Exercise plays an important role to improve the performance of sportspersons. It increases the endurance, causes faster recovery of damaged muscle and improves the aerobic fitness of sports persons. The best indicator of cardiorespiratory endurance, aerobic fitness and potential of player’s performance is VO$_2$ max. It is defined as the highest rate of oxygen consumption attainable during maximal or exhaustive exercise. As exercise intensity increases so does oxygen consumption. Ninety five to ninety eight percent of the total oxygen consumed during exercise is reduced to water, but the rest 2-5% of the oxygen consumed is utilized for the reduction of oxygen in which highly reactive oxygen species like superoxide radical, hydrogen peroxide and hydroxyl radicals are produced. These reactive oxygen species further leads to lipid peroxidation. Lipid peroxidation is one of the mechanisms behind exercise induced muscle damage in players. Malondialdehyde, a product of lipid peroxidation is used to estimate lipid peroxidation. In the present study, serum malondialdehyde concentrations in serum of elite cyclists and athletes were 2.18 $\mu$ moles / mg serum protein and 2.62 $\mu$ moles / mg serum protein respectively while in control group of sedentary workers it was 1.59 $\mu$ moles / mg serum protein. Thus lipid peroxidation in elite cyclists and athletes was 37% and 64% more as compared to the lipid peroxidation in control group of sedentary workers. Furthermore, female cyclists had 12% less lipid peroxidation as compared to male cyclists and female athletes had 11% less lipid peroxidation as compared to male athletes. This suggests that exercise causes oxidative stress in both elite cyclists and athletes. This oxidative stress was less in female sportspersons as compare to their male counterparts.

To combat the deleterious effects of free radicals our body has enzymatic and non enzymatic defenses. It protects against lipid peroxidation by acting directly with a variety of oxygen radicals, including singlet oxygen, lipid peroxide products and superoxide radicals. Vitamin E levels were slightly higher in cyclists and athletes than the sedentary subjects. Female cyclists and athletes had 8% and 7% higher vitamin E levels than their
respective counterparts. Vitamin C is another antioxidant in biological fluids which is water soluble. Vitamin C levels in cyclists and athletes were 29.44±2.10 and 28.54±2.71 mmoles/L as compared to 24.55±2.11 mmoles/L in sedentary subjects. Uric acid is a powerful antioxidant and a scavenger of singlet oxygen. Uric acid concentration was 32% and 25% higher in cyclists and athletes respectively as compared to sedentary subjects. Female players had low levels of uric acid concentration as compared to male players. Superoxide dismutase provide defense against superoxide radical. Superoxide dismutase activity was higher in serum of elite cyclists and athletes as compared to control group of sedentary workers. Within the group of elite players, superoxide dismutase activity in female cyclists and athletes was 6% and 7% higher respectively as compared to male players. The higher SOD activity in cyclists and athletes may be the result of increased superoxide radical formation due to exercise induced oxidative stress. In contrast to superoxide dismutase, activity of catalase, another antioxidant enzyme, was significantly lower in elite cyclists and athletes as compared to control subjects of same age group. Female cyclists showed 14% less catalase activity as compared to male cyclists and in female athletes catalase activity was 12.5% less as compared to male.

Oxidative stress plays an important role in atherosclerosis. Oxidative stress as indicated by malondialdehyde concentration was higher in cyclists and athletes. To check whether elite cyclists and athletes have a risk to develop coronary artery disease, levels of total cholesterol, LDL-C, HDL-C and triglycerides were measured in elite players. Serum cholesterol concentration in elite cyclists and long distance runners was less than the cholesterol concentration in control group. Female cyclists and athletes had slightly less cholesterol levels compared to their male partners. Level of triglycerides, another important risk factor of atherosclerosis, was 15% less in cyclists and 17% less in athletes as compared to triglycerides level of sedentary workers. Triglycerides level in female cyclists was 20% lower than male cyclists, while it was only 11% less in female athletes. Low levels of cholesterol and triglycerides in elite sportspersons suggest that in spite of high oxidative stress probably they are at low risk of coronary artery disease. These results were supported by the observation that elite cyclists and athletes HDL-C levels were higher as compared to that of control. HDL-C levels in male cyclists and athletes
were 22% and 20% higher respectively. LDL-C was 16% higher, while very low density lipoprotein cholesterol levels was 35% lower in elite cyclists as compared to control group of sedentary workers. Similar were the results in elite athletes. These observations clearly indicate that exercise affects the lipid metabolism in elite players in such a way that they had very low risk of coronary artery disease as compare to the control group of same age.

Higher concentration of malondialdehyde in elite athletes and cyclists indicate exercise induced oxidative stress in them. Their natural antioxidative system was not sufficiently effective to diminish the exercise induced oxidative stress. In order to reduce the oxidative stress, elite cyclists and athletes were given vitamin E (400 IU/day) and vitamin C (500 mg/day) for two months. As a result of supplementation, Vitamin E concentrations increased in blood of players. This increase was more in female as compared to male sports persons. Vitamin C levels also increased in serum of both cyclists and athletes after 2 months of supplementation. However, male players had more increase in vitamin C levels as compared to their female counterpart. Uric acid concentration decreased by 33% and 26% in cyclists and athletes respectively compared to their pre supplemented levels. The increased levels of vitamin E and C after supplementation affected their malondialdehyde levels also. After completion of two months of vitamin supplementation, elite cyclists and athletes had more than 80% decrease in their serum malondialdehyde concentration compared to prior supplementation values. Within the groups female cyclists and athletes showed more decrease in malondialdehyde concentration as compared to male.

Vitamin E and C supplementation in diet resulted in enhancement of superoxide dismutase activity was 25 % and 14% higher in cyclists and athletes respectively. The increase in activity was more in male as compared to female cyclists and athletes. Catalase activity in cyclists and athletes was also increased after two months of vitamin supplementation.

Supplementation of vitamin E and C affected the lipid profile of sports persons. Cholesterol levels decreased from 179.07±9.7 mg/dl before supplementation to 153.20±11.29 mg/dl after supplementation in elite cyclists. In case of athletes the
decrease in cholesterol levels was even more. Triglyceride levels also decreased in both elite cyclists and athletes after supplementation of vitamin E and C. The decrease in triglycerides level was significantly more in cyclists as compared to athletes. Besides total cholesterol and triglycerides, lipoprotein cholesterol levels also indicated a better lipid metabolism in cyclists and athletes after two months of vitamin E and C supplementation.

Overall it can be concluded that elite cyclists and athletes were under exercise induced oxidative stress. Female athletes and cyclists had less level of oxidative stress as compared to the male. Antioxidant defense system of these players was probably not sufficient to counteract exercise induced oxidative stress. Supplementation of vitamin E and C for two months leads to significantly reduced levels of lipid peroxidation.