

Original Article

EFFECT OF PROGRESSIVE RESISTANCE TRAINING ON FUNCTIONAL CAPACITY, QUALITY OF LIFE AND CD4 COUNT IN PEOPLE WITH HIV/AIDS

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ABSTRACT

Background: Exercise training in the management of HIV/AIDS patient is not under research in India and if proper exercise training is been proved then quality of life for the HIV patients will improve significantly and will set a new dimension in exercise training. The present study aims to find the effect of Progressive Resistance Training on Functional Capacity, Quality of Life and CD4 Count in People with HIV/AIDS.

Study Design: Experimental design.

Methods: 24 participants were randomly allocated to Progressive Resistance Group and control group with 12 subjects in each group. Progressive Resistance 3 days/week for 3 months according to DeLorme's Protocol with intensity of exercise (10 RM) calculated every week. Control group was advised not to do any exercises. Functional capacity was assessed by Six Minute Walk Test, Quality of Life was assessed by MOS-HIV Health Survey and Immune System was assessed by CD4 count. All three outcome measures were tested by blinded evaluator and measured at baseline and after intervention.

Results: 24 subjects were recruited for the study and randomly divided in to 2 groups with Mean±SD age of 41.71±5.68 years. Both groups were homogenous at base line in all three outcome measures. Progressive Resistance group showed significant improvement in all three outcome measures with $p < 0.05$ whereas control group showed no change in CD4 count and quality of life and detrimental change in 6 minute walk test.

Conclusion: Progressive Resistance Training can be better adjunct to pharmacological therapy for people with HIV/AIDS for improving cardiovascular fitness, quality of life and immune system.

KEYWORDS: HIV/AIDS, Progressive Resistance, Functional Capacity, Quality of Life, CD4 count.

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INTRODUCTION

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) were unknown prior to 1982, but since then have grown to become a global epidemic. Indian State wise HIV Statistics 2010 state that adult HIV prevalence is 0.31% in the country which includes men 0.36% and women 0.25%. In that, Tamil Nadu HIV/AIDS infected peoples statistics

showed as men 0.39% and women 0.27%.¹

AIDS is defined in terms of either a CD4+ T cell count below 200 cells per μL or the occurrence of specific diseases in association with an HIV infection². In the absence of specific treatment, around half of people infected with HIV develop AIDS within ten years. The most common initial conditions that alert to the presence of AIDS are pneumocystis pneumonia (40%), cachexia in the

form of HIV wasting syndrome (20%) and esophageal candidiasis. Other common signs include recurring respiratory tract infections.³

Most commonly recommended treatment regimen in India as per National AIDS Control Organisation(NACO)includes: Anti retro viral therapy – start Nevirapine 200mg/twice day for 14 days, If patient tolerates medication, on 15th day onwards regimen is followed (lamivudine and nevirapine), zidovudine is also available as combination therapy.⁴

Individuals infected with HIV experience numerous comorbidities caused by the disease progression and medications, lack of physical activity, malnutrition. Common symptoms include loss of muscle mass, fatigue, lypodystrophy, lypoatrophy and decrease in strength, functional capacity and overall quality of life.⁵

Persons living with HIV may simultaneously experience a range of impairments, activity limitations and participation restrictions affecting multiple systems including the musculoskeletal, neurological and cardio-respiratory systems, requiring Rehabilitation Intervention.⁶

Cardiovascular disease is emerging as the most important cause of death and comorbidity in individuals infected with HIV based on its prevalence in the aging HIV population.⁷

Exercise is one key management for people living with HIV infection to address impairment, activity limitation and participation restriction⁸. Participation in an exercise program modify the side effects of anti-retro viral therapy and quality of life may benefit⁹. Exercise is well accepted as an adjunct therapy in the management of chronic illness and therapeutic exercise among people with HIV has been shown to be both beneficial and safe.¹⁰

Recovering strength and physical fitness is the major goal of exercise in patients with AIDS wasting syndrome. Therefore, a resistance training program could form the basis of an exercise prescription for this group of patients. It should be progressive, so resistance increases as the patient becomes stronger.¹¹

However, the effects of progressive resistance exercise among HIV/AIDS are not well-establish-

ed. Knowing the effects of progressive resistance exercise for people living with HIV may facilitate the appropriate use of progressive resistance exercise interventions to enhance HIV care and treatment, with the overall goal of improving the functional capacity, quality of life and CD4 in people with HIV/AIDS.

