blood pressure and heart rate.<sup>[6]</sup> Free radicals are produced in the body due to certain metabolic processes. Free radicals due to their unstable configuration

causes release of electrons which in turn reacts with proteins, lipids, carbohydrates and nucleic acids.<sup>[7]</sup> They are generally referred as “reactive oxygen species” (ROS) they are produced both endogenously and exogenously. The internal environment of cells sometimes converts the oxygen in to its univalent reduced form called superoxide anion radical. The superoxide anion, hydrogen peroxide and the extremely reactive hydroxyl radical are common products of life in an aerobic environment these agents are responsible for oxygen toxicity.<sup>[8]</sup> To survive in such a hostile environment the living organisms generate variety of antioxidant compounds. Additionally they produce series of antioxidant enzymes whose role is to intercept and inactivate reactive oxygen. However in spite of

these defenses there is some damage that occurs and a series of damage removal repair enzymes for proteins, lipids and DNA are synthesized. Since oxidative stress varies depending on the environment the synthesis of antioxidants, removal and repair enzymes also varies. [9] There is now evidence that chronic stress may increase oxidative process. The free radical may contribute to pathophysiology of atherosclerosis, coronary heart disease and other disorders. [10] Yoga has now shown to have beneficial effects in various ailments including psychological stress which is one of the factors contributing in increase oxidative stress. Therefore we tried to evaluate the effects of yoga in healthy people both for oxidative stress and antioxidant compounds.

## Materials & Methods

The present study was conducted at Department of Physiology and Biochemistry, Mamata Medical College and Hospital, Khammam. The Biochemical analysis for estimation of Serum Malondialdehyde (MDA, a marker of lipid peroxidation) and Serum Uric acid (Natural antioxidant of the body) levels by calorimetry by using spectrophotometer.

A group of 60 male age matched volunteers having good health, non-smoking, and non-alcoholic were selected and randomly assigned into two groups, Group-I (Yoga group), Group-II (Control group) consisting 30 subjects each. Both the groups are screened for general health and vital data was collected. They are also screened for their food habits. Only vegetarians are selected as non-vegetarian food can interfere in the results of the experiment. The subjects selected were not previously trained for any exercises. Procedures followed in this study were in accordance with the ethical standards laid down by ICMR's Ethical guidelines for biomedical research on human subjects (2006). Informed consent was taken from all the patients participated.

Group-I (Yoga): Group-I subjects were given programmed training in yoga by certified yoga instructor for 1 hour every day Morning 6:00 AM to 7:00 AM for 12 weeks and 6 days a week. The Yoga schedule consisted of Ansanas, Pranayama and meditation. Pranayama included deep inhalation, breath holding and exhalation called as Puraka/Kumbhaka/Rechaka in yoga

literature followed by meditation during meditation the individuals sat in a comfortable posture called padmasana with eyes closed and tried to relax completely.

Group-II Control group: The control group did not receive any training and they were advised not to deviate from their routine work. At the start of the training schedule blood samples were collected from all subjects of both groups for the estimation of MDA and Uric acid levels. Similarly the samples of blood were collected for the estimation of MDA and Uric acid levels at the end of 6 weeks in both the groups.

## Biochemical Tests

Aldehydes, especially Malondialdehyde [MDA] a product of fatty acid peroxidation MDA, is an indicator of the extent of peroxidation and has been frequently used as marker of oxidative stress in response to exercise. The most common method used to assess changes in MDA with exercise is Thiobarbituric Acid (TBARS) Assay. This method works well when used on defined membrane systems such as microsomes in vitro. [11] Estimation of Uric Acid: Uric acid is a final enzymatic product in the degradation of purine nucleosides and free bases in humans. Urates appear to play role beyond the end product of purine metabolism. Urate by itself serves as an antioxidant undergoing non-enzymatic conversion to Allantoin. It is now considered as a naturally occurring antioxidant. Estimation of uric acid gives the level of antioxidants in the body. [12]

## Results

**Table 1** shows the recordings of Malondialdehyde [MDA] in nmol% [Serum MDA levels shows free radical activity] of both groups before exercise training. The initial blood samples were obtained from both the group before beginning of Yoga training to the Group I and the values of parameters recorded. The mean value of MDA in Group I (yoga) was 253.12 and the mean value recorded in the Group II (control) was 252.80. When the p values were found to be greater than 0.1 this shows that they were not significant.

**Table 2** shows the recordings of MDA after Yoga training period of 12 weeks in the Group I whereas the control group did not receive any training and they followed their normal routine

activities during this period. The mean values for Group I was 180.30 and the group II was 248.15 the calculated p value was < 0.05 which indicate it is significant.

