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A comparative study between effects of aerobic exercises and conventional treatment on selected outcomes of heart failure clients

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ABSTRACT

Heart failure (HF) is now a major public health issue with a current prevalence of over 23 million worldwide. Physical exercise is now mandatory for HF management to improve a sense of wellbeing. The purpose of the study was to compare the effect of aerobic exercises with the conventional treatment methods with selected patient outcomes among heart failure patients. A quantitative experimental research approach with a post-test-only control group design was adopted. A total of 40 HF patients were taken as study sample, and they were randomly divided into two groups. One group was given conservative treatment, whereas the other was trained with aerobic exercise. Aerobic exercise training was given to the training group for 30 days, and physical, physiological, and psychological changes were assessed by standardized rating scales. A difference of post-test scores of the exercise training group and conservative treatment group were examined using t-tests and Chi-square tests. Out of 40 patients (45% above 60yrs of age, 62.5% male), two groups exhibited an extremely significant difference in terms of HF symptoms, pain, and anxiety ($p < 0.00001$). HF symptoms, chest pain, anxiety exhibited a significant association with age, edema showed significant association with occupation and oxygen uptake showed a significant association with age and occupation. This study concluded that aerobic exercises are highly effective to improve the activity tolerance of the body and can significantly reduce pain, edema, and anxiety levels in heart failure patients receiving conservative treatment.

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INTRODUCTION

Cardiovascular diseases is one of the major public health concern in India, contributing to roughly 40 million deaths annually and becoming the leading cause of death and disease burden globally. According to the World Health Organisation (WHO) report, in 2012 that out of 56 million deaths, cardiovascular diseases caused about 17.5 million deaths (Woods *et al.*, 2010). Among the cardiovascular diseases, heart failure (HF) is now a major public health concern with a current prevalence of over 23 million worldwide (Bui *et al.*, 2011). A hospital-based study in the UK reported that crude annual HF admission rates were higher for South Asian men and women with Indo-Asian patients being younger than a white patient. In India, the burden of HF is constantly on the rise due to the growing age of population. A model study estimated the HF prevalence in India to range from 1.3 – 4.6 million with an annual incident of 0.5 – 1.8 million (Pillai and Ganapathi, 2013).

HF is the inability of the heart to meet the demands of the tissues, resulting in fatigue or dyspnoea on exertion progressing to dyspnoea at rest. Heart failure management regimen has been restricted to bed rest, supplemented with digoxin and diuretics for a long time (Lee *et al.*, 2012). Over the past four decades, many scientific reports examined the relationships between physical activities with cardiovascular health (Myers, 2003). Patients with newly diagnosed heart disease who participate in an exercise program report an earlier return to work and improvements in other measures of quality of life. A study conducted to compare the effect of high-intensity interval training and moderate-intensity continuous among the HF patients concluded that exercise intensity resulted in significant improvement in the quality of life and aerobic capacity (Belardinelli *et al.*, 1999). Therefore, this study was conducted to analyze the effect of aerobic exercises versus conventional treatment with the selected outcome of the patient.

MATERIALS AND METHODS

Sample and setting

This was an experimental study with a post-test-only control group design in which 40 HF patients admitted in the cardiology ward of IMS & SUM Hospital, Bhubaneswar, Odisha, were randomized into two groups of the conservative treatment group and aerobic exercise training group from January 2017 to April 2017. Patients diagnosed with 1^{st} and 2^{nd} class HF, who were receiving conservative treatment, only were considered as eligible samples. Patients who were diagnosed with 3^{rd} and 4^{th} class HF with other major comorbidities such as cancer or other terminal illness were excluded from the study. For the purpose of the study, aerobic exercise was defined as stretching exercise, walking, and bicycling from low to high intensity. Patients those treated with other radical therapies were also excluded from the study. We also excluded the patients who exhibited an unwillingness to participate in the study during informed consent. The study was approved by the institutional review committee of SUM Nursing College and IMS & SUM Hospital. Both written and verbal information about the study (study objectives, benefits, problems, and time period) was explained through the consent form. Risk minimization and benefit maximization was ensured to all the study participants.

Procedures

The training group of 20 patients was trained with thirty minutes of aerobic exercises for thirty days. If the patients were discharged from the hospital before thirty days of training, they were followed up through telephonic conversation and the home visit in the evening. At the end of thirty days of training, the patient outcomes were assessed by a self-structured rating scale and standardized scales.

Data Collection

Collected patient data included demographics (i.e. age, gender, educational qualification, occupation, monthly income, family type and past history of diseases), severity of HF symptoms (i.e. breathlessness on exertion and rest, cough, chest pain, fatigue), severity of chest pain, level of anxiety, extent of edema and amount of oxygen uptake. A self-structured four-point rating scale was used to assess the severity of HF, severity of chest pain was assessed by numeric pain rating scale, edema grading scale was used to assess the extent of edema of dependent extremities, Hamilton's anxiety rating scale assessed the level of anxiety in which only seven fields were used (anxious moods, tension, fears, insomnia, intellectual, depressed mood, behaviour at interview).

Statistical Analysis

A descriptive statistical analysis was done taking demographic variables in terms of frequency and percentage. Unpaired 'T' test (inferential statistical analyses) was done to evaluate the difference of post-test scores of the exercise training group and conservative treatment group. A chi-square test was done to determine the association between the symptoms, chest pain, edema, anxiety, and oxygen uptake with selected demographic variables.

