ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 6, Issue – 2, March - 2023, Page No. : 681 - 696

Effectiveness of high intensity treadmill training versus low intensity tread mill training to improve exercise tolerance in subjects with bronchiectasis.

[1]K. Harika, [2]M. Geetha Sai, [3]Dr. Patchava Apparao,[4]M. Parvathi Bhanu

Corresponding Author: K. Harika,

How to citation this article: K. Harika, M. Geetha Sai, Dr. Patchava Apparao, M. Parvathi Bhanu, "Effectiveness of high intensity treadmill training versus low intensity tread mill training to improve exercise tolerance in subjects with bronchiectasis", IJMACR- March - 2023, Volume – 6, Issue - 2, P. No. 681 – 696.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background and Objectives: Bron chi ectasis is a condition where damage causes the bronchial walls in lungs. Chronic lung disease that causes permanent dilatation of the bronchial walls and also causes loss of lung elasticity. Bron chi ectasis causes recurring breathing difficulties, chest tightness, dyspnea high intensity interval treadmill training and Low Intensity Treadmill Training are the two adjunct trainings for Bron chi ectasis. The objective of this study is to compare the effectiveness of High Intensity Tread mill Training and Low Intensity Treadmill Training on six-minute walk test and m MRC dyspnea scale in subjects with Bronchiectasis.

Methods: Prospective study design. 78 subjects with Mean age of 25 – 50 years having and a clinical diagnosis of Bronchiectasis were randomly divided into two groups. Subjects In Group -A (n=31) received High Intensity Treadmill Training and Group-B subjects (n=31) received Low Intensity Treadmill Training. The participants were given intervention thrice daily for 8 weeks. The Outcomes of the intervention were measured using six-minute walk test and m MRC Dyspnea scale.

Results: The independent t' test was used to compare the average significance differences between continuous variables. Paired 't' test was used to assess the Statistical significance difference between pre and posttests cores. Statistical analysis of data revealed that within the group comparison both groups showed significant improve Ment in all parameters. Whereas comparison between groups High Intensity Treadmill Training showed better improvement compared to Low Intensity Tread mill Training Breathing.

Conclusion: The present study suggests that after 8-weeks of interventions both groups showed statistically significant improvement in post-test values however High Intensity Treadmill training is more effective when compared to low intensity treadmill training. Thus this study concludes that High Intensity Treadmill training isa useful adjunct training in patients with Bron Chi

ectasis in improving six minute walk test and decreasing dyspnea.

Keywords: High Intensity Treadmill Training, Low Intensity Treadmill Training, Mmrc, Six-minute walk test.

