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IMPACT OF INDIAN CLASSICAL BHARATNATYAM DANCING IN TERMS OF NOVEL ANTHROPOMETRIC MARKERS OF CARDIO-VASCULAR HEALTH STATUS: A STUDY IN BENGALEE ADULT FEMALES

NEEPA BANERJEE[1], SURJANI CHATTERJEE[2], SANDIPAN CHATTERJEE[3], KUNTAL GHOSH[4] & SHANKARASHIS MUKHERJEE[5]

[1,2,3,5] Human Performance Analytics and Facilitation University, Department of Physiology, University Colleges of Science and Technology, University of Calcutta, Kolkata, India

[4] Indian Statistical Institute West Bengal, Kolkata, India

ABSTRACT

Background: The prevalence of cardiovascular diseases (CVD), one of the major life threatening Non Communicable Diseases, has increased dramatically in the past decades in countries that are undergoing rapid nutrition and lifestyle transitions such as India; and the control and management strategies of the NCDs including CVD has become a bottleneck to the country's social and economic development. On the other hand, dance is an accessible and appealing form of physically active recreational activity having the potential to influence adiposity, major modifiable risk factor for CVD.

Objectives: Present study, in this backdrop, aims to find out the impact, if any, of Bharatnatyam dancing, a cost effective, feasible traditional form of recreational activity, on novel anthropometric markers of CV health status.

Materials and Methods: Data on anthropometric adiposity indices (namely BMI, C-Index, BAI, WC, NC, ABSI, AVI and ICO) were obtained from 72 adult Bengalee female individuals constituting the Bharatnatyam Dancing Group (BDG) with a minimum dancing experience of 5 years. Measurements were also obtained from 96 female individuals constituting Control Group (CG), of similar age, socio-economic and ethnic background but no dancing or any other physical activity background.

Results: Overall a significant ($P < 0.01$) favorable impact of Bharatnatyam dancing has been found in BDG individuals compared to their CG counterparts.

Conclusions: Practicing of Bharatnatyam dancing, a traditional Indian dance form has a positive influence on novel anthropometric indices reflecting a better CV health status in individuals practicing it regularly.

KEYWORDS: ABSI, C-Index, CVD, ICO, Upper Body Obesity

INTRODUCTION

Presently cardio vascular diseases (CVD) that includes heart attacks, heart failure, stroke and peripheral artery diseases, presents an enormous global health problem. It is the largest single cause of death among women and account for one third of all deaths worldwide (Lerman*et al* 2006), in addition, CVD accounts for more deaths in women than any other cause, including all types of cancer combined. An estimated 20 million people may die from cardio vascular diseases (CVDs) by 2015 (WHO 2005)and the burden of the diseases is on the rise in developing nations (Khor 2001); The dual burden of persistent infectious diseases and emerging chronic Non communicable diseases (NCDs) such as CVD poses a

serious threatto population health and limited health care resources especially for low and middle income countries; India is not an exception, moreover Asian Indians have unusually high rates of Coronary Heart Disease (CHD) (Ghosh*et al* 2004). Due to socio-cultural issues generally prevailing in Indian society, females start leading a more sedentary life, one of the major risk factors for CVD and all-cause mortality (Katzmarzyk*et al* 2009, Healy *et al* 2011, Thorp et *a*l 2011) after attaining pubertal age and consequently are at high risk group. Obesity is one of the risk factors of CVD in both Western and Asian populations. The detrimental impact of obesity in the incidence of subsequent CVD is partly mediated by increased levels of cardiovascular risk factors (CVRF), in particular hypertension, dyslipidemia and diabetes (Juonala*et al*2011). On the other hand, Dance, an accessible and appealing form of physically active widely enjoyed recreational activity (Mastura*et al* 2012), is a demanding neuromuscular, skeletal event, a temporal, spatial, kinetic interface anchored by the universality of human motion and propelled by creative forces. It is a transient mode of expression that manifests in many styles and forms and therefore requires a delicate balance of perfection and freedom in the moving architecture of the human body. Bharatnatyam, a low impact dance form maintains contact of one foot with the floor at all times, is one of the oldest but still popular Indian classical dancers. It involves the adoption of different body postures like sitting, bending, twisting and continuous rhythmic body movements which might exert some effects on different physiological system. Previous study has found the favorable impact of Bharatnatyam dancing on body composition (Mukherjee*et al* 2014) especially body fat (Banerjee *et al* 2014), motor ability (Bhattacharjee*et al* 2014),pulmonary function indices (Banerjee *et al* 2014, Kundu*et al*2014)and also diabetic markers (Banerjee *et al* 2015); Since there is dearth of literature for comprehensive studies which focus on the effect, if any, of Bharatnatyam dancing on cardio vascular disease risk, present study aims to find out the impact of practicing regular Bharatnatyam dancing on select adiposity markers contributing to cardio-vascular risk of adult Bengalee female population.

