

## ADDRESSING THE PUBLIC HEALTH CHALLENGE OF OBESITY THROUGH A NOVEL STRATEGY

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**ABSTRACT** ■ The prevalence of overweight and obesity-which have, during the past decade, joined underweight, malnutrition, and infectious diseases as major health problems threatening the developing world including India, has taken an alarming shape. Although obesity is a multi-factorial issue, evidences indicated the role of physical inactivity in its causation. As risk factors are being identified, various approaches have been tried out; but effective long term outcomes are yet to be obtained for prevention of the looming threat of obesity. Therefore, the challenge is to search for some novel and acceptable strategies to curb the rising trend of obesity. On the other hand, it is well known that India has a tradition of practicing dance, an appealing form of physical activity, for centuries. An attempt, in this context, has been made to assess and document the impact of being trained in Bharatnatyam, an Indian classical dance form, on obesity status of Bengalee females of age range 25-30 years. A significant ( $P < 0.05$ ) favorable impact of undergoing training and regular practicing of Bharatnatyam has been found. As a cost effective and holistic approach, Bharatnatyam can be a choice to address obesity, the new age public health issue.

**Key words:** Physical inactivity, traditional exercise, Indian classical dance, Bengalee females, wellbeing

### INTRODUCTION

Globalization has always been a part of humanity. But in recent times, due to rapid unplanned economic and nutrition transition resulting from globalization, developing countries are facing the new age public health challenges of Non Communicable Diseases (NCD) (Pullaret *al* 2018) more and the severity has become distinct with the recent constitution of the Developmental Origins of Health and Disease (DOHaD) society to study these emerging issues (Norris *et al* 2017). For

these NCDs, obesity has been identified as the common risk factor (Ezzatiet *al* 2013). It has been reported that by the year 2000, the human race reached a sort of historical landmark, when for the first time in human evolution the number of adults with excess weight surpassed the number of those who were underweight (Caballero 2007); India is also not having insulation from this development. In India, the second most populous country in the world, and where under-nutrition has been the major public

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health concern over the past several decades, prevalence of obesity has increased dramatically (Behl and Misra 2017) and little attention has been paid to obesity until recently. Given India's limited resources and the strains on its health system from having the greatest number of malnourished people in the world, rising overweight/obesity with the causal link with NCD including Type 2 diabetes, cardiovascular disease, hypertension, pulmonary function abnormalities and like, represents a major public health challenge. Although multifactorial influence on obesity has been established, while addressing this major health challenge, modifiable factors are generally considered; and as physical inactivity has been identified as the major modifiable behavioral risk factor for the causation of obesity, various options have been explored. *Paripassu*, India has a glorious tradition of classical dance, which has a set of rules that are rigid, and have developed over a long period and consequently a complex technique that must be mastered (Haskell 1962). Bharatnatyami is one of the oldest but still popular forms of Indian classical dancing. It involves adoption of different body postures like sitting, bending, twisting and continuous rhythmic body movements. Hence, in addition to the aesthetic aspects, Bharatnatyami is also a physically demanding recreational activity, especially for females. In this context, an attempt has been made to assess the impact of being trained in Bharatnatyam, an Indian classical dance form, on obesity status of Bengalee females of age range 25-30 years.

#### **METHODS**

Present study was conducted on randomly selected 78 adult unmarried Bengalee female volunteers, of age range 25-30 years, regularly undergoing Bharatnatyam dancing training

for at least a period of five years and practicing at least five times a week on an average for half an hour period, and 99 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 background information including age (year), occupation, lifestyle status and like were obtained from every individual volunteering to participate in the study. Socio-economic status of the participating individuals was assessed using updated Kuppuswami socio-economic scale (Singh *et al* 2017). BMI was calculated using ratio of measured body weight (kg) to squared value of stature (m), with participants in light indoor clothing and without shoes. The Neck Circumference (NC) (de Lucena Ferretti *et al* 2015) and Waist Circumference (WC) (Taylor *et al* 2010) were measured using a narrow flexible, inelastic and non-stretchable measuring tape. Sagittal abdominal diameter (SAD) was measured using an abdominal caliper with the participants in supine condition (Zamboni *et al* 1998). Body Adiposity Index (BAI) (Bergman *et al* 2011), Abdominal Volume Index (AVI) (Guerrero-Romero and Rodríguez-Morán 2003), and Index of Central Obesity (ICO) (Parikh *et al* 2007) were found out. To reduce inter-observer measurement error, the

measurement procedures were carried out by only one investigator, in morning hours. All variables were analyzed to find the significant difference, if any and  $P < 0.05$  was considered statistically significant.

