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THE INFLUENCE OF AEROBIC EXERCISE ON FATIGUE, ACTIVITIES OF DAILY LIVING AND AEROBIC FITNESS IN POST GASTRECTOMY INDIVIDUALS UNDERGOING CHEMOTHERAPY

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ABSTRACT

Background: Gastric cancer is the second most common cancer among men and third most among women in world wide. For over 100 years, gastric cancer has remained one of the most important malignant diseases with significant, geographical, ethnic and socio-economic differences in distribution. The main aim of the study is to evaluate the effectiveness of supervised aerobic exercises on severity of fatigue, activities of daily living and aerobic fitness in post gastrectomy individuals undergoing chemotherapy.

Methods: Total sixty patient's age 30 to 68 years post gastrectomy individuals undergoing chemotherapy included for study. These patients were randomly allocated to intervention group (n = 30), which underwent a 4- weeks training programme of supervised aerobic exercises & control group (n = 30) that received standard care and unsupervised aerobic exercise protocol. Primary outcome was change in fatigue levels as determined by fatigue severity scale in before and after the intervention program. Secondary outcomes were activities of daily living and aerobic fitness as assessed by the dukes activity status index and six minute walk test by using cahalin formula. Paired sample t- test was used to analyse changes from before and after intervention programme.

Result: There is a statistically significant ($p < .000$) improvement in both variables from baseline to 4th week in experimental group and control group but compared to control group, experimental group shows highly significant values in all parameters.

Conclusion: Aerobic exercise proved to be effective in improving aerobic fitness, activities of daily living and decreasing the fatigue in post gastrectomy individuals undergoing chemotherapy.

Keywords: Gastric cancer, H. Pylori (helicobacter pylori), activities of daily living (ADL'S), six minute walk test (6MWT), fatigue severity scale (FSS), Japanese gastric cancer association (JGCA), lymph node ratio (LNR).

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INTRODUCTION

Gastric cancer is the second most common cancer among men and third most among females in world wide.[1] For over 100 years, gastric cancer has remained one of the most important malignant diseases with significant, geographical, ethnic and socio-economic differences in distribution.[2] In India, 25,200 men and 27,500 women are dying with gastric cancer every year.[3] The prevalence of stomach cancers in Andhra Pradesh is 12.6%. The prevalence of stomach cancer in India is due to consumption of unsafe water from open streams.[4] Most cancer patients experience a loss of energy and an impairment of physical performance in the course of the disease. It has been estimated that this problem affects up to 70% of cancer patients during chemo and radiotherapy or after surgery.[5] In the light of the above, fatigue is the major physical dysfunction hindering the progress of the disease. It is known that fatigue is the commonest side effect of chemo therapy and radiotherapy. It has been shown that 65-100% of patients undergoing radiotherapy[6,7,8] and up to 82-96% of those receiving chemotherapy present with fatigueness during their treatment.[9, 10] The negative impact on cardio-respiratory function had effect on activities of daily living (ADL) have not specifically been studied in the past.

Majority of the studies were done in breast cancer, limited studies were done on gastric cancer related fatigueless, as the fatigueless is due to altered metabolism. Apart from adapting decreased physical activity influence of low level of physical and resistance exercise were studied to improve the functional level in different cancer patients but the aerobic capacity which reflects the fatigueless, activities of daily living, and aerobic fitness were not studied.

Hence the main purpose of the study is to focuses on the possible benefits of aerobic exercise on fatigue, activities of daily living and aerobic fitness in post gastrectomy individuals under chemotherapy.

The main objective of this prospective, randomized, controlled trial was to evaluate the effect of a supervised aerobic exercises on fatigue, activities of daily living, and aerobic fitness in post gastrectomy individuals undergoing chemotherapy. We hypothesized that the intervention would lead to significantly increased in both groups but compared to control group experimental group shows a highly significant values.

MATERIALS AND METHODOLOGY

Materials and Methodology

All participants who are diagnosed as gastric cancer & completed their surgery (gastrectomy) admitted in medical oncology wards & GERR wards undergoing chemotherapy in SVIMS hospital, Tirupathi Andhra Pradesh, were taken for the study. Inclusion criteria includes gastric cancer subjects with age 30-68 years, both genders who were confirmed as gastric cancer subjects and completed their surgery and receiving chemotherapy were included. Subjects with neurologically unstable patients, chronic lung diseases, uncontrolled hypertension, electrolyte imbalance, cardiac diseases, anemia, and asthma conditions were excluded from the study.