METHODOLOGY

Present study was conducted on randomly selected 72 adult unmarried Bengalee female volunteers, of age range 25-30 years, regularly receiving Bharatnatyam dancing training for at least a period of five years and practicing at least five times a week on and average for half an hour period, and 33 adult Bengalee females of comparable age, and socioeconomic background and not undertaking any form of exercise training including any form of dancing, leading a sedentary life; they respectively constituted the Bharatnatyam Dancing Group (BDG) and Control Group (CG). Individuals receiving Bharatnatyam dancing training for less than five years, being trained in other forms of exercise and also other forms of dancing, and with self-reported any chronic illness were excluded as subjects from the study. Prior to the commencement of the study, necessary ethical permission and individual consent were obtained after explaining the study requirements. Anthropometric and demographic data were obtained for each subject. Demographic data included age (year), marital status, occupation, lifestyle status and like information. Socio economic status of the participating individuals was assessed using Kuppuswami socio economic scale (Kumar *et al* 2013). BMI was calculated using ratio of measured body weight (kg) tosquared value of stature (m), with participants in light indoor clothing and without shoes. The Neck Circumference (NC) (Mondal*et al* 2016) and Waist circumference (WC) (Motamed*et al* 2015) were measured using non stretchable measuring tape.C-Index (Ezeukwu*et al* 2014), Body Adiposity Index (BAI) (Bergman *et al*2011), Abdominal Volume Index (AVI) (Patil*et al* 2011), A Body Shape Index (ABSI) (Krakauer*et al* 2012) and the Index of Central Obesity (ICO) were calculated (Farahani*et al* 2013) using standard expressions. The measurement procedures were carried out in the morning hours. All variables were analyzed to find the significant difference, if any, and $P < 0.05$ was considered statistically significant.

RESULTS

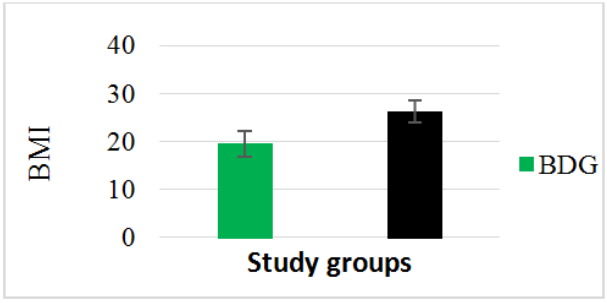
In the present study participants were adult Bengalee females (age BDG 26.3 ± 1.75 years and CG 26.6 ± 1.42 years) residing in and around Kolkata, the capital of West Bengal. All of the individuals belonged to Bengalee Hindu Caste Population (BHCP) and were from middle class strata of the society.

Table 1: Basic Socio-Demographic Characteristics of the Participating Volunteers

Variables	BDG (72)	CG (96)
Marital status	Unmarried	Unmarried
Addiction (smoking, alcoholism or like)	Nil	Nil
Family history of CVD	No previous history of parents and self	No previous history of parents and self
Any regular medication for any chronic diseases	Nil	Nil
Lifestyle	Sedentary in nature	Sedentary in nature
Exercise habit	Only BD	Nil

In the following section, comparisons between BDG and CG individuals in terms of anthropometric indicators of CVD have been presented graphically.

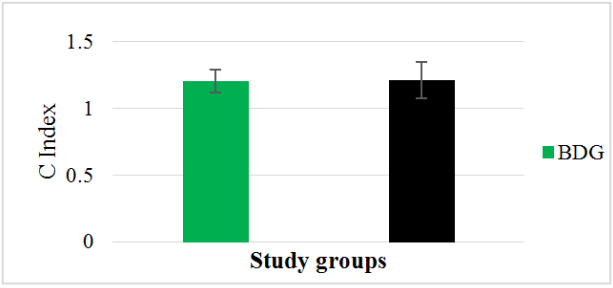
In Figure 1 compares between BDG and CG individuals in terms of BMI has been graphically presented.