RESULTS AND DISCUSSION

Analysis of our data revealed that 45% of the study sample were more than 60years of age group, 62.5% study samples were male, 52.5% of the study sample were graduates and postgraduates, 47.5% study samples were service holders, 47.5% of the study sample were in the monthly income group of Rs. 15001-Rs. 25000, 75% of the study samples were from a nuclear family, and 72.5% of study samples had the previous history of other heart diseases (Table 1). As recorded, the two groups exhibited an extremely significant difference in terms of HF symptoms, pain, and anxiety ($p < 0.00001$).

There was a significant difference between the two groups in terms of edema of dependent extremities and oxygen uptake ($p < 0.01$ and $p < 0.02$, respectively, Table 2). Further, the results indicated that HF symptoms, chest pain, anxiety exhibited a significant association with age, edema of dependent extremities showed significant association with an

Table 1: Sample distribution according to demographics

Items	Characteristics	Percentage %
Age (in years)	30-39	12.5
	40-49	17.5
	50-59	25
	> 60	45
Gender	Male	62.5
	Female	37.5
Education	Illiterate	0
	Primary/Middle	5
	High School/Higher Secondary	42.5
	UG/PG	52.5
Occupation	Not working	35
	Service	47.5
	Self-employed	17.5
Monthly income	<Rs. 5000	0
	Rs. 5001 - Rs. 15000	17.5
	Rs. 15001 - Rs. 25000	47.5
	>Rs. 25000	35
Family type	Joint Family	25
	Nuclear Family	75
Previous history of illness	T2 DM	17.5
	Renal Disease	10
	Other Heart Disease	72.5

Table 2: A difference of post-test scores of both the groups

Area of observation	Experimental group (N=20)		Control group (N=20)		DF	Unpaired 't' Test	p-value	Inference
	Mean score	Variance	Mean score	Variance				
Symptoms	9.75	2.29	15.5	15.65	19	6.07	<0.00001	Extremely Significant
Pain	1.2	0.16	4.8	7.36	19	5.87	<0.00001	Extremely Significant
Edema	1.4	2.1	0.54	0.99	19	2.53	0.010186	Fairly Significant
Anxiety	7.05	13.5	15.8	12.56	19	7.65	<0.00001	Extremely Significant
Oxygen uptake	17.42	14.93	14.07	38.21	19	-2.05	0.027051	Fairly Significant

Table 3: Association of patient outcomes (symptoms and chest pain) with demographic variables

Socio-demographic variables	Symptoms				Chest pain			
	Chi sqaure value	Df	Critical p-value	Inference	Chi sqaure value	Df	Critical p-value	Inference
Age	11.11	3	0.011141	Fairly significant	30.75	3	< 0.00001	Extremely significant
Gender	3.33	1	0.067891	Ns	0.83	1	0.36132	Ns
Occupation	2.01	2	0.364401	Ns	0.47	2	0.788163	Ns
Previous history of illness	3	2	0.22313	Ns	2.5	2	0.286505	Ns

Table 4: Association of patient outcomes (edema with dependent extremities and anxiety) with demographic variables

Socio-demographic variables	Edema of dependent extremities				Anxiety			
	Chi sqaure value	Df	Critical p-value	Inference	Chi sqaure value	Df	Critical p-value	Inference
Age	4.37	3	0.22408	Ns	17.37	3	0.000591	Extremely significant
Gender	1.31	1	0.250843	Ns	2.81	1	0.093533	Ns
Occupation	24.49	2	< 0.00001	Extremely significant	1.32	2	0.514454	Ns
Previous history of illness	0.84	2	0.654522	Ns	0.35	2	0.836482	Ns

NS, Not significant

Table 5: Association of patient outcomes (oxygen uptake) with demographic variables

Socio-demographic variables	Oxygen uptake			
	Chi-Square Value	df	Critical P-Value	Inference
Age	11.26	3	0.010357	Fairly significant
Gender	0.15873	1	0.690356	NS
Occupation	10.87	2	0.004361	Fairly significant
Previous History of Illness	2.31	2	0.314601	N

NS, Not significant

occupation, and oxygen uptake showed significant association with age and occupation (Table 3 and Tables 4 and 5).

The findings of the study interpret that aerobic exercises are more effective on reducing the patient outcomes of heart failure, such as symptoms, chest pain, edema, anxiety, and oxygen uptake. The present study revealed that there is a statistically significant relation on patient outcomes regarding aerobic exercise training.

A study with 110 patients with stable congestive HF were recruited and randomized into two groups. One group underwent exercise training 3 times a week for 8 weeks and then 2 times a week for 1 year, whereas the other group did not undergo any exercise training. The results of the study revealed the exercise training shows sustainable improvement in functional capacity and quality of life in HF patients. The study also revealed that exercise intensity significantly improved aerobic capacity (Belardinelli *et al.*, 1999). Another study with twenty-two patients with chronic HF randomized into a training group, and a non-training group revealed that the exercise training group achieved an increase in oxygen uptake and also increased in peak leg oxygen consumption (Hambrecht *et al.*, 1995). In the current study, aerobic exercise training apparently reduced the severity of the HF symptoms increasing the oxygen uptake in comparison to the conservative treatment group.

Another study with 26 HF patients, randomized into rehabilitative group participating in exercise training for 6 months and control group, suggested that patients in the training group demonstrated significant improvement in life quality. The study, however, did not reveal any psychological parameter gain, but more depressed patients demonstrated the largest physiological responses (Koukouvou *et al.*, 2004). Our study also revealed that the two groups exhibited a significant difference in terms of anxiety and also demonstrated its significant association with age.

CONCLUSIONS

Based on the findings, this study implies that aerobic exercises prove to be useful not only for maintaining a healthy heart but also it can improve the complete physiological and psychological symptoms as a result of HF. Hence it is advisable to include aerobic exercises in the cardiac rehabilitation programme.

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