Recruitment and randomization

During their treatment period, eligible patients were informed about the trial by the ward personnel. The exercise instructor gave more detailed oral information about the study to patients who showed positive interest. Those still interested signed an informed consent document of study participation. The study design adopted for the study was prospective randomised clinical trial, the course of selection of study samples, their hospital investigation, data recording etc. were conducted during a period of 3 months from December 2014 to January 2015.

In a total of sixty samples, the control group was represented by 30 samples while the study group consists of 30 samples who met the inclusive criteria were taken up for the study. Samples were selected through simple random sampling technique. Lottery method was the procedure adopted to randomly select the samples. 1to 60 numbers are written on the small slips of paper. The paper slips are of the same size to ensure random selection of samples. These slips are thoroughly mixed and slips are picked up for the study group and control group equally.

Intervention

A total sixty samples were collected. The samples were divided into control group (n=30) and experimental group (n=30) by simple random sampling technique.

Materials

Materials used in the study are, fatigue severity scale and dukes activity status index questionnaires, countdown timer, source of oxygen, sphygmomanometer, inch tape.

Unsupervised aerobic exercise protocol for control group:-

All the 30 samples in the control group were clinically and objectively evaluated in detail. They

were advised a standard care and general follow up and continue the medication and chemotherapy cycles management. Samples were taught to do progressive walking as individual tolerance, for a period of 4-days per week for 4 – weeks. All these samples were examined for fatigueness, activities of daily living and aerobic fitness before starting the intervention programme and exercise protocol is advised as mentioned in the table no: 5 to continue for 4- weeks and re-assessed after 4– weeks of intervention with the above mentioned parameter.

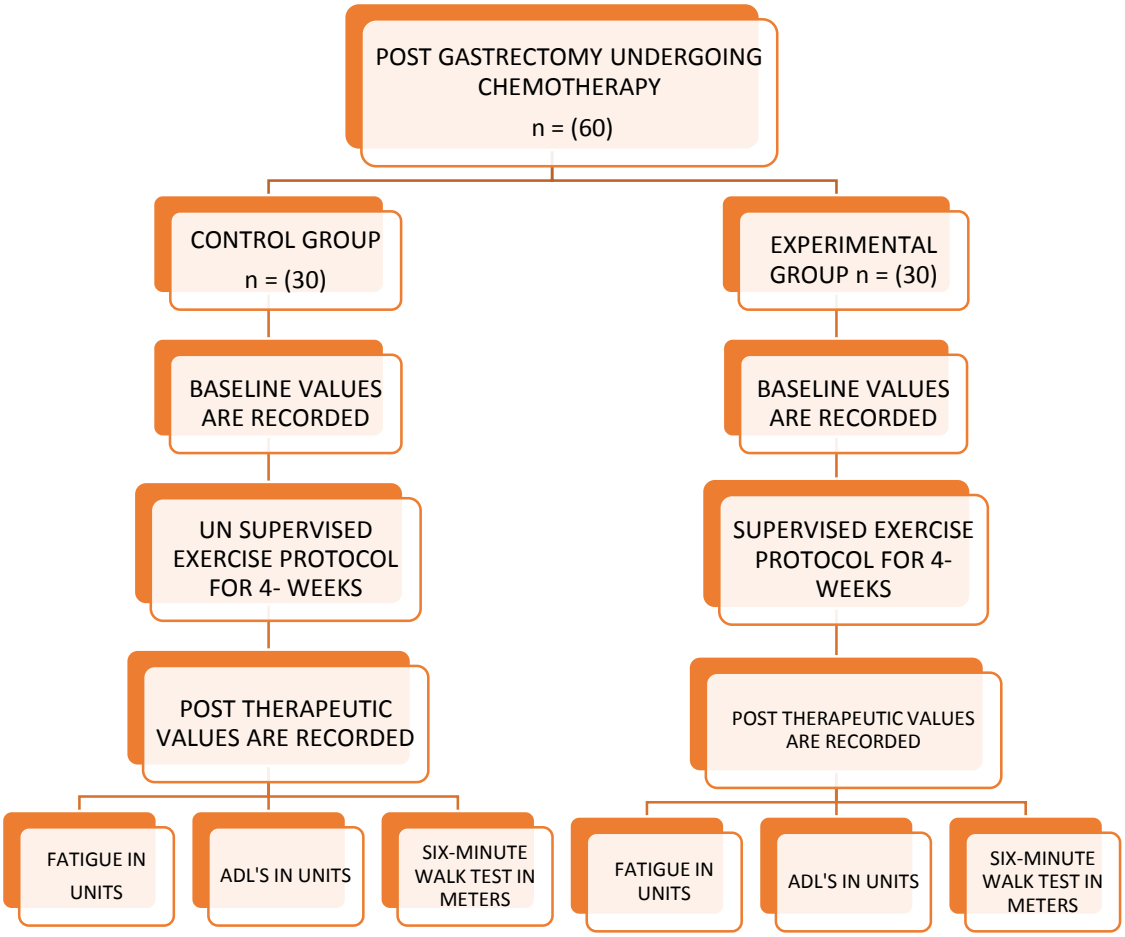
Supervised aerobic exercise protocol for experimental group:-

