

**Research Article**

## **IMPROVED HEALTH STATUS THROUGH PROLONGED PRACTICE OF DANCE AS A THERAPY – A CASE STUDY**

**\*Arpita Chatterjee**

*Department of Botany, Barasat College, Barasat, Kolkata – 700 126, India*

*\*Author for Correspondence*

### **ABSTRACT**

Dance as a form of physical activity have a significant contribution to the healthy-living agenda. It increases total body movement, and helps to improve circulatory, respiratory, skeletal and muscular systems. Present investigation revealed that immunoglobulin IgG and complement C3 levels of dancers were significantly higher than those of the non-dancers. In comparison with non-dancers due to prolonged practice of dance the dancers also show high levels of antioxidants. The decreased levels of IgG, complement C3, antioxidant indicate that due to lack of physical exercise such non-dancers may have chance of higher incidences of infections or immune complex diseases or it may also induce a state of secondary immuno-deficiency. Besides in case of dancers dance, as a complete exercise, plays an important role in controlling blood sugar level. Bone mineral densities of dancers were under normal value whereas in many cases of non-dancers this value was lower.

**Key Words:** *Immunoglobulin IgG, Complement C3, Antioxidant, Blood Sugar, Bone Mineral Density*

### **INTRODUCTION**

Dance provides an active, non-competitive form of exercise that has potential positive effects for physical health as well as mental and emotional wellbeing. It has the potential to motivate and excite people and it can be a way of engaging people in physical activity. Scientific research proved that in males and females dance practice and physical activity can have a positive effect on physical fitness and it also increases lung function, lung capacity, flexibility and aerobic capacity (Blair *et al.*, 2001; Marshall *et al.*, 1998; Quin *et al.*, 2007). As a physical activity and a creative art form, it is believed that dance can make a significant contribution to the healthy-living agenda. Now-a-days in many hospitals and medical settings it has been used as a form of therapy not only for mental health, but also for physical health as well. Dance therapy as exercise is known to increase the neurotransmitters called endorphins which increase a state of well-being. Dance increases total body movement, which helps improve circulatory, respiratory, skeletal and muscular systems (Quin *et al.*, 2007).

As a major defense mechanism against external environmental hazards, human immunological surveillance is composed of a cellular immunity as well as humoral immunity including antibody and a complement system (Matsutani *et al.*, 1984). Humoral immune response is mediated by secreted immunoglobulins produced by B lymphocyte lineage. IgG being most abundant, constitute about 80% of the total serum immunoglobulin, is used as a parameter to represent humoral immunity (Matsutani *et al.*, 1984). Complement system is an important mediator in the immunologic defense of the body in non-specific (innate) resistance by amplifying the humoral response and converting it into an effective defense mechanism to destroy invading microorganisms by enhancing phagocytosis (Björge *et al.*, 2005). To increase the immune response as defense mechanism the complement C3 has central role in formation of membrane attack complex as well as in opsonization. Oxidative stress injury is also very much related with muscular tenacity and ageing directly. Antioxidants significantly protect the DNA damage caused by reactive oxygen species or ROS (Subramanian *et al.*, 1994), either by preventing the formation of them or by removing them before they can damage vital component of the cell (Kelly *et al.*, 2003).

The present investigation was aimed to study the oxidative stress injury profile, blood sugar level and bone mineral density (BMD) in dancers by comparing with non-dancers. The study was also directed

### **Research Article**

towards a mechanistic understanding of immune response, innate as well as humoral, in dancers where dance is admitted as a form of alternate therapy.

### **MATERIALS AND METHODS**

For this investigation three female cases were enrolled, having the problem of mild diabetes (as mentioned by medical practitioners), belonging to age group 58-60 years. They were suggested to practice simple dance movements on regular basis for nearly one year with consultation with doctors and dance therapist. No medicines and drugs were given to them. Here dance is taken as an alternative therapy for the diabetes patients. Controls ( $n = 3$ ) were participants frequency matched to cases by age, sex, similar lifestyle and food habit, except they are non-dancers. Written informed consent was obtained from all. Blood samples were collected from cases and controls in a regular interval to estimate blood sugar and immunological status.