METHODOLOGY

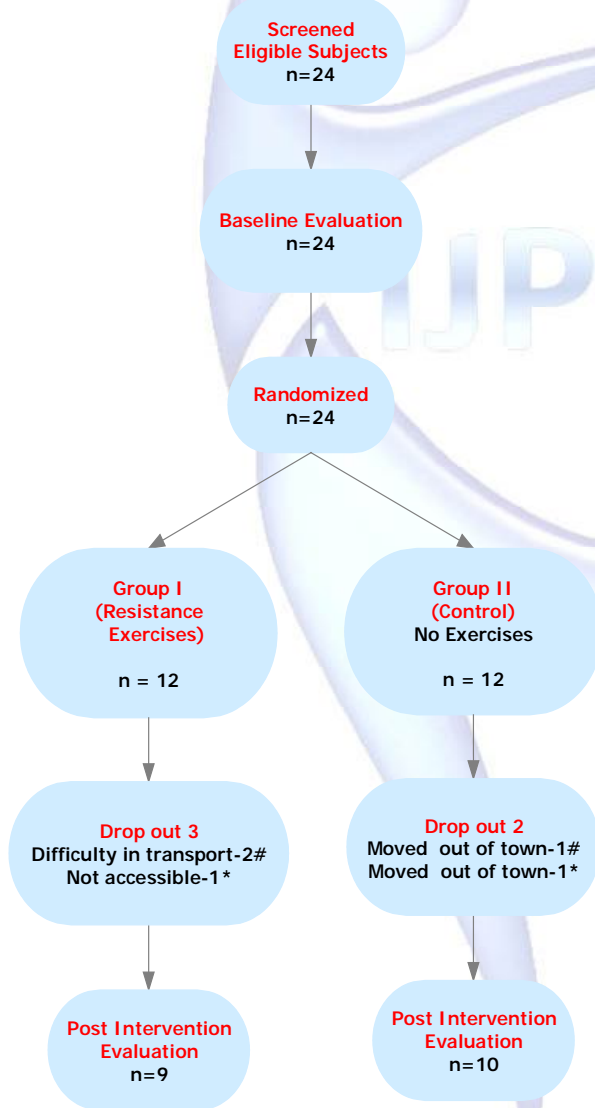
The study was experimental design, conducted at Physiotherapy out Patient Department of Saveetha Medical College and Hospital, Chennai. Study was cleared by institutional ethical committee. 24 subjects of both sexes with HIV infections were included for the study irrespective of their anti-retro viral therapy status. Subjects with active inflammatory disease such as active hepatitis, active gout, other active inflammatory diseases, active malignancy, history of a serious medical condition, including heart problems, tuberculosis, cancer, hypertension, uncontrolled diabetes, or osteoporosis, steroid therapy and already on a consistent and rigorous exercise regimen were excluded.

All subjects fulfilling selection criteria were provided informed consent for participating in the research. All 24 subjects after baseline assessment were randomly allotted into two groups by using sealed envelopes (fig-1). The experimental group was receiving Progressive Resistance Exercise and Control Group receiving no exercises. All measures detailed below were performed during study period by Progressive Resistance exercise group and control group was advised not to do any exercise. Typical duration of intervention was 3 days per week for 3 months of 1 hour per session.