## RESULTS

Participants of the present study were adult Bengalee females (age in year BDG:  $26.3 \pm 1.75$  and CG:  $26.6 \pm 1.42$  (AM  $\pm$  SD) residing in and around Kolkata Metropolitan Area. All of the individuals belonged to upper middle class, as obtained score from modified Kuppusswamy scale was in the range of 16-25 corresponding to upper middle class strata

of the society.

In Figure 1, comparisons between BDG and CG individuals in terms of BMI, most popularly used indicator of overweight and obesity, has been presented.

A significantly lower mean value of BMI has been found in BDG individuals compared to CG individuals.

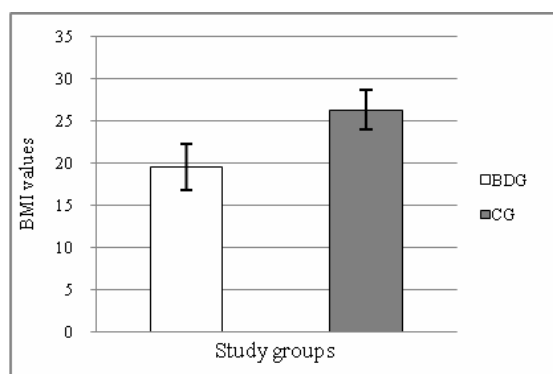
In Figure 2, comparisons between BDG and CG individuals in terms of select upper body obesity indicators have been presented.

Significantly lower mean values of NC, WC and SAD have been found in BDG individuals

**Table 1:** Background characteristics of the participating volunteers

Variables	BDG	CG
Residence	Urban areas	Urban areas
Age (years)# ^	$26.3 \pm 1.75$	$26.6 \pm 1.42$
Ethnicity	Bengalee Hindu	Bengalee Hindu
SES	Upper middle	Upper middle
Marital status	All unmarried	All unmarried
Addiction (smoking, alcoholism or like)	Nil	Nil
Self or familial history of chronic diseases	No previous history of self and parents	No previous history of self and parents
Any regular medication for any chronic diseases	Nil	Nil
Lifestyle	Sedentary in nature	Sedentary in nature
Exercise habit	Only BD	Nil

#AM $\pm$ SD, ^ ns



**Fig. 1.** Comparison between BDG and CG individuals in terms of BMI

compared to their CG counterparts.

In Figure 3, comparisons between BDG and CG individuals in terms of select obesity indices have been presented.

Mean values of BAI, AVI and ICO have been found to be significantly lower in BDG individuals compared to their CG counterparts.

## Discussion

Development in public health, the art and science of protecting and improving the health of a community through an organized and systematic effort that includes education,

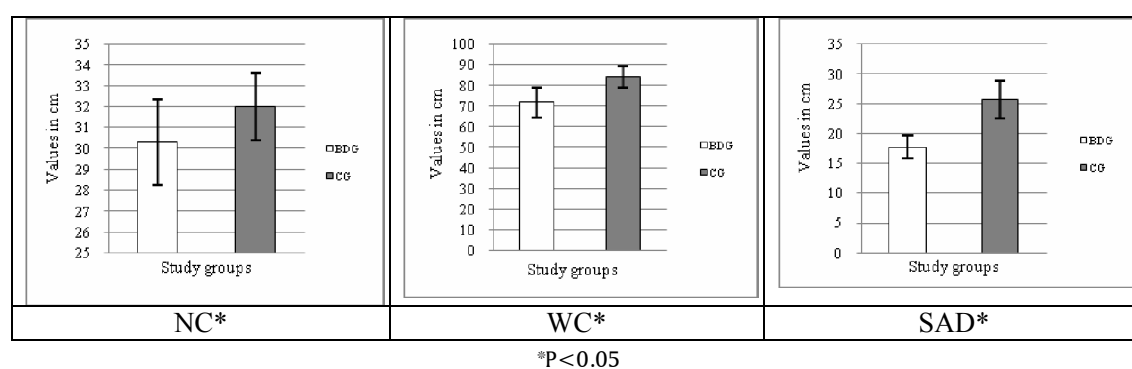


Fig. 2. Comparisons between BDG and CG individuals in terms of select upper body obesity indicators