Introduction

Bron chiectas is a relatively frequent condition chara cterized as an “irreversible localized or wide spread dilatation, usually resulting from chronic infection, proximal air way obstruction, or congenital bronchial ab normality.” Bron chi ectasis is presented Sa significant burden to the healthcare system not only in terms of its chronicity but also due to its increasing prevalence. It occurs because of repeated infections to the lower respiratory tract, altered muco-ciliary clearance that leads to stasis of secretions, infection, in flammation and eventually destruction and dilatation of the peri-bronchial and bronchial tree. on chest radiographs, Bron Chi ectasis is shown as tram tracks, parallel line opacities, ring opacities, and tubular structures.1 In Asia Bron chiectas is prevalence rate is 7%. 21 In India Prevalence of Bron Chi ectasis is 5.9 to 20.5%. Are cent pan India study [n=680] identified post-infection [41%] to be the primary cause for Bron chiectasis.2despite the global prevalence of Bron Chi ectasis being unclear, various reports provide an estimate according to country. The true prevalence of Bronchiectasis is unknown given that Bronchiectasis is undiagnosed or misdiagnosed as COPD orasthma.3 Aetiology of Bron chiectas is hetero geneous and includes severe infections, immune deficiencies, auto immune disorders and ciliary disorders. Primary cause is idiopathic and secondary causes are post infectious conditions like myco bacterium tuber culosis, as per gillus species, bacteria, congenital conditions like primary ciliary dyskinesia, alpha1 -anti tryps in deficiency, cystic fibrosis. 4 Bron chiectas is a chronic respiratory disease characterized by a clinical syndrome of cough, sputum production and bronchial infection, and radio logically by abnormal and permanent dilatation of the bronchi. The objectives of treatment in Bron chiectas is are to preventex acerbations, reduce symptoms, improve quality of life and stop disease progression. Cough and sputum production, along with breathlessness are the frequent symptoms but rhinosinusitis, fatigue, hemoptys is and thoracic a in a real socommon.3 Most studies of the pathology of Bronchiectasis were reported between 1930 and 1960 as there was access to significant quantities of operative and postmortem lung specimens at this time. Reid categorized Bronchiectasis as having three main pheno types: 1) tubular characterized by smooth dilation of the bronchi; 2) varicose in which the bronchi are dilated with multiple indentations; and 3) cystic in which dilated bronchi terminate in blind ending sacs. The current major form seen on high resolution computed tomography is the tubular form of Bron chiectas is. 5 Medical management in Bronchiectasis patient should include the following elements as (I) correction of any associated underlying disorder, if possible; (II) attention to general clinical care including education on nutrition, maintaining a healthy lifestyle, receiving appropriate vaccinations (against in fluenza and pneumococcal in fections); (III) airway clearance therapies. (IV) anti-inflammatory therapies, if appropriate; (V) maintenance antibiotics if required; (VI) treatment of exacerbations. Importantly, Bron Chi ectasis is often characterized by air flow obstruction, which can significantly improve after the administration of Bron Cho dilators. 6 Pharmaco logical management for Bron Chi ectasis is Bron Cho dilators, anti-biotics, mucolytic agents.

Surgical management double-lung trans plantation, lung trans plantation, pulmonary lobectomy. Pulmonary function and exercise capacity often deteriorate with time, despite adequate medical interventions, such as antibiotic treatment and Bron chodilators.7 Bron chiectas is not related to cystic fibros is (non-CF Bron chiectas is) is a persistent or progressive condition chara cterized by dilated thick-walled bronchi. Patients with non-CF Bronchiectasis exhibit persistent or recurrent broncial in fection related to irreversibly damaged bronchi, with symptoms including cough, sputum production, wheeze, dyspnea, and decreased Exercise Tolerance.8 The causes of dyspnea and reduced Exercise Tolerance are multi factorial: altered pulmonary mechanics, inefficient gas exchange, decreased muscle mass, and confounding psycho logical morbidity led to a progressive detraining effect.9 Individuals with Bron chiectas is may also show a health-related quality of life impairment. Pulmonary reha bilitation (PR), a multi-disciplinary approach to treat patients with chronic lung diseases, is crucial for the management of Bron chiectas is patients. 10 The underlying principle for recommending Pulmonary Reha bilitation to patients with Bron chiectas is depends primarily on physio logical reasoning and on the similarities between this disease and chronic obstructive disease. Moreover, since the patho physiology of Bron chiectas is involves more factors than only air flow obstruction, pulmonary rehabilitation [PR] might represent a useful tool also for patients without air flow obstruction.11 Bron chiectas is had excessive sputum production there are many techniques to clear these creations various like post Ural drain age, positive expiratory pressure, auto genic drain age, lung flute, flutter device, acapelladevice.12 The repeated exposure to a high-intensity training stimulus increases muscle pain tolerance, which is independent of the im provements in aerobic fitness induced by endurance training and may contribute to thein crease in Exercise Tolerance following HIIT.13 A dissociation of lung function, dyspnea ratings, and pulmonary extension in Bron Chi ectasis the effect of pulmonary reha bilitation in patients with Bron Chi ectasis showed improve ments in Exercise Tolerance with help of the 6-min walk test (6MWT) in Bron Chi ectasis. 14 High intensity interval training [HIIT] requires a greater quantity of work carried out at a higher intensity within a single exercise session which is progressed by alternating high - intensity exercise in tervals with low-intensity exercise or rest intervals.15 Low intensity interval training [LIIT] has Beena effective way to target the patients with lower levels of exercise participation, also can lead to substantial increase in the exercise ability overbaselines.16 Exercise training can be defined as any hierarchical exercise programme that focus on positive changes in physical function or Exercise Tolerance. Reduction in exercise capacity has been associated with structural alterations to lung tissue, progressive air flow obstruction, dyspnea secondary to dynamic hyperinflation, and psycho logical morbidity.17 Pulmonary reha bilitation for people with Bron chi ectasis aims to improve Exercise Tolerance, through effects on aerobic capacity and peri pheral muscle, as well as to enhance disease management and provides healthy life. Res is tance exercise improves body mobility in people with Bron chiectas is and can do little to relieve shortness of breath. Tread mill, cross trainer, static cycling exercises app ear to be safe to practice for people with Bron Chi ectasis, and it can be beneficial for lung function and lung capacity when compared to a traditional treatment program. 18 A dissociation of lung

