Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/8011
DOI URL: http://dx.doi.org/10.21474/IJAR01/8011
ISSN NO. 2320-5407

RESEARCH ARTICLE

COMPARISON OF AEROBIC EXERCISE AND YOGA THERAPY ON ENDURANCE CAPACITY IN DIABETES MELLITUS PATIENTS.

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Manuscript Info

Manuscript History
Received: 04 September 2018
Final Accepted: 06 October 2018
Published: November 2018

Keywords:-
Aerobic exercise, yoga therapy, endurance capacity, Harvard Step test, diabetes mellitus.

Abstract

Background: Regular exercise and yoga are key elements in the management of type 2 diabetes. It can help people with diabetes to achieve variety of goals including enhancement of cardiopulmonary fitness, improvement of glycemic control, reduction of blood pressure and improvement in quality of life. Walking and asanas with rhythmic breathing exercises are often the most popular and most preferred feasible type of exercises in overweight middle aged and elderly people with diabetes. **Objective:** To compare the effect of aerobic exercise and yoga therapy on endurance capacity in type 2 diabetes mellitus patients. **Methods:** 30 participants aged 40-55 years diagnosed with type 2 diabetes mellitus attending OPD of Rajah Muthiah Medical college and Hospital were recruited. Patients with renal cardiac complications were excluded. Aerobic group involves moderate brisk walking and yoga group involves asanas with pranayama 45 minutes daily 5 days per week for 4 weeks. Endurance capacity was measured by Harvard Step test before and after aerobic training and asanas with pranayama and compared with both groups.
Results and Conclusion: Independent t test showed no significant differences in endurance capacity between aerobic exercise and yoga therapy. The study revealed that regular practice of both the aerobic exercise and yoga are essential and effective in improving overall functional capacity of diabetes mellitus patients.

Introduction:-

Diabetes incidence is mainly attributable due to the increasing rates of urbanisation, migration from rural to urban areas and adoption of sedantary lifestyle and unhealthy diet habits.[1,2] During few decades, most of the working population had changed their lifestyle from active working occupations like agriculture to a less demanding works like office jobs. TV, video games too makes the children refrain from regular physical activity. It was observed that the prevalence of diabetes was 3 times higher in individuals with sedantary lifestyle compared to those having heavy physical activity.[3]

Exercise mainly aerobic exercise and yoga plays a key role in the management of diabetes. Aerobic exercise comprises of walking, rowing, swimming, cycling, running and jumping rope maintain blood pressure, improves oxygen consumption, fasting blood glucose level, glycemic control, lipid profile and restore endothelial function[4-6].

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Yoga therapy consists of 3 components including physical postures, breathing exercises and meditation. Yoga postures improve sensitivity of β cells of pancreas to glucose signal and also the improvement in insulin secretion, improvement in lipid level due to increased hepatic lipase and lipoprotein lipase at cellular level increased uptake of triglycerides by adipose tissues thereby increases the utilization and metabolism of glucose in peripheral tissues, liver and adipose tissues. Pranayama bring new homeostasis in the body.[7-9]

Low physical fitness mainly cardiopulmonary fitness seems to be a stronger predictor of both cardiovascular and all cause mortality than any other well established risk factors.[11] Several studies reported that increase in cardiopulmonary fitness reduces the risk of cardio-metabolic diseases and affect these comorbidities by regulation of cardiac output and blood pressure.[12-15]Therefore,the purpose of the study was to determine the effect of aerobic exercise and yoga therapy in aerobic endurance and compare both interventions especially in the diabetes patients.

Objective:-

To compare the effect of aerobic exercise and yoga therapy on endurance capacity in diabetes mellitus patients.

Study Design

Randomised clinical trial

Materials And Methods:-

Participants:

30 middle aged adults of type2 diabetes mellitus were randomly selected from Rajah Muthiah Medical College and Hospital, Annamalai Nagar, Chidambaram, Lord Nataraja Temple City. They were assigned into two groups. [Aerobic exercise] Group A =15 and [Yoga therapy] Group B =15. Demographic data like age, gender and BMI were documented. All subjects got written consent before participation in the study. The detailed procedure was explained as well as demonstrated to the subjects.

