International Journal of Yoga, Physiotherapy and Physical Education
ISSN: 2456-5067; Impact Factor: RJIF 5.24
Received: 12-05-2019; Accepted: 24-06-2019
www.sportsjournal.in
Volume 4; Issue 4; July 2019; Page No. 87-90

12 weeks programme of yoga with aerobic dance on blood pressure, blood sugar level in pre-diabetic sedentary individuals

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Abstract
Sedentary life style is when an individual doing less than 30 minutes of physical activity on most of days of week. Yoga is our traditional technique which promotes active life style and also to promote healthy living. Aerobic dance is a form of exercises which promotes exercise through dance. There are studies about yoga and aerobics on blood pressure and blood sugar levels but there is no head to head comparison was made, so this study was aimed to compare the effect of yoga and aerobic dance on blood sugar and blood pressure levels. 66 participants were selected using random sampling method and they were divided into two groups, yoga group and aerobic group. Both underwent a protocol of exercises for 12 weeks. Fasting blood glucose, Systolic & Diastolic blood pressure were calculated. SPSS 21.0 was used to evaluate the variables. The result of the study shows that yoga and aerobics show significant improvement within the groups whereas between the groups there was no differences exist.

Keywords: sedentary individual, pre-diabetes, yoga exercises, aerobic dance, blood sugar, blood pressure

Introduction

Sedentary lifestyle is defined as a type of lifestyle where an individual doesn't receive regular physical activity as prescribed by Centre of disease control guidelines (CDC) [1]. Globally around 31% of adults aged 15 and over are living sedentary and approximately 3.2 million deaths each year are attributable to insufficient physical activity [2]. Physical inactivity is defined as doing less than 30 minutes of physical activity on most of days of week [3].

Sedentary lifestyle is due to insufficient participation in physical activity during leisure time and an increase in sedentary behavior during occupational as well as domestic activities [4]. It is a state of concern as it leads to major health problems like stroke, diabetes, obesity, hypertension and various other metabolic disorders [5].

Main contributing factor of sedentary lifestyles is due to technological improvement. Rouse of technology has bought more inactive modes of transit which caused by increased desk job work, and increase activity in sitting like watching TV, surfing in web, playing video games etc.. There is a rapid increase of inactivity when compare with decades back [6].

Pre diabetic individuals are higher than the normal in fasting blood glucose level. Pre diabetic are more likely to get heart diseases and stroke in sedentary life style, which has high positive correlation [7]. Sedentary lifestyle is suspected to be a risk factor for hyper tension, although the mechanism is not clear, though studies have suggested that sedentary behavior has linked with elevated blood pressure [8].

Physical activity and fitness have often found to be inversely proportional to the incidence of hypertension. Regular exercises are strongly recommended to reduce hypertension [9]. Multiple studies have showed that physical activity has been associated with reduction in blood pressure [10]. Exercises play a major role in reducing blood sugar and blood pressure which is demonstrated in various studies [11], although mechanism of exercises is inconclusive. On the other hand yoga is the traditional technique which was discovered by Indians and gifted to the world; Yogic exercises are slow, static type of muscular exercises which found to be effective in reducing blood pressure and blood sugar levels where the mechanism is still unclear [12]. There are many exercises and advises were given on managing blood pressure or blood sugar, still which type of exercises is suited are not identified. Some studies have identified aerobic exercises as the best, however the mechanism is not fully understood [13]. So this study tries to identify the effect of yoga and aerobic dance on blood sugar and blood pressure in pre-diabetic sedentary individuals.