The amount of matter per cubic centimeter of bones (Richmond, 2007) is measured to estimate the frequency of BMD in dancers and non-dancers by densitometric procedure. BMD was measured at the heel and wrist. The main outcome measures were in the form of baseline T-scores. By detecting the change in the level of serum IgG the effect of dance on humoral immunity was studied. Radial immuno diffusion plate (DIFFU-plate) containing uniform mono-specific antiserum directed against IgG in agarose gel layer is used (Biocientifica S.A., Argentina). To study the effect of prolonged practice of dance on health in respect to innate immunity concentration of complement C3 in serum of dancers was compared with non-dancers. DIFFU-plate containing mono-specific complement C3 antiserum was used (Biocientifica S.A., Argentina). Antioxidant level was analyzed by evaluating the activity of super oxide dismutase (SOD) by the protocol suggested by Reddy *et al.*, (1998).

### **RESULTS AND DISCUSSION**

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 (Table 1). Dancers had overall greater motivation and controlled blood sugar value within months of regular practice of dance in comparison to non-dancers. Monthly test of blood sugar level proved that due to physical activity in controlled manner among dancers the problem of higher blood sugar level did not persist among them. Thus dance helped in managing the problem in the specific cases having the mild diabetes before present investigation. Thus the present investigation suggests that dance is particularly beneficial for physical wellbeing (Clippenger, 1997). BMD of dancers (T-scores) were under normal value (-1.0), whereas in non-dancers this value was lower (-1.2). This T-score is a comparison of a person's BMD to that of a healthy one of the same sex and ethnicity (Table 1). The lower T-score indicate osteopenia when the value range is less than -1.0 and greater than -2.5 and osteoporosis as -2.5 or lower. The frequency of decreased BMD increases significantly with increasing age and constitutes a high-risk group for osteoporosis and future fractures (Quin *et al.*, 2007). In general females are more prone to osteoporosis than male, as because females' involvement in physical activity is less than that of males and further this involvement decreases from adolescence onwards (Cole, 2008; Daley and Buchanan, 1999). The dance practice in one way may change this spectrum and in other direction helps to have a risk free immune system. Therapeutic approaches are actually aimed at increasing immune response, thus prolonged practice of dance may cause betterment in normal immune system.

The present investigation revealed that antioxidant level was more in dancers as compared with the non-dancers (207.5 unit/ml) as shown by Table 1. All the dancers showed the value even greater than the normal level. The antioxidant factor plays a major role for the prevention of many diseases and also has an anti-ageing role. Free radical in form of oxidative damage causes fatal diseases and oxyradical-induced cytotoxicity arises from both chronic and acute increases in reactive oxygen species (Keller and Mattson, 1998). Antioxidants act as free radical scavengers and hence prevent and repair damage done by the free radicals. Due to prolonged practice of dance the dancers show high levels of antioxidants. The immuno-

## Research Article

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.

**Table 1: Comparison of bone mineral density and blood samples of dancers with non-dancer**

Parameters	Case I	Case II	Case III	Control (mean value)	Normal value
Age (years)	58	60	59	59	-
BMD (T score)	-1.0	-0.9	-1.0	-1.2	Upto -1.0
IgG level (mg/dl)	1498.7	1389.2	1443.6	723.8	600 – 1650
Complement C3 level (mg/dl)	142.9	111.4	136.3	72.6	80 – 160
Antioxidant level (unit/ml)	210	208	219	207.5	200 – 210

Present investigation highlighted that dance may directly effect immunoglobulin production through immuno-modulation (Table 1). Result revealed that IgG level was higher in all the dancers and the value was within the normal range (600-1650 mg/dl); whereas in non-dancers the IgG value was quite low (723.8 mg/dl). In case of complement, the serum C3 level was higher in all the dancers than non-dancers, but lie within normal level (80-160 mg/dl), whereas the C3 level of non-dancers was below normal level (72.6 mg/dl). The majority of non-dancers with C3 deficiency may have chance of higher incidences of infection, recurrent bacterial infection and may have immune-complex disease. This investigation proposes that dance as a complete exercise play an important role in innate immunity as an early defense system against infections. IgG, Complement C3 and antioxidant levels of dancers were significantly higher than those of the non-dancers. The antigen-antibody complexes require immunoglobulin and complement which causes an increased production to maintain normal levels (Hu *et al.*, 1988). The high IgG and complement levels in dancers as compared with non-dancers may be caused by the continued practice of dance, which serves as a stimulus for the antibody production in proper fashion. The elevated complement level in dancers may be explained by the concept that complement activity rises to enrich the cell-mediated immunity, in order to preserve the activity of the biophylaxis mechanism against any disease (Matsutani *et al.*, 1984). Fall in C3 level decreases the opsonin and anaphylatoxic activity of C3 as well as affect membrane attack complex formation. In non-dancers this immune system is low as compared with persons practicing dance for a prolonged time. This may lead to great suffering of non-dancers from many short term and long term diseases and their side effects due to lack of physical activity. People with C3 deficiency are susceptible to bacteria infection and some types of kidney disease such as post-infectious glomerulonephritis and shunt nephritis (Matsuyama *et al.*, 2001).