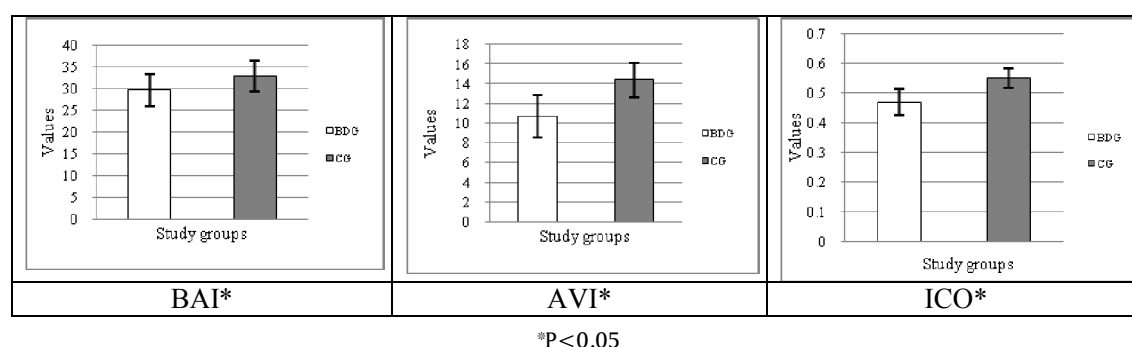


Fig. 3. Comparisons between BDG and CG individuals in terms of select obesity indices

provision of health services and protection of the public from exposures that will cause harm (Chauhan 2011), is the need of the hour in the present ever changing societal scenario. The epidemic of overweight and obesity, the new age public health issue, presents a major challenge to chronic disease prevention and health. The challenge exists throughout the life, around the world including developing countries and it is not only confined to urban areas, prevalence of obesity has been found in rural areas too (Banerjee *et al* 2013a and b). For management of this public health issue, pharmacological and non-pharmacological options have been tried and reported (Bhattacharjee *et al* 2016); in this respect, spices (Bhattacharjee *et al* 2017a), usage of a particular type of cooking oil (Banerjee *et al* 2018) and like things have been reported to be beneficial also. But while

addressing obesity issues, major focus has been on behavioral risk factors, and addressing physical inactivity is the prime concern. Practicing of various sports activities including football, cricket (Bhattacharjee *et al* 2017b and c), sprinting (Banerjee *et al* 2014) and like have been found to have positive impacts on obesity status of males but considering the socio-cultural perspective generally prevailing in the society and injury aspect (Chatterjee *et al* 2014) selection of a specific mode of physical activity for females is a crucial factor. In the present study, impact of regular practicing of Bharatnatyam, a traditional Indian classical dance form, on obesity issues. Has been the focus.

The most commonly used indicator of obesity is BMI. Mean BMI value of CG individuals has been found to be significantly higher ( $P < 0.05$ ) compared to the BDG individuals. An earlier

study has also revealed that regular exercising with Indian classical dancing is beneficial in achieving and maintaining favorable BMI (Mukherjee *et al* 2012); creative dancing has also been found have favorable impact in this context (Kundu *et al* 2015). It has been found that the average BMI of CG individuals was falling into overweight (25.0-29.9 kg.m<sup>-2</sup>) class, as per the WHO Standard classification (Poirier *et al* 2006), but on consideration of the Asian standards it falls into obese category. BMI has also been found to be higher in individuals with type 2 diabetes mellitus (Biswas *et al* 2017), which often coexist with obesity. It has been established that at a given BMI, Asians have significantly higher body fat content than westerns (Rajiet *al* 2001), and hence it is a matter of concern. NC is a relatively new marker of overweight and obesity. It is especially considered as the upper body subcutaneous adipose tissue distribution and may be a unique, pathogenic fat deposit (Li *et al* 2014). In the present study, it has been found that the BDG individuals have lower mean value of NC compared to their CG counterparts; present finding is consistent with an earlier report (Banerjee *et al* 2015). Earlier studies on Asian young females have identified the cut off value of NC for being defined as overweight and obese (Hingorjoi *et al* 2012); in the present study, it has been found that mean value of NC of CG individuals have already crossed the cut off for being considered as overweight. Although BMI gives the idea of generalized obesity, central obesity, commonly reflected by WC, has been recognized as an independent risk factor for cardio-metabolic diseases (Klein *et al* 2007). In the present study, it has been found that mean value of WC in BDG individuals is significantly lower compared to CG individuals. Previous studies have found