The following anthropometric measurements were made on the subjects prior to the commencement of the test: (1) The height in centimetres was measured with subjects standing without their shoes.(2) The weight in kilograms was recorded using a standardized weighing machine. (3) All the subjects were familiarized with Modified Harvard step test and PFI (Physical fitness index)score was calculated.

Inclusion criteria:

Both males and females, aged 40-55years,5-10 years duration of diabetes.

Exclusion criteria:

Systemic illness, patients with neurological symptoms, renal or cardiac complications, practice of yoga or other exercise training schedule, any endocrine disorders and obesity or anemia.

Procedure:

Aerobic exercise:

Subjects from group A were asked to walk for 45 minutes 5 times a week for 4 weeks. The subjects were asked to walk at a brisk pace and cover as much distance as possible. Moderate brisk walking approximately 40-60% of VO2 max and 50-70% of MHR according to American College of Sports Medicine and American Heart Association guidelines

Yoga therapy:

Group B subjects were taught pranayama, sun salutations and15 yoga postures (asanas) in standing, sitting and lying, 45 minutes daily for five days in a week for 4 weeks. Sitting: Sukhasana, Padmasana, Vakrasana, Yogamudrasana, Paschimottanasana, Gomukhasana Standing: Trikonasana, Virbhadrasana Lying: Bhujangasana, Pawanmuktasana, Dhanurasana, Naukasana, Halasana, Setubandhanasana, Shavasana. Follow up was done for both groups after every month.

Meditation sessions were conducted in first 10 minutes followed by performance of the above asanas in the next 35 minutes. 2 repetitions of each asana were given in the sequence mentioned above. The session ended with

Shavasana. A 30 second rest pause was provided between each asana. A demonstration was given to the subjects prior to the intervention.
At the end of 4 weeks, PFI was measured again for both groups and the data was statistically analyzed.

Cardiopulmonary fitness parameter:
Modified Harvard step test:
The procedure of this method is that subject took rest for 30 minutes prior to test after which the resting pulse was noted. Then the subject was asked to perform the exercise of ascending and descending Harvard step of 33 cm height, 30 times per min for 5 min. If the subject was dyspneic, felt exhausted or felt pain in chest or legs during the exercise, he was asked to discontinue the exercise immediately.

Time is noted with the help of stopwatch. At the end of test ask the subject to sit immediately on chair, count the pulse and record it during 1 to 1-1 /2 min, 2 to 2/-1 /2 min and 3 to 3/-1 /2 min intervals. Total of these three reading is called recovery pulse. Convert the duration of exercise in seconds and Physical fitness index is calculated as follows.

Physical Fitness Index = (100 x test duration in seconds) divided by (2 x sum of heart beats in the recovery periods) Depending upon the score, Physical fitness index is graded as Excellent (>90), Good (80-89), High average (65-79) and Low average (55-64) and poor (< 55).

Statistical analysis:

The collected data were analyzed via SPSS statistical analysis package version 19, using dependent T-student test to compare intergroup mean differences. Independent T- student test was applied to compare mean differences between groups. The Significance level was set at P <0.05.

Results:-

Table 1:-Physical and clinical characteristics of the subjects

Variables	Aerobic (n =15)	Yoga (n=15)
Mean age ± SD (years)	43.33 ± 6.73	44.11 ± 5.82
Mean diabetes duration ± SD (years)	4.44 ± 2.33	3.92 ± 2.66
Mean BMI ± SD kg/m2	28.30 ± 1.24	27.12 ± 2.51

Interpretations
The mean and standard deviation of age, diabetes duration and BMI for aerobic exercise group A were 43.33 ± 6.73, 4.44 ± 2.33, 28.30 ± 1.24 and yoga therapy group B were 44.11 ± 5.82, 3.92 ± 2.66, 27.12 ± 2.51 respectively. The above results showed that there were no statistically different in base line and clinical characteristics of both groups.

