



Serum Ascorbic Acid Levels as an Antioxidant in Short Term and Long Term Strenuous Exercise

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Introduction-

Since the time of industrial technology has advanced at an astounding rate, People are becoming more and more sedentary and find significant physical outlet by engaging in sports during their leisure time or joining some physical training centre. Although on one hand sedentary lifestyle with too little activity is bad for health, excessively intense or wrong type of physical activity may create negative attitudes, damage or deform the body. A lot of studies giving various results for strenuous exercises and their benefits are done.¹ This study is designed to see the benefits of strenuous exercise on the basis antioxidant status, which type of exercise is to be suggested for physical fitness is the aim.²

It is known that Oxidative stress is production of oxygen radicals (free radicals) in biological system. Intense physical activity in the form of strenuous exercise causes more oxygen consumption and more free radical production termed as oxidative stress.³

Antioxidants are compounds that blocks the production of free radicals. Our body has defence system in the form of antioxidant enzymes and vitamins to fight against these free radicals. Serum Ascorbic acid (commonly known as Vit.C) levels are routinely measured as an indicator of Antioxidant status. ⁴

So present study was planned to estimate serum ascorbic acid (Vit .C) in aerobic strenuous aerobic exercise group.

Materials and Methods-

The present study was undertaken in 32 Healthy adult male individuals. Male subjects aged between 20-35 yrs with no previous or current training in any type of exercise were chosen. The subjects joining the exercise training programme for the first time were selected from the Gym. They were advised standard diet for the study period. Vital data and general clinical examination for each individual & informed written consent from each individual was taken .

Symptoms suggestive of disease of any body systems, Family h/o carcinoma ,recent exposure to radiation ,addictions such as tobacco,Gutkha,alcohol ,Cigarette smoking etc were excluded from the study. 5,6

Aerobic moderate to severe type of exercise given on bicycle ergometer. Standardization was done to avoid the discrepancy in the data collection. Pulse rate was used as an indicator of severity of exercise.

Subjects were asked to exercise on bicycle ergometer and pulse rate was monitored continuously throughout the exercise. It was found that exercising for about 2+- ½ min the pulse rate coincided with the value for moderate exercise. (pulse rate 100-120beats/min). similarly when they exercised at the same resistance for about 4 min+-1/2 min the value

of pulse rate corresponded to severe exercise (pulse rate 120-150 beats /min).

The blood samples were collected from each individual, before aerobic strenuous exercise ,at the end of 3 months & 6 months of aerobic strenuous exercise .About 10 ml of blood was collected early morning hours without food, from antecubital vein with all aseptic precautions. Serum was prepared by centrifugation and it was used for estimation of Ascorbic acid as an index of antioxidant status by Ayekaw (1978) method. ⁷

Observation and result:

Table no.1 Average Serum Ascorbic acid levels in Aerobic strenuous exercise group before and after training (mg/dl)

| Sr. No. | Before Aerobic exercise training (A) Mean+-S.D. | 3 months after aerobic exercise (B) Mean+-S.D. | 6 months after aerobic exercise training (C) Mean+-S.D. | Difference between A & B | Difference between A & C |
|---------|--|---|--|--------------------------|--------------------------|
| 1 | 1.22+ 0.144 | 1.234+ 0.140 | 1.283+ 0.138 | 0.014 | 0.063** |

The difference in average serum Ascorbic acid value after 3 months of aerobic strenuous exercise training and before aerobic strenuous exercise was 0.014mg/dl which was statistically not significant (p>0.05).

The difference in average serum ascorbic acid value after 6 months of aerobic strenuous exercise training and before aerobic strenuous exercise was 0.063 mg/dl,which was statistically highly significant(p<0.001)

DISCUSSION

A combination of scientifically based information and circumstantial evidence indicates that physical activity is beneficial to health in general with specific physiological gains in various systems and many biochemical variables. Physical activity is associated with beneficial changes in serum lipid but exhaustive exercise has been suggested to increase oxidative stress. Increased mental stress also increase oxidative stress. 8,9,10

Cells continuously produce free radicals and reactive oxygen species (ROS) as a part of metabolic processes. These free radicals are neutralized by an elaborate antioxidant defense system consisting of various antioxidant enzymes and antioxidant vitamins like Ascorbic acid (Vit. C) and α -tocopherol (Vit. E). Excess physical activity, increased mental stress and exercise can produce an imbalance between ROS and antioxidants, which is referred to as oxidative stress. ¹

It is well known that free radicals are generated deliberately by animal cells in certain special circumstances as these are beneficial as bactericidal agents. (¹¹) Also free radical chain reaction takes place in our body countless times a day. Cig-

arete smoking, alcohol consumption, pollutants, sunlight, radiations, emotional stress, mental stress, excess physical activity, and fast food all these can cause free radical formation and free radical chain reactions.^{5, 6}

Most other factors influencing free radical production were ruled out and the present study was planned to study the effect of aerobic exercise on the production of free radicals, Serum Ascorbic acid levels were estimated as an indicator of antioxidant status. The serum values were estimated before, 3 months after and 6 months after training .

Table 1 shows the serum Ascorbic acid levels in individuals before, 3 months after and 6 months after aerobic exercise training.

Most plants and animals synthesize Ascorbic acid for their own requirement. However Apes and humans cannot synthesize it due to lack of an enzyme, gulonolactone oxidase. hence Ascorbic acid has to be supplemented mainly through fruits vegetables and tablets^{12,13}

It was observed that after 3 months of aerobic strenuous exercise the serum Ascorbic acid levels were increased (1.242 + 0.140 mg/dl) than before exercise (1.222 + 0.44 mg/dl) but this increase was not statistically significant ($p > 0.05$), however after 6 months of Strenuous exercise there was highly significant increase ($p < 0.001$) in Ascorbic acid levels (1.283 + 0.138 mg/dl)

Theses study results matched with the previous studies.^{1,14,15,16}

Exercise generally causes a transient increase in circulating Ascorbic acid in the hours following exercise, probably to combat increased oxidative stress during exercise. It is released from its higher tissue concentration. Though there is no Ascorbic acid storage in the body, the conc.is different in different organs according to their need. During strenuous exercise ,the Ascorbic acid is released from such high concentration tissues. But a decline below pre exercise levels. As there was increased Oxidative stress, increase in the antioxidant enzymes and vitamins occurred as a physiological response to combat increased free radical production. This increase resulted in the form of increased Ascorbic acid levels.^{17- ,20}

After 3 months ,there was insignificant increase in antioxidant level, as it must have utilized for increased oxidative stress due to exhaustive exercise. But after 6 months of training, there was strengthening of antioxidant defence system by increasing Ascorbic acid and antioxidant enzymes.^{18-,22}

Conclusion-

Strenuous physical activity in the form of Aerobic strenuous exercise, if continued for longer period is beneficial as it improves antioxidant status of an Individual..

Limitation : We have not studied the difference in sex i.e in female .So these finding will be confirmed in large number of individuals in male and females in future

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