Similarly 30 samples were considered for experimental group, clinically and objectively were evaluated in detail. After initial base evaluation samples were prescribed individualized structured supervised exercise protocol and were modified weekly as per the individual tolerance. Exercises protocols implemented as described in the table no: 5. The exercise was progressed every week till the end of four weeks. Their fatigueness, activities of daily living and aerobic fitness were assessed before and after 4 weeks as in the case of control group. The supervised aerobic exercise protocols were framed with aerobic exercise as a mode of exercise, with 50 to 60 % of intensity, 15to 35 minutes of duration and with frequency of 4-days in a week with gradual progression according to the individual capacity in a period of 4- weeks.

Table.1: supervised exercise protocol for experimental group:

	Warm up Walk slowly	Target zone walk briskly	Cool down walk slowly
Week 1	5min	10min	5min
Week 2	5min	15min	5min
Week 3	5min	20min	5min
Week 4	5 min	25 min	5 min

Chart 1: Study Algorithm



OUTCOME MEASSURES

The primary outcome parameter in this study was fatigueness was measured by the fatigue severity scale (FSS). The FSS which consists of 9- questions, uses a 7-point likert scale ranging from strongly disagrees to strongly agree. The score from each question are totaled with lower scores indicating less fatigue in everyday life and higher score indicates the higher the intensity of fatigue. Ask the subject to circle a number from 1 to 7, depending on how appropriate they felt the statement applied to them over the preceding

week. The total score for the FSS is calculated as the average of the individual item responses. The total score of less than 36 suggests that the subject may not be suffering from fatigue. A total score of 36 or more suggests that higher the intensity of fatigue.

The secondary outcome parameter is the Duke Activity Status Index (DASI) and six minute walk test. The DASI is a self-administered questionnaire designed to measure functional capacity, based on the patient's ability to perform a set of common activities of daily living). It is a 12-item questionnaire that assesses daily activities such as personal care, ambulation, household tasks, sexual function and recreation with respective metabolic costs. Each item has a specific weight based on the metabolic cost (MET). The participants were asked to identify each activity they are able to do. The final score ranges between zero and 58.2 points. The higher the score, the better the functional capacity.

The third outcome parameter is 6 minute walk test. Using the cahalin formula the six minute walk test can be calculated by [VO2 MAX = 0.006 × 6 MWT (FEET) + 3.38. Patients with a 6MWT of less than 360 have low level exercise capacity and those with 6MWT greater than 546 have moderate to high level of exercise capacity. Six minute walk test is a universally accepted field test. It is safe, simple and well tolerated by most patients, even by frail elderly. It is reliable and feasible for many patient populations including the renal patients. The six minute walk test is a simple, safe, and inexpensive test that uses an exercise mode relevant to everyday activities. The 6MWT is a good measure of functional exercise ability because it is self paced and sub-maximal in nature. The 6MWT is also well accepted by patients easily administered and easily reproduced.

