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A STUDY ON HIGH INTENSITY VERSUS LOW INTENSITY AEROBIC TRAININGIN IMPROVING HEALTH RELATED QUALITY OFLIFE IN POST STROKE SUBJECTS

Singam Siva Sankar[1]*, Pappala Kiran Prakash[2], Patchava Apparao[3] and Pasala Gopi Krishna[4]

[1]Assistant Professor, Sims College of Physiotherapy, Guntur.
[2]Associate Professor, Swatantra College of Physiotherapy and Rehabilitation, Rajahmundry.
[3]Professor and Principal, Swatantra College of Physiotherapy and Rehabilitation, Rajahmundry.
[4]Assistant Professor, Gems College of Physiotherapy, Srikakulam.

***Corresponding Author: Singam Siva Sankar**

Assistant Professor, Sims College of Physiotherapy, Guntur.

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ABSTRACT

Background and Objectives: Stroke is a clinical syndrome with a presumed vascular origin, characterized by rapidly developing clinical signs of focal or global symptoms due to changes in cerebral functions lasting more than 24 hours or leading to death. Therefore, increasingexercise capacity in persons with stroke to improve their ability to perform functions of daily living, The purpose of the study is to find the effectiveness of high intensity and low intensity aerobic training in subjects with stroke on improving health related quality of life. **Methods:** 102 subjects who were clinically diagnosed of stroke were assessed and only 66 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group I (n=33) subjects were high intensity aerobic training for 12 weeks, where in Group II (n=33) subjects were treated with low intensity aerobic training for 12 weeks. The outcome of this intervention was health related quality of life using SF-36 questionnaire. **Results:** Statistical analysis of the data revealed that in between group comparison showed there is a Statastical significant difference in SF-36 questionnaire. **Conclusion:** Both techniques are equally effective in improving health related quality of life. But high intensity aerobic training is more effective in improving health related quality of life when compared with low intensity aerobic training.

KEYWORDS: Stroke, High intensity Aerobic training, Low intensity Aerobic training, Health related Quality of life, SF-36 questionnaire.

INTRODUCTION

Stroke is a clinical syndrome with a presumed vascular origin, characterized by rapidly developing clinical signs of focal or global symptoms due to changes in cerebral functions lasting more than 24 hours or leading to death and it is the most disabling conditions worldwide.[1]

According to India stroke factsheet updated in 2012, the estimated age adjust prevalence rate for stroke ranges between 84/100,000 and 262/100,000 in rural and between 334/100,000 and 424/ 100,000 in urban areas.[2] There are several risk factors in which leads to physical inactivity and sedentary life style by cardiovascular diseases.[3.4] Thus, it is very important to develop and implement interventions to prevent and damage.

Stroke subjects exhibit low endurance, low aerobic exercise capacity which can attributed to stroke as pathological manifestation and it also having secondary effects. Therefore, increasing exercise capacity in persons with stroke to improve their ability to perform functions of daily living, which might be limited by weakness and fatigue secondary to stroke is a desired strategy in stroke rehabilitation.

Low aerobic capacity can be attributed due to reduction in oxidative capacity of the attached muscles decrease in active motor units after stroke[6]as well as oxidative capacity and endurance in paretic muscles. These significant cardiovascular and neuromuscular changes combined with the energy costs of walking.[7,8]

Low physical activity levels are the main consequences of the concomitant presence of cardio respiratory fitness, depression, mobility limitations, as well as low perception of quality of life and restricted participation. There is evidence that the physical inactivity and time spent in low energy expenditure activities are the risk factors for developing cardiovascular diseases.[9,10]

Moreover stroke causes functional impairment leading to dependency in activities of daily living, mood disorders, social isolation, which consequently reduces the health related quality of life, which is the major clinical outcome with stroke.

There have been studies regarding that health related quality of life in persons who are affected with stroke was lower than unaffected ones. It is getting more important to monitor and improvehealth related quality of life in stroke survivors because of improved survival following successful acute management. Therefore, stroke rehabilitation has to be planned to improve health related quality of life and identification of factors related health related quality of life is necessary to make an effective strategy.