Progressive Resistance exercise involved a warming up period for 10 minutes, followed by 30 minutes of Progressive Resistance and a cool down period at the end for 10 minutes. Breathing exercises, Stretching activities for major muscle groups and free exercises for major joints were included in the warming up and cool down session. Quadriceps, Hamstrings, Gluteus maximus, Plantar Flexors, Dorsi Flexors, Pectoralis Major Biceps, Triceps, Deltoid, Wrist Flexors and Wrist Extensors were worked according to DeLorme's Protocol with intensity of exercise (10

Repetition Maximum) calculated every week bilaterally for major muscle groups alternatively. Functional Capacity was assessed by Six Minute Walk Test (6MWD), QoL was assessed by MOS-HIV Health Survey by a post graduate physiotherapist who is blinded to group allotment. Immune System was tested by CD4 count by sending the blood sample to an ISO certified lab outside the study center. All three outcome measures were tested at baseline and end of three months of intervention.

Fig. 1: CONSORT Diagram of randomized clinical trial: number of participants screened, randomized, and retained and analyses.



RESULTS AND TABLES

There were 9 males and 3 females in experimental group and 7 males and 5 females in control group. The Mean ± SD age of experimental Group is 41.00±6.24 and Control Group is 42.42±5.23 years. The homogeneity of variances

of the data at baseline and significant differences of post intervention data were analysed by Independent t-test for continuous variables and Mann Whitney U test for ordinal variables. Significant changes within group was analysed with paired t test for continuous variables and Wilcoxon signed rank test for ordinal variables. An overall significance level was maintained at p-value less than 0.05. 12 subjects were recruited in each group, there were 3 dropouts in experimental group; two found difficulty in transport and one moved out of city. 2 dropouts in control group moved out of city. Intention to treat analysis for all outcome measures was carried out with individual's latest available data or baseline data as applicable.

The independent t test for between group analyses at baseline for CD4 count shows p value equal to 0.984 and for 6 MWD equal to 0.260. The Mann Whitney U test for QOL score shows p value equal to 0.840. All these variables were proved homogeneous at baseline.

Table 1: Within group analysis for experimental group.

Experimental Group		Mean ± SD	Min	Max	p
CD4 Count	Before	549.58±117.14	391	782	0.041
	After	594.91±128.49	476	781	
6 MWD	Before	652.58±47.80	585	717	0.027
	After	692.41±75.36	566	765	
QOL	Before	43.41±17.11	22	82	0.004
	After	55.25±9.98	43	79	

Table 1 shows the details of within group analysis of progressive resistance exercises group for CD4 count and 6 MWD analyzed by paired t-test and QOL scores analyzed by Wilcoxon signed rank test for all completed subjects. Intention to treat analysis shows p value equal to 0.041 for CD4 count, 0.027 for 6 MWD and 0.004 for QOL scores. The p value for all variables is less than 0.05 proves progressive resistance exercises are effective in increasing CD4 count, 6 MWD and QOL in subjects with HIV/AIDS.

Table 2: Within group analysis for control group.

Experimental Group		Mean ± SD	Min	Max	p
CD4 Count	Before	509.75±114.62	331	723	0.072
	After	480.00±139.07	311	798	
6 MWD	Before	669.83±102.44	476	803	0.006
	After	589.33±96.60	441	758	
QOL	Before	36.83±14.58	21	64	0.138
	After	32.33±13.15	18	57	

Table 2 shows the details of within group analysis of control group for CD4 count and 6 min walk test analyzed by paired t-test and QOL scores analyzed by Wilcoxon signed rank test for all completed subjects. Intention to treat analysis shows p value equal to 0.072 for CD4 count, 0.006 for 6 MWD and 0.138 for QOL scores. The p value for 6 MWD is less than 0.05, but the mean changes are detrimental, other two variables show p value more than 0.05 and proves that control group is not effective in increasing CD4 count, 6 MWD and QOL in subjects with HIV/AIDS.