Methodology

This study was conducted in the KG College campus, Coimbatore. The study was approved by the institutional ethical committee. Notice about the study was displayed in the various places of the college campus and those who volunteer were registered in the Outpatient department, KG College of physiotherapy, Saravanampatti, Coimbatore. 164 volunteers were registered for the study. Blinded assessors evaluated all the individuals and identify the suitable subjects for the study based on the selection criteria. 110 volunteers were included in the second evaluation process. 66 volunteers were selected for the study and all were randomly allocated into two groups using computer assisted random sampling method. Volunteers were with the age group of 18-35 years, both gender were selected, subjects with BMI more than 30 (overweight), sedentary individual identified by IPAQ questionnaire, volunteers with pre diabetic stage (Fasting blood sugar level is more than

>100mg/dL) [14]. Volunteer selected are without any cardiac illness, without any congenital problems. Volunteers were randomly divided as 33 in each group. Yoga group (YG) who underwent yogic exercises formulated by Malhotra *et al*., 2004 [15]. The study was conducted for 12 weeks, initial 4 weeks the participants were instructed to participate. This study follows thirteen specific yoga asanas and pranayama, the asanas include Surya Namaskar, Trikonasana, Tadasana, Veerasana, Ardhakati Chakrasana, Sukhasana, Padmasana, Bhastrika Pranayama, Pashchimottasana, Bhujangasana, Vakrasana, Vajrasana, Matsysana, Dhanurasana and Shavasana. All the participants have received personalized attention and supervision by Yoga expert which was carried out in the Outpatient Department of KG College of Physiotherapy, Coimbatore, and every alternate day in the morning for 40-60 mins for continuous 84 days.

Aerobic dance group underwent set of aerobics formulated by Daniel *et al*., 2019 [16]. Participants were put through a warm up exercise in form of low intensity aerobic dance to a beat of a slow music. The warm up exercise was maintained at minimal intensity of 11 to 12on Borg Scale of Perceived Exertion. After 5min warm up, the music was changed to a faster track of a pre-recorded beat that made the dance at an intensity corresponding to13 to 14 on the Borg Scale of perceived exertion. The dance pattern was demonstrated by the coach who is a trained Physical education specialist. They sang along as they danced, as a familiar music tone was used. The participants danced for 20 min and then, the music was switched back to the slow music as cool down for 5 min. All the participants are received personalized attention and supervision by Aerobics instructor which was carried out in the Outpatient Department of KG College of Physiotherapy, Coimbatore, every alternate days in the morning for 40-60 mins for continuous 84 days. Blood pressure (Systolic and Diastolic) were measured using sphygmomanometer and fasting blood sugar was measured using glucometer. The data's were analyzed using SPSS 21.0.

Results

Table 1

	Yoga	Aerobic	p value
Age	27.12± 5.05	25.90 ± 4.48	p = 0.65
Gender	Males: 18	Males: 20	-
	Females: 15	Females: 13	
BMI	31.33 ± 1.17	31.88 ± 1.29	p = 0.74

Table 2

Outcome	N	Yoga (Mean/SD)		Aerobic (Mean/SD)		Yoga Vs Aerobic (Mean/SD)		p value	t value
		Before	After	Before	After	yoga	Aerobic		
Blood sugar	33	129.08± 2.04	115.52± 4.24	130± 4.21	114±3.47	115.52± 4.24	114±3.47	0.05	1.56
Systolic Blood Pressure	33	135± 6.22	120± 5.20	136± 7.29	119±1.74	120± 5.20	119±1.74	0.05	0.38
Diastolic Blood Pressure	33	91.2± 3.80	82.8± 3.31	90.7± 3.66	81.2± 4.05	82.8± 3.31	81.2± 4.05	0.05	1.73

Analysis

On comparison of the data pre intervention, the p values yielded were statistically non-significant. This suggested that the data was homogenous in distribution. The above table 2 suggests that both Yoga and aerobic exercise are effective in reducing blood glucose levels and systolic blood pressure and diastolic blood pressure in sedentary individuals. On contrary to that, comparison of blood sugar, systolic blood pressure and diastolic blood pressure between group A and group B, shows no significance in the sedentary individuals. This suggests that both Yoga and Aerobic effect in reducing blood glucose levels & blood pressure in sedentary individuals but while comparing between both shows no changes in effect on blood sugar and blood pressure.