Table 2:-Comparison of Physical fitness index of group A

Variable	Pre treatment	Post treatment	p value
PFI score (mean ± SD)	54.67±11.4	74.78 ± 3.9	<0.05 (significant)

Interpretations:
The above table 2 showed the comparison of pre and post treatment for group A. the results showed that there was significant difference in between pre (54.67±11.4) and post treatment (74.78 ± 3.9) at p<0.05

Graph 1:-Comparison of Physical fitness index of group A

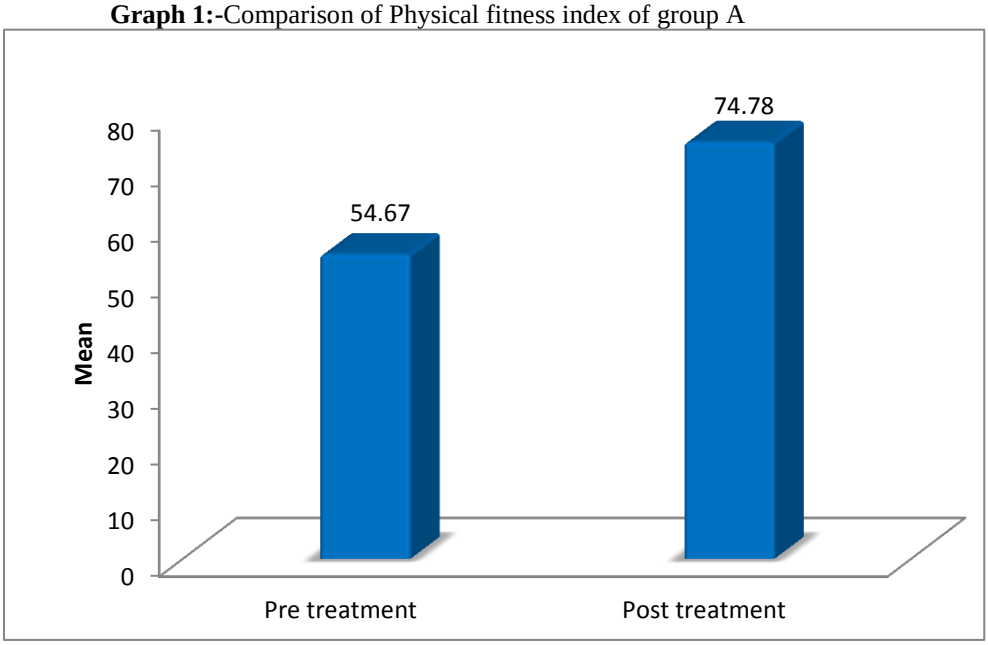


Table 3:-Comparison of Physical fitness index of group B

Variable	Pre treatment	Post treatment	p value
PFI score (mean ± SD)	55.8±12.8	73.4 ±4.8	<0.05 (significant)

Interpretations:
The above table 3 showed the comparison of pre and post treatment for group B. the results showed that there was significant difference in between pre (55.8±12.8) and post treatment (73.4 ±4.8) at p<0.05.