Health related quality of life (HRQOL) is a broad ranging concept that affected in a complex way. It includes physical health, psychological state, person beliefs, social relationships to salient features of their environment (World Health Organization Quality Of Life Group, 2013). Health related quality of life is a subjective measure depending on an individual perception to the impact of disease and treatment on their health status.

Assessment of health related quality of life can be done by using short form or SF-36 questionnaire form. It can be applied in any context of age or disease and is therefore a useful toolfor surveying the general population.

Several mechanisms have been brought forward to explain the positive impacts of aerobic exercise. These include increased blood flow, changes in neurotransmitter release, structural changes in the central nervous system, and altered arousal levels.[11]

In the last decade specific task related training at different intensity for stroke survivors were developed and but mode is still unclear. The intensity of the training could be as important component in exercise prescription for stroke survivors. Intensity refers to the work rate, effort level or metabolic level demand of aerobic exercise and can be qualified in heart rate (HR), rate of consumption, rating of perceived exertion and walking speed with inclination.[12]

Nevertheless, in a recent review authors suggested that stroke rehabilitation professionals have to be encouraged to increase physical activity intensity for a person with stroke.[13]

Exercise prescription using low intensity (<40% HR reserve) lies not been extensively studied after stroke. However, the literature suggested that low intensity exercise may improve motor performance, gait function, balance and to reduce cardiovascular risk factors.[14]

MATERIALS AND METHODS

The study was proposed to determine the effectiveness of high intensity versus low intensity aerobic training in improving health related quality of life in post stroke subjects.

Study Design: prospective cohort study.

Ethical clearance

The study protocol was approved by the ethical committee of GSL Medical College (annexure- I); the principal investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participation in the study (Annexure-II). All participants signed the informed consent and rights of the included participants have been secured.

Subjects

A total number of 66 patients, both men and women aged between 18-75 years suffering withstroke and clinically diagnosed as having stroke by an neurophysician, referred to physiotherapy department and willing to participate in the study at G.S.L General hospital, Rajanagaram.

Method of Data Collection

Study Sample: A total of 102 stroke patients were taken, out of that 66 subjects were recruited who are willing to participate in the study, obtaining the consent form from the patients who met the inclusion criteria. These 66 subjects were randomized into two groups.

Group – A: High intensity aerobic training Group – B: low intensity aerobic training.

Sampling Method: Simple random sampling.

Duration of Study: 1 year (from july 2018 to june 2019)
Treatment Duration: 12 weeks, three days per week.

INCLUSION CRITERIA

- Age between 18 and 75 years.
- Diagnosed with ischemic brain injury or intra cerebral haemorrhage by magnetic resonance imaging or computed tomography at least 6 months before the onset of the study.
- Ability to walk on the treadmill at ≥0.3 km/h for 3 minutes with handrail support.
- Be able to give informed consent and be motivated to participate in 3 months intensivephysical fitness training.

EXCLUSION CRITERIA

- Mini-Mental State Examination (MMSE) < 20 (66)
- Unstable angina pectoris
- Unstable cardiac conditions (resting systolic blood pressure > 200 mm Hg and resting diastolic blood pressure > 100 mm Hg)
- Complex ventricular arrhythmi
- Aphasia

OUTCOME MEASURES

SF-36 questionnaire (short form health survey-36); the

36 item short form health survey questionnaire is a very popular instrument for evaluating health related quality of life. The SF-36 measures eight scales: physical functioning (PF), role physical (RP), bodily pain(BP), general health(GH), vitality(VT), social functioning(SF), role emotional(RE), and mental health(MH). It can be apply in any context of age or disease and is therefore a useful tool for surveying the general population. Each dimension is score on a scale from 0-100, with higher scores indicatingbetter health.[22,23,24]

GROUP – A

High intensity aerobic training were performed on treadmill. A single session involve 40 minutes of treadmill walking: 5-minute warm up, 30 minute high intensity speed based intervals interleaved with active recovery, and a5 minute cool down. The treadmill was fixedat0%incline and no manual assistance was given, although one research assistant was positioned behind the participant in case of fall. Participants were allowed to hold on to the handrails for support, however minimal use of handrails was encouraged. HR (heart rate) and RPE(rated perceived exertion) were monitored throughout the training session for any signs of cardiovascular intolerance. Blood pressure was measured before and after the session, and as needed if the participants showed signs of pallor, excessive sweating or dizziness. Age predicted maximum HR determined using the formula (220-age) and HR achieved during warm up were used as reference values while increasing the belt speed.

