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CORRELATION OF ANTIOXIDANTS AND FITNESS LEVELS IN UNDERGRADUATE MEDICAL STUDENTS

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Abstract : Fitness is the ability of the organism to maintain the various internal equilibriums as closely as possible to the resting state during strenuous exercise and to restore promptly after exercise. The aim of the present study was to evaluate the fitness and correlate it with anti-oxidant levels of 50 male medical students in the age group of 18 to 25 years. Fitness was assessed by Harvard Step Test. The antioxidant status was assessed by Vitamin C and Vitamin E levels in the blood. Three groups were formed on the basis of fitness score. The mean values of fitness scores were 95.33±7.66, 68.5±9.22 and 37±10.9, in-group A, B and C, respectively. Between the three groups, Vitamin E values were significantly different but not the Vitamin C levels. Thus, it is concluded that Vitamin E levels influence the fitness state of an individual.

Key words : fitness Harvard Step Test fitness score vitamin C vitamin E

INTRODUCTION

The adaptive capacity of the individual to the rigorous of work is determined by the physical fitness. Physical fitness has been defined as “the development and maintenance of a sound physique and of sound functioning organs” (1). Antioxidants play a vital role in the defense system in vivo against oxidative stress induced by free radicals and oxygen species. Antioxidants, because of their molecular structure can give an electron to free radical and terminate chain reactions. Antioxidant radicals themselves are least reactive and harmless therefore assume utmost importance in the context of disposing of harmful free radicals (2) Antioxidant vitamins are ascorbic acid (vitamin C), tocopherol (Vitamin E) and B carotene (Vitamin A). Vitamin C converts free radicals into less harmful and more stable derivatives. It can also regenerate the Vitamin E to antioxidant form. Tocopherol protects the cell membranes and low-density lipoproteins from lipid peroxidation.

Considering above things, our study was designed to find whether a relationship exists between antioxidant levels in blood and the fitness status of an individual.

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METHODS

The study was undertaken in the Departments of Physiology and Biochemistry, Moti Lal Nehru Medical College, Allahabad from May 2004 to May 2005. The subjects selected were 50 male medical students in the age group of 18 to 25 years, who were ruled out for any disease six months prior to the test. Subjects were forbidden to participate in any regular sports or other type of physical exercise programme during the tenure. The Institute Ethics Committee of Allahabad approved the study protocol. All subjects gave the informed consent. For anthropometric studies weight and height were also measured with the subjects barefoot and lightly dressed. Body Mass Index was calculated as weight (kg)/height^2(m).

Physical fitness

The students were asked to perform Harvard step test using a stool of 18 inches height. The subjects were asked to perform exercise at the rate of 30 times per minute for a maximum of five minutes. The exercise was terminated at the stage of exhaustion or if he was unable to keep up pace for 20 seconds. The duration of exercise was noted by using stopwatch.

After the exercise the subject was asked to sit on chair quietly. One minute after stopping the exercise, heartbeat was recorded for 30 seconds by taking the radial pulse. The physical fitness of subjects was evaluated by using the fitness table (1). Physical fitness was categorized as poor, average and good according to the score below 50, 50-80 and above 80, respectively.

Estimation of antioxidant levels

For the determination of plasma levels of vitamins, 5 ml of blood was collected between 9–10 A.M. from subjects prior to the fitness test (in EDTA vials). The samples, if not used immediately, were refrigerated and protected from light. Plasma was separated by centrifugation and was immediately analyzed for Vitamin C and Vitamin E as described elsewhere (3, 4).

RESULTS

The value of BMI is generally considered to be a measurement of nutritional status of an individual. The BMI of students was found to be (21.5±3.8) and was within normal range.

In Group A, the fitness score was 95.33±7.66 (ranging between 90–115), in Group B, it was 68.5±9.22 (ranging between 50–80); and in Group C, the score was 37±10 (ranging between 25–45).

The mean values of Vitamin E levels in blood were, 0.882±0.119, 0.80±0.119 and 0.71±0.08 in groups A, B and C, respectively. Analysis of variance was applied to compare the Vitamin E levels in the three groups and it was found that the values were significantly different between the groups (one way ANOVA, $F=4.73$; $P<0.05$).

The mean values of Vitamin C levels in blood were, 0.55±0.01, 0.47±0.2 and 0.46±0.16 respectively in the Groups A, B and C. These values were not different from one another (one way ANOVA, $F=1.89$; $P>0.1$).

DISCUSSION

The present study was conducted on 50 male medical students to observe the correlation between fitness status and anti-oxidant levels.

Firstly, the physical fitness of medical student was assessed using Harvard Step Test and three groups were made as Group A – good (score=95), Group B – average (score=68) and Group C – poor fitness (score=37). The present observations show that 30% of the subjects had good, 60% average and 10% had poor fitness. The observations are similar to the report of Pramanik et al, (5) who measured the physical fitness of Nepalese medical students and found the proportion of students with poor, average, good and very good to be 10.4%, 23.6%, 39.6% and 26.4%, respectively.

The blood levels of Vitamin E and Vitamin C exhibited that only Vitamin E levels were decreased in these groups. This finding is consistent with the results of Tidus et al (6) who concluded that Vitamin E has a role in preventing exercise induced oxidative stress (lipid per-oxidation), by acting as a cell membrane stabilizer and preventing muscle damage. The Vitamin E further stabilizes the membrane lipid packaging.

Our study also shows low levels of Vitamin C in all the three groups. Blood vitamin C levels above 0.6 mg/100 ml have been established adequate (7). There was no statistically significant difference between the mean Vitamin C levels between various Groups. Keren and Epstein (8) in their study showed that vitamin C supplementation provided no enhancement either in aerobic or anaerobic work. This is against the finding reported by Jakeman et al (9). Thus, it can be concluded that poor fitness state is associated with a lower Vitamin E levels though such correlation with vitamin C could not be established and requires further research.

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