STATISTICAL ANALYSIS

Statistical analysis has been carried out to analyze the significant impact of the treatment issued to the subjects of both control and experimental groups by using IBM SPSS Inc.20.0 version for this purpose the data was entered into Microsoft excels spread sheet, tabulated and subjected to statistical analysis. Statistical tools unpaired t-test has been applied for parameters in between groups and paired sample t- test for parameters within group. Descriptive measures like mean, standard deviation have been reported along with p-value.

RESULTS

A total of 60 subjects were invited on to this study, they were randomly allocated to the intervention group (n = 30), and control group (n = 30)

Table2: pre and post values of fatigueness, aerobic fitness and ADL of experimental and control group.

Parameters	Group		N	Mean ± Std. Error	S.D	t- value	Df	p- value
Fatigueness	Control	Pre	30	48.73 ± .452	2.476	6.074	29	.000
		Post	30	45.70 ± .704	3.860			
Fatigueness	Experimental	Pre	30	46.53 ± .541	2.968	34.312	29	.000
		post	30	27.30 ± .230	1.263			
Aerobic fitness	Control	Pre	30	577.00 ± 8.388	45.94	-1.908	29	.066
		post	30	583.86 ± 7.069	38.718			
Aerobic fitness	Experimental	Pre	30	572.26 ± 11.653	63.828	11.708	29	.000
		post	30	677.70 ± 8.638	47.314			
ADL	Control	Pre	30	11.43 ± .309	1.695	-2.670	29	.012
		Post	30	12.06 ± .299	1.638			
ADL	Experimental	Pre	30	12.60 ± .554	3.035	11.837	29	.000
		post	30	25.23 ± 1.094	5.992			

Pre and post mean and std. error values of fatigueness, aerobic fitness and activities of daily living which shows significant increase in post therapeutic values compared to pre values in both groups.

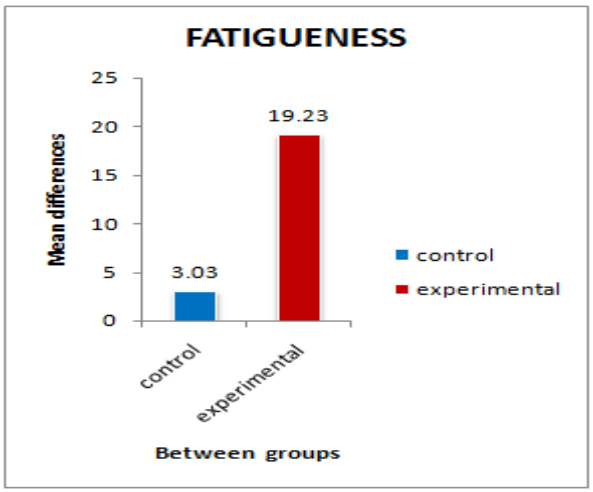
Table 3: Comparison of mean values between the groups

Parameters	Groups	N	Mean ± Std. Error	t- value	P value
Fatigueness	Experimental	30	-19.23 ± .499	21.579	.000
	Control	30	-3.03 ± .560		
Aerobic fitness	Experimental	30	105.43 ± 3.598	-10.164	.000
	Control	30	6.86 ± 9.005		
ADL	Experimental	30	12.63 ± .237	-10.976	.000
	Control	30	.633 ± 1.067		

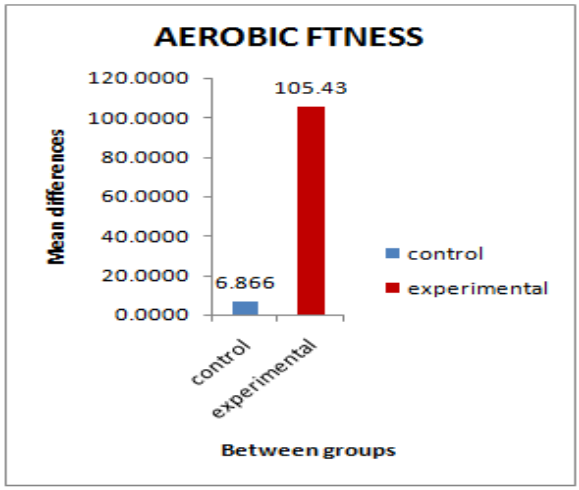
To compare the results between the groups of control and experimental group, paired t-test was selected. The mean and std. error values of fatigueness, activities of daily living and aerobic

fitness are given. There is found to be significant improvement in experimental group than control group.