During a period of 2 minutes, the belt speed was slowly increased within the participants tolerance, to the highest speed at which the participant could was safely and without stumbling and at the end of 2 minute interval, this maximum achieved belt speed was held for 10 seconds. It was followed by recover period when the participant walked at the warm up speed until a time at which the participants HR and RPE returned to the levels reached during the warm up phase.

The next interval begin if the HR recovered to the level achieved during the warm up, At the HRwas not restored, additional active recovery time or rest was given until the HR reduced to the warm up level. If the participant maintain the speed and felt safe during the 10 seconds at the end of the first training interval, the speed was then increased by 10% during the next interval. The end of 30 minute of structured waking, a 5 minute cool down phase was provided.

GROUP-B

Low intensity aerobic training were performed on treadmill. Every aerobic training session consisted of five minute warm-up, thirty minute targeted intensity training and five minute cooldown period. one additional therapist helped to correct patient performing wrong compensatory actions, keep them in good posture, verbally encouraged the use of the affected leg and to monitor the training intensity ensure the treatment fidelity.

The resistance of the treadmill was adjusted to achieve the targeted heart rate level, a cardiac monitor or heart rate belt be used and the resistance was progressively increased to ensure that the heart rate in target zone.

In aerobic sessions with targeted intensity training times of 30minutes reached was defined as finished one and short breaks of less than 2 minutes were allowed twice per session in first week, subject's blood pressure and heart rate, 15 and 30 minutes during training and 5 minutes post training were recorded. All patients were also evaluated before and after the intervention using the tests the adopted exercise test which was conducted to record peak heart and exercise test.

STATISTICAL ANALYSIS

Statistical analysis was performed using MS Excel 2007 and SPSS software version 20.0. Descriptive statistical data has presented in the form of mean ± Standard deviation and mean difference percentage were calculated and presented.

Between the groups: Independent student "t" test was performed to assess the statisticalsignificant difference in mean value between the groups for SF-36 score.

Within the groups: Paired Student "t" test was performed to assess the statistical difference with in the groups for high intensity and low intensity aerobic training and SF-36 score from pre-test and post-test values.

For all statistical analysis, $P<0.05$ was considerable as statistically significant.

RESULTS

Table 1: Analysis of mean scores of Pre and Post health related quality of life mean within the Group A.

	MEAN	SD	*P*-VALUE	INFERENCE
PRE	47.7	3.60	0.0001	Highly significant
POST	73.75	3.22		

The above Table shows mean values changes within the groups from pretest and posttest in Groupwere found to be statistically significant ($p< 0.05$).

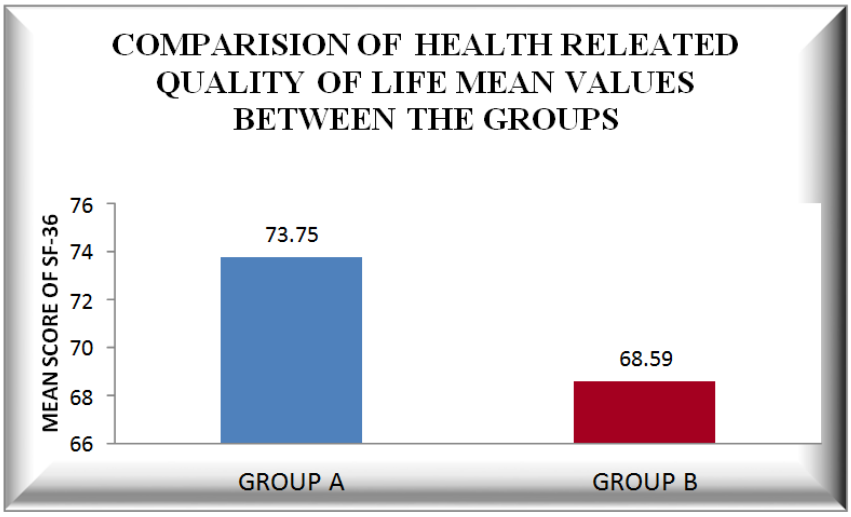

Table -2: Analysis of mean scores of Pre and Post Health related quality of life meanwithin the Group B.