function, dyspnea ratings, and pulmonary extension in Bron chiectas is the effect of pulmonary reha bilitation in paents with non - CF Bron chiectas is showed im prove ments in Exercise Tolerance with help of the 6-min walk test (6MWT) in Bron chiectas is. 19 Pulmonary rehabilitations consisted of exercise training and multi - disciplinary education targets exercise intensity of 80% of the peak heart rate achieve do nan initial maximal incremental exercise test 20. sessions involved High Intensity Tread mill Training and low in tensity tread mill training. Mmrc dyspnea scale to guide intensity.21

Need of the study

Bron Chi ectasis is a progressive respiratory condition chara cterized by permanent dilatation of the Bron chi and associated with a clinical symptom of cough, sputum production and recurrent respiratory infections. Reducing Exercise Tolerance is also the most common problem encountered by subjects with Bron chiectas is along with respiratory problems hampering their quality of life but there is no standard exercise protocol addressing Exercise Tolerance in the Bronchiectasis. Exercise training via tread mill is widely used in cardiac reha bilitation but its utilization in pulmonary reha bilitation is limited in the literature. High Intensity Treadmill Training [HIIT] and Low intensity treadmill training [LITT] are two common methods of training by using tread mill and commonly used to improve cardio pulmonary fitness among different health related conditions. Previous literature on these exercise methods has shown conflicting results where it is becoming difficult chose between these techniques, to train Exercise Tolerance among subjects with Bron chiectas is. So, the need arises to compare between these two training methods. The Purpose of this research study was to examine current exercise training protocols and to determine which exercise protocol is effectively suitable for subjects with Bronchiectasis.

Aim of the study

The Aim of the Study was to Compare the Effectiveness of High Intensity Treadmill Training Versus Low Intensity Tread mill Training on Improving Exercise Tolerance in Subjects with Bron chiectas is.

Objectives of the study

1. To determine the Effectiveness of High Intensity Tread mill Training on improving Exercise Tolerance in subjects with Bron chiectas is.
2. To determine the Effectiveness of Low Intensity Tread mill Training on improving Exercise Tolerance in subjects with Bron chiectas is.
3. To compare the Effectiveness of High Intensity Tread mill Training versus Low intensity tread mill training on improving Exercise Tolerance training in subjects with Bronchiectasis.

Hypothesis

Research hypothesis [h]

High Intensity Treadmill Training shows greater improvement on increasing Exercise Tolerance when compared to Low Intensity Treadmill Training among the subjects with Bron chiectas is.

All ternative hypothesis [h1]

Low Intensity Treadmill Training shows greater improvement on increasing Exercise Tolerance when compared to High Intensity Treadmill Training among the subjects with Bronchiectasis.

Null hypo thesis[ho]

There is no significant difference between High Intensity Tread mill Training and Low Intensity Tread mill Training on improving Exercise Tolerance among the subjects with Bron chiectas is.

Materials and methods

Study design

Prospective Study Design.

Ethical clearance and informed consent

The study protocol was approved by the Ethical Committee of GSL Medical College Rajahmundry (Annexure-I) the Principal Investigator Explained the purpose of the study and given the subject in formation sheet. The participants were requested to provide their consent to participation in the study (Annexure-II). All the participants signed in the Informed Consent and the rights of the included parti cipants have been secured.