BMI *
***P< 0.05**

Figure 1: Comparison between BDG and CG in Terms of BMI

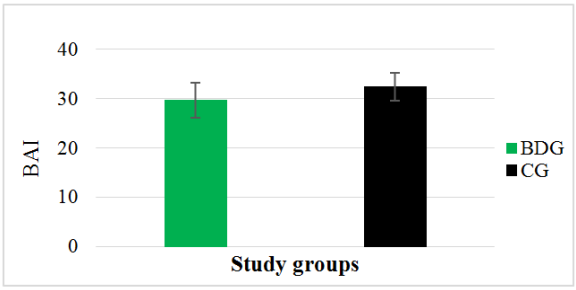
In Figure 2, comparison between BDG and CG individuals in terms of C Index has been graphically presented.



C Index^
^ns

Figure 2: Comparison between BDG and CG in Terms of CI

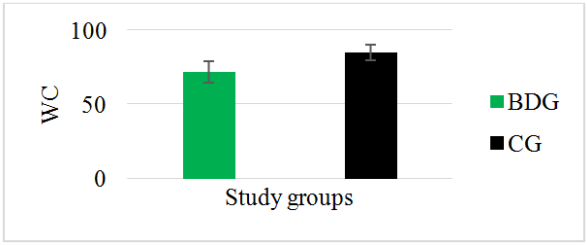
In Figure 3, comparison between BDG and CG individuals in terms of BAI has been graphically presented.



BAI*
***P< 0.05**

Figure 3: Comparison between BDG and CG in Terms of BAI

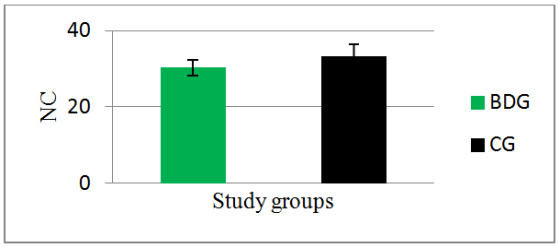
In Figure 4, comparison between BDG and CG individuals in terms of WC has been graphically presented.



WC*
***P< 0.05**

Figure 4: Comparison between BDG and CG in Terms of WC

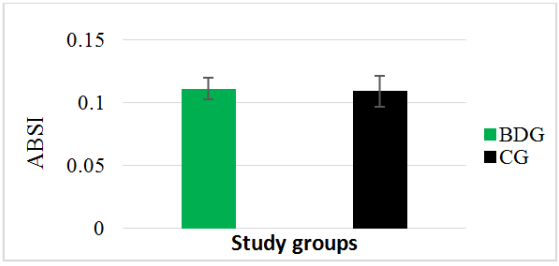
In Figure 5, comparison between BDG and CG individuals in terms of NC has been graphically presented.



NC*
***P< 0.05**

Figure 5: Comparison between BDG and CG in Terms of NC

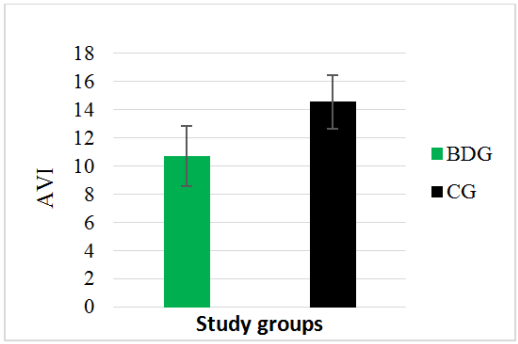
Graphical comparison between BDG and CG individuals in terms of ABSI has been presented in Figure6.



ABSI^
^ns

Figure 6: Comparison between BDG and CG in Terms of ABSI

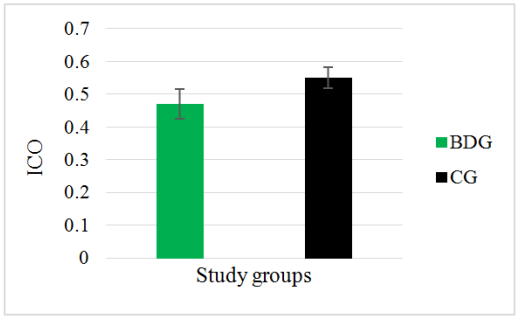
In Figure 7, comparison between BDG and CG individuals in terms of AVI has been graphically presented.



AVI*
***P< 0.05**

Figure 7: Comparison between BDG and CG in Terms of AVI

In Figure 8, comparison between BDG and CG individuals in terms of ICO has been graphically presented.



