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Prevention of Oxidative Stress Injury among Females by Movement Therapy in India

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Oxidative stress injury induced lipid peroxidation and the impairment of the antioxidant system has a potential role in the pathogenesis of many diseases. Free radicals in form of oxidative damage causes fatal diseases and oxyradical-induced cytotoxicity arises from both chronic and acute increases in reactive oxygen species, which give rise to subsequent lipid peroxidation. Antioxidants act as free radical scavengers and hence prevent and repair damage done by the free radicals. The present investigation revealed that dance, as a form of physical activity, have a significant contribution to the healthy-living agenda. In comparison with non-dancers, due to prolonged practice of dance, the dancers also show high levels of antioxidants with low level of LPP. The decreased levels of antioxidant and increased levels of LPP indicate that due to lack of physical exercise the non-dancers may have chance of higher incidences of infections or immune complex diseases. In case of dancers, as a complete exercise, dance plays an important role in immunity as an early defence system against infections and has a potential role in oxidative stress induced lipid peroxidation and the impairment of the antioxidant system.

Key words: Antioxidant, lipid peroxidation products, oxidative damage, dance movement

INTRODUCTION

Reactive oxygen species in form of free radicals play an important role in various kinds of cell toxicity, among which lipid peroxidation is important (Loft *et al.*, 1993). Metal ions also generate free radicals and they again promote lipid peroxidation and DNA damage (Sahu and Washington, 1991). This DNA damages, caused by reactive oxygen species, can be protected by the antioxidant systems (Subramanian *et al.*, 1994). Super Oxide Dismutase (SOD) is a well known antioxidant. It is already established that environmental toxicants, industrial wastages and other various pollutants can suppress the antioxidant status with an elevation of Lipid Peroxidation Products (LPP), lipids and lipoproteins levels (Reddy *et al.*, 1994). Further, hydroxyl ion, peroxy-nitrite and other oxy-radicals can also generate LPP through the bio-chemical events and reaction with polyunsaturated fatty acids in the cellular membranes. These peroxidation metabolites act as cellular pollutants, perform multiple interactions with cellular components and cause patho-physiological alterations, diseases and cyto-toxicity (Keller and Mattson, 1998). The oxidative stress injury is also very much related with muscular tenacity and ageing directly. The antioxidants prevent the formation of reactive oxygen species and also remove them, thus inhibit the damage of the vital component of the cell (Kelly *et al.*, 2003). Moreover antioxidants start the bio-chemical chain reactions of lipid peroxidation.

Physical activity may provide a safe and effective means of enhancing the response and improve quality of life by reducing or preventing side effects in many diseases related to oxidative damages, including cancer (Kushi *et al.*, 2012). Dance movement can be considered as an active and non-competitive form of exercise and it leads to a positive direction towards physical fitness and good health (Chatterjee, 2013). Earlier study proved that regular practice of dance can increase pulmonary function, muscular flexibility, aerobic capacity and health status (Blair *et al.*, 2001; Marshall *et al.*, 1998; Quin *et al.*, 2007). Now-a-days in many hospitals and medical settings dance has been used as a form of therapy, either alternate or complementary. But the role of dance movements for the prevention of oxidative stress injury has never been attempted or not reported earlier. The present investigation was directed towards this mechanistic understanding of oxidative stress injury profile in females by comparing the antioxidant and LPP level. The study was also aimed to compare them in dancers and non-dancers where dance is admitted as a form of complementary therapy.

MATERIALS AND METHODS

Cases and sample preparation: A total of 10 female dancers belonging to age group 20-32 were enrolled for the investigation covering differential socio-economic status. They were selected as cases depending on over 10 year's regular practice of dance. Controls (n = 10) were participants frequency matched to cases by age, sex and those having similar lifestyle and food habit except they are non-dancers. Demographic as well as environmental data was recorded. Written informed consent was obtained from all in accordance with the guidelines of health centre review board. Blood samples were collected from cases and controls. The blood samples (1 mL) were centrifuged at 3000 rpm for 15 min and clear serum was collected.

Determination of antioxidant level: Antioxidant level was analysed by evaluating the activity of super oxide dismutase, SOD (Reddy *et al.*, 1998). The assay medium contained 50 mM sodium carbonate, bicarbonate buffer (pH 9.8), 0.1 mM EDTA, 0.6 mM adrenaline in a total volume of 3 mL. Adrenaline was the last component to be added and the adrenochrome formed in the four minutes was recorded at 470 nm. One unit of SOD activity was defined as the amount of enzyme needed to cause 50% inhibition of adrenaline autoxidation at pH 9.8.

Determination of LPP level: To determine the LPP level, thiobarbituric acid was added to plasma sample under acidic condition and the absorption of color that developed after heating was estimated spectrophotometrically at 535 nm (Reddy *et al.*, 1998). 1,1,3,3-tetraethoxypropane was used as internal standard and the concentration was expressed in nmol of malondialdehyde per mL of plasma.

Statistical analysis: All the data of cases and controls were represented in the form of Mean value \pm SD and the results were analysed by Student's t-test. The statistical significance testing was done by estimating the p value.