Discussion

Raise in blood pressure is one of the important risk factors in south Asia. Hypertension and high blood glucose level a substantial public health burden on cardiovascular health status and healthcare systems in India [17]. Aerobic exercises are advised for health promotion and prophylaxis for many cardiovascular diseases. Previous studies have reported that exercise training altered balance between vasodilatation and vasoconstriction [18]. It has also been postulated that blood vessel dilatation can be influenced by aerobic exercises which can regulate by nitric oxide and prostanoid systems. Aerobic exercises would reduce blood pressure by improving vascular stiffness and endothelial functions[19], seen also in the studies indulged in rats.

Aerobic dance promotes working of various muscles which are more sensitive to insulin, aerobic exercises facilitates glucose intake by the muscles and can thus be a definitive tool in blood glucose control [20]. Various other studies also showed that aerobics increases insulin binding to the receptors of moncytes, which results in higher production of insulin and thus greater glucose absorption, and finally reduces blood sugar levels [21, 22].

A set of Yoga intervention consisting of Surya namaskar along with other yoga postures resulted in a significant decrease in diastolic blood pressure and hip circumference, and beneficial effects on glycaemic outcomes [23]. Yoga postures are the physical positions that coordinate breath with movements and with holding the position to stretch and strengthen different parts of the body. Yogic exercises will produce effect in the various muscle groups and organs, although they are not pure aerobic in nature they send oxygen to the cells by the way of conscious deep breathing and sustained stretching and contraction of different muscle groups [24].

Multiple studies support that yoga may reduce Blood pressure and the studies have shown significant reduction in the systolic blood pressures up to 6mmHg and diastolic BP of up to 5 mmHg [25]. Short yoga programme has an antihypertensive effect as well as positive effect on self rated quality of life[26]. Yoga produces substantial changes in the blood sugar levels, the hypothetical reason behind it was yogic postures could create muscle contractions and dilation which causes stimulation in the pancreas. Deep breathing, relaxation, bending and twisting stimulates pancreatic cells and thus performing these asanas, increases insulin secretion and regulation. Asanas could cause skeletal muscle activity and increases the ability of the muscles to upload glucose during exercises which is independent of insulin [27].

Yoga has beneficial effect on blood glucose levels, it increases insulin sensitivity at the target tissues which also decreases insulin resistance and consequently increases the peripheral utilization of the glucose [28]. Yogic exercises play a major role to stimulate and regulate the glucose transports (GLUT-4) carrier of cell membranes from the intracellular storage locations. Recent reviews suggest that yoga may improve the metabolism of the body, regulate autonomic nervous system activity and alters hypothalamo pituitary adrenal axis which act as a neural mediators of hyperglycemia [12]. There are few reports showing that yoga influences the blood glucose levels [29]. It also postulated that yoga can rejuvenate beta cells of pancreas [14].

Multiple researches were confirmed that exercises enhance the capillary beds and increases the number of insulin receptors [30]. However both yoga and aerobic exercises the works in the muscles produces more sensitive to insulin rather than resting muscles, this insulin sensitivity aids in absorb glucose during exercises as well as in reduction of blood pressure. The reduction in the blood sugar level or in the blood pressure is identified in mild exercises like yoga or moderate exercises like aerobic dance. Thus exercises are safe and easy can increase insulin sensitivity and lowers blood sugar, reduces blood pressure as well as improvement in the quality of life. There are few limitations found in the study including study sample is limited in number, the exercises done at the home was not well monitored and the food habits and nutritional factors are not controlled in the participants.

Conclusion

This study concluded that there was a no significant differences obtained when compared between the yoga and aerobic dance in blood sugar, blood pressure values, however the within group analysis shows significant difference in these values.

Acknowledgement

The authors sincerely thank Dr. G. Bakthavathsalam, Chairman, Mrs. Vasanthi Ragu, Vice Chairman, Mrs. Vaijeyanthi M Das, CEO, Mr. Prabhu Kumar, CEO, and Prof V. Mohan Gandhi, CEO, KG Hospital, Coimbatore. India. for their support and logistical help to conduct this research.

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