	MEAN	SD	*P*- VALUE	INFERENCE
PRE	48.19	4.39	0.0001	Highly significant
POST	68.5	1.88		

The above Table shows mean values changes within the groups from pretest and posttest in Groupwere found to be statistically significant ($p< 0.05$).

Table -3 Analysis of mean scores of Post and Post Health related Quality of life meanbetween the groups.

	MEAN	SD	P VALUE	INFERENCE
GROUP-A	73.75	3.22	0.001	Highly significant
GROUP-B	68.59	1.88		

The above Table and Graph shows mean values changes between the groups from post-test between the Group were found to be statistically significant ($p< 0.05$).

DISCUSSION

This study was aimed to evaluate the high intensity versus low intensity aerobic training in improving health related quality of life in post stroke subjects.

Quality of life is significantly improved in both groups, but high intensity aerobic training shows statistically more improvement than low intensity aerobic training.

This treadmill training has a greater effect on the torque generating capacity of paretic versus non affected quadriceps and hamstrings, it also improves spastic reflexes in hamstrings of the paretic limb[15] and these exercise mediated motor adaptations could contribute to peak oxygen capacity and in particular biomechanical efficiency of gait.

A stepwise treadmill inclination resulted in reduced cadence. A longer stride length with prolonged stance and reduced swing phase of the affected leg with improved symmetry of swingduration.[16]

Skeletal muscle modifications that protect myocytes and muscle fibers from muscle injury, improve muscle performance, and delay muscle fatigue are produced by aerobic exercises. Aerobic exercise can induce profound molecular changes in neurologically intact muscle, promoting fast to slow twitch MHC (major histocompatibility complex) fibre conversion.

Some studies indicated that early endurance exercise improved blood flow, in the ischemic regionan promoted angiogenesis.[17] Such finding was reinforced by the fact that daily treadmill traininginduced in increase of GFAP (Glial fibrillary acidic protein)expression (proteins playing a role in vascular cerebral plasticity).[18]

Furthermore, it worthy to add that only three days of aerobic exercise reduced micro vascular endothelial cells apoptosis in brain related by shear stress increase following modest improvementof cerebral blood flow.[19]

In addition, the hind limb muscle atrophy was attenuated just after 6 sessions of daily low intensity endurance exercise in both type I and IIfibre cross sectional area (both in affected and non affected limbs).[20] Moreover, it was shown that aerobic treadmill training(20 minutes,21 days) improved cholinergic system regulation, homeostasis and it was suggested such adaptation allowing wetter limb motor function.[21]

According to page et al, the absence of functional impairment observed in stroke patients may beavoided by changing the rehabilitation exercise characteristics.

Carda et al, found out that gait training with treadmill device with either positive or negative slope, may be useful in improving gait speed and endurance in stroke survivors. Sacco et al, Increasing exercise capacity following a stroke can help prevent deterioration system. Accordingto guidelines of the American college of sports medicine, first adaptations of the cardiovascular system are expected after two to six weeks of training. A recovery plateau was mainly observed after 6 to 12 months. Post stroke traditional functional rehabilitation meaning that no additional improvements were expected after time period.

It seems reasonable to suppose varying the way of performing aerobic exercises may be beneficial stroke patients. Several authors reported that greater improvements were observed with higher exercise intensity after stroke. Given that high intensity exercises could be supported by most stroke patients, we will now support that high intensity training should be considered as plausible effective alternative to low intensity endurance training in order to avoid plateau and optimize cardio respiratory fitness and motor function after stroke.

CONCLUSION

Individuals in this study participated in 12weeks intervention period in two types of aerobic training program (high intensity and low intensity aerobic training). After the intervention, the high intensity aerobic exercise program shows improvements in health related quality of life in post stroke when compared to low intensity aerobic exercise program.

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