## ACKNOWLEDGEMENT

Authors are grateful to the technicians of Department of Biochemistry, Barasat Cancer Research and Welfare Centre, West Bengal, India for their cooperation in the bio-medical investigations during the study. Authors are also thankful to Dr. Sumanta Thakur, Orthopedic Surgeon, for his kind help and suggestion in collection and analysis of data during the present investigation.

## REFERENCE

- Björge L, Hakulinen J, Vintermyr OK, Jarva H, Jensen TS, Iversen OE and Meri S (2005).** Ascitic complement system in ovarian cancer. *British Journal of Cancer* **92** 895-905.
- Blair SN, Cheng Y and Holder S (2001).** Is physical activity or physical fitness more important in defining health related benefits? *Medicine and Science in Sport and Exercise* **2** S379-S398.
- Clippenger K (1997).** Fitness, dance, and health. *Journal of Dance Medicine and Science* **1**(1) 27-29.
- Cole RE (2008).** Improving clinical decisions for women at risk of osteoporosis: dual-femur bone mineral density testing. *The Journal of the American Osteopathic Association* **108**(6) 289-295.

**Research Article**

**Daley AJ and Buchanan J (1999).** Aerobic dance and physical self-perceptions in female adolescents: Some implications for physical education. *Research Quarterly Exercise Sport* **70**(2) 196-200.

**Hu DE, Ling XS, Hu J, Li BL, Wang XF, Shen YG and Ye J (1988).** The effects of radiotherapy on the immune system of patients with nasopharyngeal carcinoma. *British Journal of Radiology* **61** 305-308.

**Keller JN and Mattson MP (1998).** Roles of lipid peroxidation in modulation of cellular signaling pathways, cell dysfunction, and death in the nervous system. *Reviews in the Neurosciences* **9**(2) 105-116.

**Kelly FJ, Dunster C and Mudway I (2003).** Air pollution and the elderly: oxidant/antioxidant issues worth consideration. *European Respiratory Journal* **21**Suppl 70s-75s.

**Marshall SJ, Sarkin JA, Sallis JF and McKenzie TL (1998).** Tracking of health-related fitness components in youths ages 9 to 12. *Medicine and Science in Sport and Exercise* **30**(6) 910-916.

**Matsutani M, Suzuki T, Hori T, Terao H, Takakura K and Nishioka K (1984).** Cellular immunity and complement levels in hosts with brain tumours. *Neurosurgical Review* **7**(1) 29-35.

**Matsuyama W, Nakagawa M, Takashima H, Muranaga F, Sano Y and Osame M (2001).** Molecular analysis of hereditary deficiency of the third component of complement (C3) in two sisters. *Internal Medicine* **40**(12) 1254-1258.

**Quin E, Redding E and Frazer L (2007).** The effects of an eight-week creative dance programme on the physiological and psychological status of 11-14 year old adolescents: An experimental study. *Dance Science Research Report*, Hampshire Dance and Laban, England.

**Reddy KK, Reddy TPK, Somasekharaiah BV and Kumari KS (1998).** Free radical generation and lipid peroxidation among the dry cell industry workers exposed to carbon. *Indian Journal of Clinical Biochemistry* **13**(1) 27-32.

**Richmond B (2007).** In: Osteoporosis and bone mineral density. American College of Radiology, USA.

**Subramanian M, Rao MNAS, Devasagayam TPA and Singh BB (1994).** Diminution of singlet oxygen-induced DNA damage by curcumin and related antioxidants. *Mutation Research* **311** 249-255.