The Table 3 shows the serum uric acid levels in the groups initially before the Yoga training. The value of serum uric acid is an indication of natural antioxidant levels in the body. The mean values of serum uric acid were 4.60 in the test group and 4.43 in the control group the

calculated p values were greater than 0.1 which indicate it is not significant.

Table 4 shows the readings of Serum uric acid levels after Yoga training in both the groups the mean values of Group I was 6.76 and group II was 4.55 which indicates a slight increase in the Uric acid levels in Group I however when the p values were calculated the values was > 0.05 which indicate it is not significant.

**Table 1:** showing readings of Malondialdehyde [MDA] in serum before yoga training

| Sample             | Readings                    | MDA nmol%<br>Mean ± SD | P value |
|--------------------|-----------------------------|------------------------|---------|
| Group I (Yoga)     | Pre Yoga training           | 253.12 ± 21.74         | > 0.1   |
| Group II (Control) | INITIAL                     | 252.80 ± 26.5          |         |
| Sample             | Readings                    | MDA nmol%<br>Mean ± SD | P value |
| Group I (Yoga)     | Final [After Yoga Training] | 180.30 ± 20.15         | < 0.05* |
| Group II (Control) | Final                       | 248.15 ± 22.50         |         |

**Table 3:** Showing readings of serum Uric Acid levels (mg%) before yoga training

| Sample             | Readings          | Uric acid mg%<br>Mean ± SD | P value |
|--------------------|-------------------|----------------------------|---------|
| Group I (Yoga)     | Pre Yoga training | 4.60 ± 1.52                | > 0.1   |
| Group II (Control) | INITIAL           | 4.34 ± 0.85                |         |

**Table 4:** showing readings of Serum Uric Acid levels (mg%) after yoga training

| Sample             | Readings                    | Uric acid mg%<br>Mean ± SD | P value |
|--------------------|-----------------------------|----------------------------|---------|
| Group I (Yoga)     | Final [After Yoga Training] | 6.76 ± 2.66                | > 0.05  |
| Group II (Control) | Final                       | 4.55 ± 1.06                |         |

## Discussion

The main findings of the present study was reduction in Malondialdehyde [MDA] levels in yoga trained individuals from prior values of 253.12 ± 21.74 nmol% to 180.30 ± 20.15 nmol% after 12 weeks of yoga training. The calculated p values were significant. This shows that yoga has caused significant improvement in the Malondialdehyde [MDA] levels which is a marker of oxidative stress in the body. In a similar study by B Smita S et al, [13] comparing the antioxidant status in normal adult males

found that in the yoga trained individuals after 6 months of training there was significant decrease in oxidative stress SOD (Superoxide Dismutase) and also increase in antioxidant levels marked by increase in glutathione reductase levels. In the present study although we found slight increase in the serum Uric acid levels the marker for antioxidant status the calculated p values was not significant. One of the reasons for such a finding could be the duration of training of yoga. Where as in our study the training was for 12 weeks (3 Months)

and the one by B Smita S et al, [13] was for 6 months and it can be said that antioxidant levels tends to increase relatively only after a long period of training in yoga. In a very similar study done by S Bhattacharya et al found that the SOD levels were increased but not to significant levels a finding very similar to our finding and interestingly they performed yoga training for only 10 weeks. [14] Although we in our present study measured serum uric acid levels both SOD and Serum uric acid levels are markers of antioxidants in the body. The same reason of duration period can be applied here as well. Studies have shown that the physical and emotional stress can increase free radical formation. Stress increases activity of sympathetic nervous system which in turn increases the levels of catecholamines in the body. The catecholamines affect the cell metabolism to such a degree that cytotoxic free radicals are formed which leads to disease progression. [15] Yoga asanas and pranayama reduces sympathetic activity by shifting autonomic balance towards parasympathetic activity. [16]

The pranayama involves slow breathing in form of inhaling, retaining and exhaling followed by meditation. It has shown to have intense calming effect psychologically and relieves stress that could be one of the reasons why the after regular practice of yoga decreases the free radical formation. A study by Sanchari S et al, found that the reduced glutathione levels and TAS (Total Antioxidant Status) improves significantly after yoga training for a period of 6 months. [17] Studies by Kwang JC et al, comparing the antioxidant effects of regular yoga training on healthy university students for a period of 12 weeks found that MDA levels were considerably decreased in yoga training group which was in agreement with our findings. [18] This shows that yoga if performed regularly definitely has beneficial effects on the antioxidant status and free radical formation in the body.

## Conclusion

Within the limitation of the present study it can be concluded that regular yoga training can decrease free radical formation and increase antioxidant system and yoga should be considered one of the therapeutic methods for

relieving stress and over all well being of the individual.

**Conflict of Interest:** None declared

**Source of Support:** Nil

**Ethical Permission:** Obtained

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