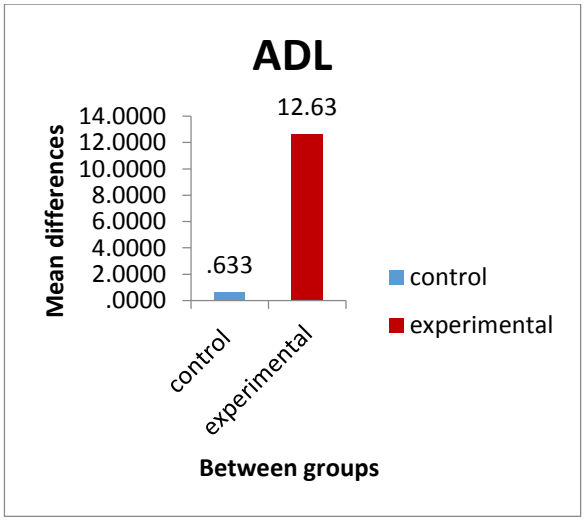
Graph 1: Graphical representation of mean difference of fatigueness in experimental and control group:



Graph2: Graphical representation of mean difference of aerobic fitness in experimental and control group



Graph3: Graphical representation of mean difference of ADL in experimental and control group



DISCUSSION

The results of the present study shows that subjects in experimental group shows there is a significant reduction in fatigue, and improve in the performance of activities of daily living and aerobic fitness when compared to control group in post gastrectomy individuals undergoing chemotherapy. The first aim of the study was to assess the effects of an aerobic exercise on fatigue in post gastrectomy individuals undergoing chemotherapy. The result of the present study is statistically significant, clinically relevant, in reduction of fatigue in post gastrectomy individuals undergoing chemotherapy. Wang (2008) et al suggested that elevated levels of inflammatory cytokines such as interleukin-6 (IL-6), were related to fatigue among cancer patients.[11] Winninham (2001) that chemotherapy damages bone marrow and thus reduces erythrocyte production, thereby decreasing the ability of the blood to transport oxygen[12].

As observed by Schwartz et al exercise consistently reduced fatigue not only on the day of exercise but in addition to one day after the exercises. Exercise was also sJhown to greatly decrease four levels of fatigue including fatigue at its worst and fatigue at its least in the past 24 hours, fatigue on average over 24 hours and fatigue experienced right now[13]. The second aim of the study was to assess the effects of aerobic exercises on aerobic fitness, and activities of daily living.

Cancer treatment can impair physical performance through several mechanisms (anaemia, cardio-toxicity, lung fibrosis, myopathy, and sarcopaenia).

Improving aerobic fitness is important to many cancer survivors as the stress of treatment often causes a reduction in physical activity as well as decrease in muscle mass and an increase in body fat that may contribute to fatigue and a decrease in functional capacity.

Winningham (2001) et al, reported that chemotherapy agents are cardio-toxic and thereby reduce cardiac output furthermore, if the lungs are affected by the cancer itself, oxygen intake will be affected. These combined toxic effects of cancer and chemotherapy impair oxygen intake and subsequent energy production can cause a reduction in the capacity for physical performance.

Thus aerobic exercise can help to improve cardio-vascular and muscular function which further increases the functional capacity and decreases the fatigue levels.

CONCLUSION

The present study proves the alternate hypothesis reveals that aerobic exercises is effective in alleviating fatigue, improving the performance of activities of daily living and enhancing aerobic fitness in post gastrectomy individuals undergoing chemotherapy.

STUDY LIMITATIONS

The study limitations are Sample size was small, Study duration is less, Specific cycle of chemotherapy was not indicated, Time receiving chemotherapy of the clients was not similar, Which stage of gastric carcinoma is not considered in this study.

RECOMMENDATIONS

The future study is recommended with large sample size, more than twelve weeks duration for better results, recommended to do in other types of cancers mostly in breast cancers, cervix, rectum and ovary cancers. Fatigue assessment in specific type of cancers need to be done.

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