Graph 2:-Comparison of Physical fitness index of group B

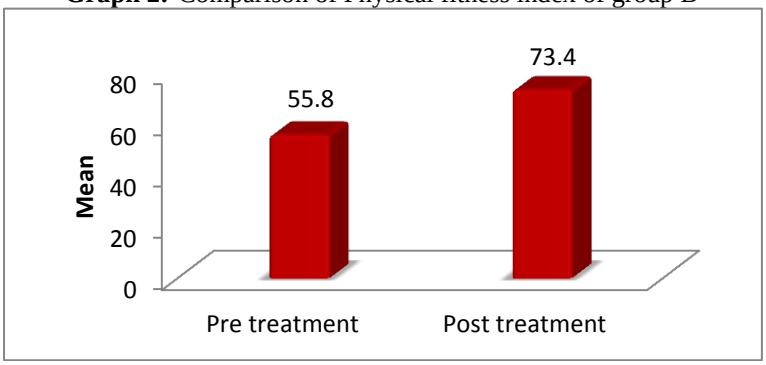
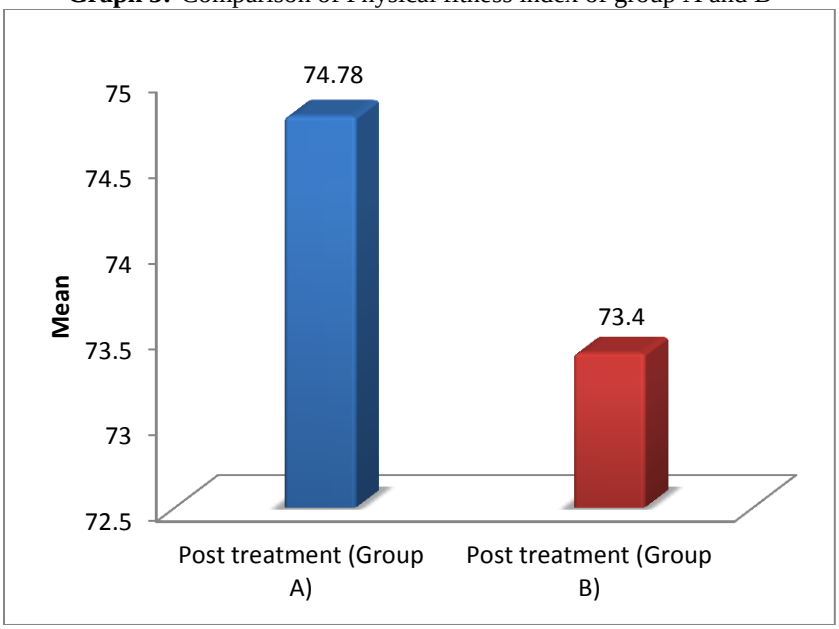


Table 4:-Comparison of Physical fitness index of group A and B

Variable	Post treatment	Post treatment	p value
PFI score (mean ± SD)	74.78±3.9	73.4 ±4.8	>0.05 (not significant)

Interpretations:
The above table 3 showed the comparison of post treatment for group A and B. The results showed that there was No significant difference in between pre (73.4 ±4.8) and post treatment (74.78±3.9) at p<0.05. The study found that PFI score of aerobic exercise group A was comparatively higher than the yoga therapy group B.

Graph 3:-Comparison of Physical fitness index of group A and B



Discussion:-

The main finding of the study was that exercise elicit greater improvements in PFI. Many studies have shown improvement in PFI after regular aerobic training. But we didn't get proper references for the studies which compared aerobic exercises and yoga therapy on PFI. But some studies have found improvement in VO2 max or aerobic fitness after regular aerobic training especially high intensity exercise.[14,15] Reasons why regular aerobic exercise training showed improvement in PFI are as follows;

1. Exercise makes demands on the body systems over and above normal daily activities and as result, the systems adapts anatomically and physiologically
2. With regular exercise training there is an increase in the size of energy stores as well as in the activity of enzymes which generate energy.
3. The ability of the muscle to extract oxygen improves and there is a shift towards aerobic metabolism.
4. The main physiological change due to training is in lowering cardiac frequency, indicating increase in stroke volume.[16]

The Harvard test is a sub maximal fitness test, as it predicts cardiovascular fitness (endurance) from the rise of heart rate during moderate exercise. This makes it a very popular fitness test. Endurance-trained subjects are known to have a significant resting bradycardia. However, only a few studies have examined the role of training intensity in lowering resting heart rate. Some studies showed that there is significant decrease in resting heart rate.[17-19] Whereas other studies showed no difference in RHR.[20,21] In our study the PFI increased in both aerobic exercise and yoga but more significant increase in aerobic group in between pre and post exercise than yoga group. The study revealed that both aerobic exercise and yoga showed improvement in physical fitness index but improvement in physical fitness index was comparatively higher in aerobic exercise than yoga using the modified HST. Our finding correlated with finding of Dr.K Ranjith Babu et al and Sharma et al. The reason suggested was that male is generally more aggressive and accepts challenge more than female.