ICO*
***P< 0.05**

Figure 8: Comparison between BDG and CG in Terms of ICO

DISCUSSIONS

Sedentary behavior, persistent low levels of physical activity and poor cardio-respiratory fitness (CRF) is known to predict progression toward Type 2Diabetes, metabolic syndrome and CVD in adults (Bassuk*et al* 2005, Duncan 2006, Ford et *al* 2006, Roberts et *a*l 2005). The most immediate impact of physical inactivity is obesity and as obesity, reclassified by American Heart Association (AHA) as a 'major, modifiable risk factor' for CVD, different preventive strategies are being attempted to address it. On the other hand, dancing has been a popular recreational activity for centuries. But across the world only a few studies have examined the effect of dancing, that too mainly western type, on factors contributing to CVD of female individuals; present study was planned in this backdrop. Significantly ($P < 0.01$) lower body weight in BDG individuals compared to their CG counterparts was found and this could be attributed to the regular dancing exercise of Bharatnatyam form, as the BDG and CG individuals were not differing in terms of their socio-economic background and dietary energy intake and no dietary modification was suggested. The trend is affirmed from BMI values, the most commonly used indicators of obesity. BMI value of CG individuals is significantly higher ($P < 0.01$) than BDG individuals. It has been found that the average BMI of CG individuals was falling into the overweight (25.0-29.9 kg. m^{-2}) class, as per the WHO Standard classification (Poirier*et al* 2006), but on consideration of the Asian standards it falls into the obese category (Vasudevan*et al* 2011). BMI has also been found to be higher in individuals with Type 2 Diabetes Mellitus (Biswas*et al* 2017), another predictor of CVD. It has been established that at a given BMI,

Asians have significantly higher body fat content than westerns (Raji*et al* 2001), and hence it is a matter of concern. But in spite of the usefulness of BMI as a surrogate for adiposity, it has been criticized as it does not discriminate between the different components of the body and is unable to describe the fat distribution over the body. In adults, it has been found that a more central fat distribution is associated with an increased risk of ill health (Kissebah*et a*l 1994). The central obesity parameter is all the more important in Asian population, as they possess high levels of abdominal fat and are particularly prone to diabetes mellitus and cardiovascular disease (Anjana*et a*l 2004). In case of C Index, another anthropometric indicator of obesity which evaluates waist circumference in relation to height and weight, a similar trend like BMI has been observed. Another new index - Body Adiposity Index (BAI) - was proposed to reflect the picture of adiposity relatively recently and in the present study lower values of BAI in BDG individuals further affirm the trend.

A greater cardio-vascular risk has been found to be associated with increased value of WC, a popular anthropometric indicator of central or abdominal obesity (Coutinho et al 2011). The present study has found significantly lower values of WC in BDG compared with CG individuals; present finding is in line with previous studies (Mukherjee*et al* 2014, Çakmakçi*et al* 2011, Chatterjee*et al* 2014, Mukherjee *et al* 2013). Recent studies have focused on the cardio-metabolic correlates of the upper trunk fat and upper trunk-related anthropometric indices, such as NC (Ben-Noun*et al* 2006, Preis*et al* 2010). A previous study has found that higher NC is correlated positively with the factors of the metabolic syndrome also. In the present study it has been found that the BDG individuals have lower mean value of NC compared to their CG counterparts. ABSI, developed by Krakauer*et al* in 2011, is a relatively new indicator indicating abdominal adipose tissue; however, in the present study, no significant difference between two participating groups has been found in terms of ABSI. Abdominal Volume Index (AVI) estimates the overall abdominal volume between symphysis of the pubis and xiphoid appendix and theoretically includes intra-abdominal fat and adipose tissue volumes. Although AVI did not cross the cutoff (Patil*et al* 2011) for being high, significantly higher mean value has been found in CG individuals compared to BDG reflecting much higher abdominal tissue volume.ICO, another novel anthropometric index, has been proved to be a strong predictor of CVD (Schneider *et al* 2010); in the present study it has been found that BDG individuals have significantly lower value of ICO compared to CG individuals.

CONCLUSIONS

From the present study, it may be concluded that practicing of Bharatnatyam dancing, one of the most popular traditional Indian classical dance forms, has a favorable impact on body adiposity, indicating a better cardiovascular health status, as adjudged in terms of the CVD markers like BMI, BAI, WC, NC and so on in the adult Bengalee females practicing it regularly. Being an enjoyable form of physical activity, health promotion and prevention of chronic lifestyle diseases such as CVD, may be achieved through proper and structured practice of Bharatnatyam dancing.

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