DISCUSSION

An ever-growing number of published studies suggest and acknowledge that exercise is the best and effective therapeutic interventions for HIV/AIDS infected people to make their living qualitatively. Notwithstanding, to the best of our knowledge, this is the first study done for Indian peoples with HIV/AIDS.

Control group was advised not to do any exercises, but to carry on their Activities of daily living & his /her occupation. In exercise group, making the participants to understand the exercises was faced as difficult in initial week. Finding 10RM for the resistance group was little tough in earlier week of this study. Slowly the participants adhered to the study protocol and followed all instructions. All exercises were performed under supervision.

The results of progressive Resistance exercises group had shown that there was statistically significant difference in CD4 counts, improvement in the performance of 6MWT, and improvement in quality of life that was assessed by MOS-HIV scales. These results had been supported by many studies.^{6,12}

Improvement in self-efficacy cardiovascular fitness was proved in a study done for HIV peoples by Soula Fillipas et al¹³. Significant and positive strength increased for all muscular groups trained for elderly population with HIV infection. Resistance exercises have shown other benefits amongst elderly population namely: improve of cardiovascular conditioning, increase in bone mass, less possibility of fractures with aging and increase of lean mass preventing decrease of strength related aging. Strength

increment is the most important benefit of resistance exercise for elderly people quality of life, because it improves biomechanics and cardiovascular responses all the above mentioned effects was stated by Souza et al. The effects of exercises on immune functions studied for elderly populations with HIV Infection, Souza PML et al stated that progressive resistance exercises had significantly improved the CD4 and CD4/CD8+ ratio in elderly population.¹⁴

Review done on effects of exercise on Immune functions by Laperriere A¹⁵ found that, a trend towards an increase in the number of CD4 cells in all study. Optimizing health-related quality of life (HQRL) has become important treatment focus for patients HIV infection. Consideration of HQRL is especially relevant with the development of new antiretroviral agents that have significant side effects. A review of existing studies revealed that certain therapies for HIV and opportunistic infections exact a significant cost in terms of HQRL.

In this study, individually the effects of excises like progressive resistance are assessed and proved there was marked improvement in functional capacity, increase in CD4 counts, and positive changes in quality of life.

The study would be better if HIV infected participants are differentiated either receiving HAART or not. The limitations in this study may be inclusion of other bio chemical analysis as outcome measures like lymphocyte count, platelet count, WBC count CD3, and CD8 count. Long time follow up of the subjects like 2 to 5 years after intervention were not analyzed in this study due to lack of time. A sample size of 8 in each study group is required as per Estimation of mean difference between populations with specified precision. It was decided to recruit 12 in each group considering number of subjects reporting to study center and possible dropouts, so sample size included in the study was 24.

Anandh et al concluded in three different pilot studies on the effect of progressive resistance exercise in the subjects with HIV/AIDS for improving cardiovascular fitness assessed by 3 minute step test and quality of life by MOS-HIV Scale.¹⁶

In summary, our results indicate that a three

months supervised progressive resistance exercise improves the performance of 6 MWT, increase in CD4 counts, improvement in Quality of life. When implementing therapeutic exercise programs for HIV infected patients, it is recommended that programs be individualized on the basis of the functional capacity and individual symptomology of each client.

CONCLUSION

Progressive Resistance training (3 days per week for 3 months of 1 hour per session) improves Functional capacity, Immune System and Quality of Life of people with HIV/AIDS.

Source of Support: Nil

Conflicts of interest: None

Disclosures: This study is part of on-going PhD research titled "Effect of Aerobic, Progressive Resistance Training on Functional Capacity, Quality of Life and CD4 Count in People with HIV/AIDS by first author. The study is cleared by Institutional Ethical Committee of Saveetha University, No. HECNo:FC003/SU142/2011 dated 11-08-2011 and registered in CTRI, No.CTRI/2013/03/003460.

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