Conclusion:-

Both aerobic exercise and yoga therapy significantly improves physical fitness by reducing resting Heart rate.

References:

1. A Comparative Study of the Effect of Yoga versus Aerobic Exercise on Blood Glucose Level and Quality of Life in Patients with Type 2 Diabetes Mellitus International Journal of Health Sciences & Research 2017; 7(1):149
2. Haskell W.L., et al.: Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med. Sci. Sports Exerc. 2007; 39: 1423.
3. Mathewos Hosiso, Sangeeta Rani, Shemelis Rekoninne "Effects of Aerobic Exercise on Improving Health Related Physical Fitness Components of Dilla University Sedentary Female Community " International Journal of Scientific and Research Publications, 2013; 3(12): 1-5.
4. Sarika Chaudhary, Manpreet Kaur Kang, Jaspal Singh Sandhu "The Effects of Aerobic Versus Resistance Training on Cardiovascular Fitness in Obese Sedentary Females". Asian J Sports Med. 2010 Dec; 1(4): 177–184.
5. WHO Expert Consultation Lancet.'Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies' 2004; 363: 157-163.
6. Sunil KR Das, Susmita Mahapatra, Goutam Bhattacharya, Debatri Mukherjee. Determination of Physical Fitness Index (PFI) with modified Harvard Step Test (HST) in young men and women. Indian J. Physiol. and Allied Science 1993; 47(2): 73-6.
7. Pansare MS, Pradhan SG, Kher JR, Aundhkar UG, Joshi AR. Study of effect of exercise on physical fitness tests and pulmonary function tests in tribal girls of Maharashtra. SNIPES 1980; 3(4): 39-43.
8. Dipayan C, Soma C, Vasanta AK. Physical fitness and non-residential schools. Indian J. Physiol. and Pharmacology 2002; 46(3): 328-32.
9. Gupta KK. The use of the physical efficiency tests in the evaluation of physical improvement after a military course involving severe physical strains. Indian J Physiol and Pharmacol 1967; 11(3): 89-93.
10. Mahon AD, Vaccaro P Ventilatory threshold and VO2max changes in children following endurance training Med Sci Sports Exerc. 1989; 21(4): 425-31.
11. Tabata I Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO2max Med Sci Sports Exerc. 1996 Oct; 28(10): 1327-30.
12. Bijalani KL. Understanding medical physiology. 3rd ed. Noida: Jaypee Brothers; 2004. p. 644.
13. M. Heydari, J. Freund, and S. H. Boutcher "The Effect of High-Intensity Intermittent Exercise on Body Composition of Overweight Young Males Journal of Obesity 2012 (2012); 1-8.
14. Braith RW, Pollock ML, Lowenthal DT, Graves JE, Limacher MC. Moderate- and highintensity exercise lowers blood pressure in normotensive subjects 60 to 79 years of age. Am J Cardiol. 1994; 73: 1124-8.
15. Leutholtz BC, Keyser RE, Heusner WW, Wendt VE, Rosen L. Exercise training and severe caloric restriction: effect on lean body mass in the obese. Arch Phys Med Rehabil. 1995; 76: 65-70.
16. Gossard D, Haskell WL, Taylor CB, et al. Effects of low- and high-intensity home-based exercise training on functional capacity in healthy middle-aged men. Am. J. Cardiol. 1986; 57: 446-9.
17. Tashiro E, Miura S, Koga M, et al. Crossover comparison between the depressor effects of low and high work-rate exercise in mild hypertension. Clin. Exp. Pharmacol Physiol. 1993; 20: 689-96.