RESULTS

The present investigation revealed that the antioxidant and LPP level of cases and controls differ considerably (Table 1). The cases considered in the present study, where dance movements were admitted as physical activity, showed higher antioxidant level and lower LPP level. The antioxidant level, as judged by unit of SOD activity, was more in dancers as compared with the non-dancers. The mean value of antioxidant level of

Table 1: Comparison of antioxidant status and LPP

S.No.	Age (years)	Antioxidant level (unit mL ⁻¹)	LPP level (μ mL ⁻¹)
1	20	210	0.97
2	23	219	0.98
3	24	202	0.92
4	21	209	0.92
5	26	218	0.93
6	20	208	0.82
7	23	212	0.88
8	32	210	1.12
9	24	222	0.99
10	22	208	0.92
Cases (Mean value±SD)		211.8±4.26	0.95±0.04
Controls (Non-dancer) (Mean±SD)		207.5±19.2	1.51±0.77
Normal value		200-210	0.85-1.00

cases and controls indicated 211.8 and 207.5 unit mL⁻¹, respectively, as shown by Table 1. The normal level of this study was 200-210 unit mL⁻¹. Moreover, all the dancers (cases) showed the value even greater than the normal level, whereas among non-dancers (controls) in few cases the level ranged below normal value.

Reversely, LPP level in blood serum was less in the cases in comparison with controls as was evident from Table 1. The mean value of LPP level of dancers was 0.95 μ mL⁻¹. This value was within the normal range (0.85-1.00 μ mL⁻¹). The level of LPP of non-dancers was 1.51 μ mL⁻¹. The p value<0.05 indicates the results are significant. Statistical analysis (p value) showed that dance practices benefited physiologically from this form of physical activity. Thus dance was proved to be an activity that has potential to increase the health status of any age group by eliciting positive changes in certain aspects of physical fitness and healthy wellbeing.

DISCUSSION

The result suggests a potential role of dance as a complete exercise in oxidative stress induced lipid peroxidation and the impairment of the antioxidant system in the healthy living agenda. The antioxidant factor plays a major role for the prevention of many diseases like cancer, diabetes, cardiac diseases and also has an anti-ageing role. Free radicals in form of oxidative damage cause many fatal diseases.

Both the chronic and acute increases in reactive oxygen species form oxyradical-induced cytotoxicity and it further give rise to subsequent lipid peroxidation (Keller and Mattson, 1998). Basically the antioxidants act as free radical scavengers. They prevent as well as repair the damage done by the free radicals. LPP is the marker for the damage of lipid plasma membrane of the cell, which further highlights the tissue damage and establish a frame work for its involvement in diseased condition

(Keller and Mattson, 1998). Due to prolonged practice of dance the dancers show high levels of antioxidants with low level of LPP. The over all scenarios were altered in case of non-dancers as the LPP level increased and antioxidant level decreased. At this state of decreased antioxidant level and increased levels of LPP, the controls may be prone to other infection or immune complex diseases. In contrast the immuno-modulation of dancers in the positive direction thus kept them in proper healthy state and supports the therapeutic use of dance as a complete exercise. As the antioxidant level was higher in dancers, it can prevent them from many diseases associated with oxidative damage. It can also safe them from early ageing.

Present investigation suggests that dance is particularly beneficial for physical wellbeing as was revealed by early reports (Clippenger, 1997). It has the potential to motivate and excite people and it can be a way of engaging people in physical activity. Despite of being a creative art form dance, as a form of physical activity, may have a significant contribution to the healthy-living agenda in human being (Chatterjee, 2013). It is already proved that dance therapy as exercise is known to increase the neurotransmitters, called endorphins, which increase a state of well-being. Basically dance increases total body movement and it further change the physiological condition to improve the respiratory activity, blood circulation and also the muscular-skeletal systems (Quin *et al.*, 2007). In general females are more prone to some diseases than males, as because the involvement of females in physical activity is less than that of males. Further this involvement of females in direct physical activity decreases from adolescence onwards (Cole, 2008; Daley and Buchanan, 1999). This observation puts a question mark on the consciousness of general people towards the health science and benefit of exercise when the health of them is in stake. The dance practice in one way may change this spectrum and in other direction

helps to have a risk free health system. The negative effect of oxidative damage can be prevented in a positive mode by regular practice of dance and other physical activities. Therapeutic approaches are actually aimed at increasing good health status, thus prolonged practice of dance may cause betterment in normal life. In case of dancers as a complete exercise dance play an important role in immunity as an early defence system against infections and has a potential role in oxidative stress induced lipid peroxidation and the impairment of the antioxidant system.

CONCLUSION

The present investigation was designed to compare the antioxidant level among dancers with non-dancers, where dance has been admitted as a form of physical activity. Result revealed that due to prolonged practice of dance the dancers show high levels of antioxidants with low level of LPP. The over all scenarios were altered in case of non-dancers, where at this state of decreased antioxidant level and increased levels of LPP, the controls may be prone to other infection or immune complex diseases. Thus the present study revealed that dance movements are helpful for prevention of oxidative stress and maintaining good antioxidant level. The negative effect of oxidative damage can be prevented in a positive mode by regular practice of dance and other physical activities.

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