similar favorable impact of Indian classical dance forms (Mukherjee *et al* 2013, Chatterjee *et al* 2013, Mukherjee *et al* 2014a, Mukherjee *et al* 2014b). The SAD or "abdominal height", which measures the vertical anterior-to-posterior distance when the subject is supine, has been identified as a surrogate marker of visceral fat mass (Gletsu-Miller *et al* 2013). In the present work, it has been found that the mean value of SAD in BDG individuals is significantly lower compared to CG individuals; present finding is in agreement with an earlier study from our group (Banerjee *et al* 2017). As SAD is a measure of visceral fat, the most dangerous fat depot of the body with potential of resulting in metabolic abnormalities, it may be mentioned that BDG individuals are in a better state in respect of visceral body fat, which has been corroborated in a previous study also (Banerjee *et al* 2014), and thereby having relatively lesser likelihood of suffering from metabolic diseases. Another relatively new index - Body Adiposity Index (BAI) - was proposed to reflect the picture of adiposity relatively recently, and in the present study, significantly lower mean value of BAI in BDG individuals compared to CG individuals, which is in consonance of our earlier findings (Mukherjee *et al* 2014, Chatterjee *et al* 2014), further affirm the trend. Abdominal Volume Index (AVI) estimates overall abdominal volume between symphysis of pubis and xiphoid appendix and theoretically includes intra-abdominal fat and adipose tissue volumes. Although mean value of AVI in both the groups did not cross the cut-off (Patil *et al* 2011) for being considered high, significantly higher mean value has been found in CG individuals compared to BDG, reflecting much higher abdominal tissue volume. The finding of the present study is in agreement with an earlier study conducted

on Bengalee adult Kathak danseuses (Chatterjee *et al* 2017). ICO, another novel index of obesity status, has been identified as a better predictor of central obesity (Parikh *et al* 2007). It was observed that people with identical WC, an indicator of central obesity, but different heights have dissimilar risk for hyperglycemia, hypertension and fatty liver (Hsieh *et al* 1999). Therefore, though WC can roughly quantify the amount of truncal fat it cannot effectively gauge its contribution to whole body fat; hence the concept of height dependency has evolved. In the present study, mean value of ICO of BDG individuals has been found to be significantly lower compared to their CG counterparts indicating favorable status of central obesity. The beneficial impacts of receiving the training and regular practicing of Indian classical dance have not only found on obesity status itself, probably the resultant benefits have also been found in pulmonary function (Banerjee *et al* 2014, Kundu *et al* 2014), muscular strength (Chatterjee *et al* 2017), motor ability (Bhattacharjee *et al* 2014) and cognitive ability (Chatterjee *et al* 2018). Even in recent times in society, many times negative attitudes persist towards obese person, they may suffer from psychological distress. As stigma is a known enemy in the field of public health, impact of Bharatnatyam dancing on psychological status has also been assessed and a favorable impact has been found in this aspect too (Banerjee *et al* 2014). It may be mentioned that practicing Bharatnatyam dancing in Bengalee females has been evidently beneficial even from the public health perspective.

#### CONCLUSION

From the present study, it may be concluded that practicing Bharatnatyam, a traditional Indian classical dance form, has favorable impacts on obesity as adjudged in terms of

the traditional and relatively new indicators in the adult Bengalee females practicing it regularly. As a cost effective and holistic approach, Bharatnatyam can be a choice to address obesity, the new age public health challenge.

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