Study population

Subjects clinically diagnosed with Bron chiectas is by Pulmonologist.

Sampling method

Systematic Random Sampling

Study setting

The study was conducted at Department of Physio therapy, GSL General Hospital, Rajah mahendrava ram.

Study duration

The study was conducted during the period of one year.

Intervention duration

8 weeks of training program with 3 sessions per week, which includes.

Group a

High intensity treadmill training [HITT].

Group b

Low intensity treadmill training [LITT].

Sample size

A Total number of78 subjects with Bronchiectasis were screened. In that 62 subjects were recruited who are willing to participate in the study, Recruited participants were explained the purpose and relevance of the study. Those willing to volunteer were included in the study after obtaining informed consent. All the eligible participants were consecutively randomized to either High Intensity Treadmill Training or Low Intensity Treadmill Training with 31 in one group and 31 in other group.

Table 1:

Groups	No of Subjects	IN trevention
Group–a	31	High intensity tread mill Training [HIIT]
Group–b	31	Low intensity tread mill Training [LITT]

Materials

1. Meter tape.
2. Recording sheet
3. Stopwatch
4. Data collection chat.
5. Marker
6. Tread mill unit and its accessories Couch, stool and pillow
7. Pulseoxi meter

Inclusion criteria

- Subjects diagnosed with Bron chiectas is by Pul mono logist
- Age:25 to 50 years
- Stable clinical functional status
- Subjects Able and will ingto give informed consent
- Subjects with Low Dyspnea mMRC score.

Exclusion criteria

- Chestpa in suggestive of angina, Ischemic ECG changes
- Complex ectopy or 2nd or 3rd degree AV block
- Uncontrolled hyper tension (SBP > 250 mmHg;

DBP > 120 mmHg)

- O_2 desaturation with O_2 saturation < 80 % or cyanosis
- Dizziness or mental confusion or loss of coordination
- Neuro logical disorders
- Severe chest wall deformities Uncontrolled hyper tension Rheumatoid arthritis
- Severe osteoporotic patients
- DVT-Deep Vein Thrombosis
- Inability run will ingness to sign informed consent.

Out come measures

Primary outcome Exercise Tolerance will be measured with 6 – Minute walk test (6 - MWT). 22

Secondary outcome

Dyspnea will be measured with (Modified Medical Research Council) mMRC Dyspnea scale. 23 SIX - MINUTE WALK TEST: The 6 - Minute Walk Test was a sub maximal exercise test developed in 1963 by Balke to evaluate functional capacity 24. Different variations of the timed walk have been tested, and the 6 – minute timed walk was recommended given its reproducibility and ease of administration compared to longer timed tests.25

- While the patient is seated and at rest, measure and document perceived exertion, Heart rate and Blood pressure.
- Aim of this test is to walk as far as possible for 6 minutes. Patient must let know if he/ she have any chest pain or dizziness.
- The rapist demonst rates walking 30 meters and back & provide physical assistance (e.g., for balance or weight-shifting)
- Immediately stop the test if the patient exhibits any one of the following
- Chest pain -Light-headedness - Severe dyspnea (shortness of breath) - Confusion - Leg cramps - Cyanosis(blue or grey skin color) - Staggering- Nausea – Diaphoresis (excessive perspiration or sweating) – Excessive fatigue - Paleo ashen appearance-Facial expression signifying distress If the test is stopped for any of the above reasons, the patient should it or lie down.

- If the patient chooses to stop the test before 6 minutes have passed, mark the exact spot where the patient stopped by placing a pen, piece of tape or beanbag on the floor.
- Record the time stopped, the reason for stopping, and the distance walked. Assist the patient to the nearest chair. With the patient seated, first take HR and obtain a rating of perceived exertion. Round the distance walked on the last length to the nearest meter and calculate the 6MWT distance as follows: Distance (meters) = (# lengths completed x walkway distance) + partial distance on final length.

(mMRC)Dyspnea scale:[25,26]

Perception of dyspnea wase valuated by the Modified Medical Research Council (mMRC) dyspnea scale. mMRC scale is a self-rating tool which used to measure the degree of disability that breath lessness poses on day – to – day activities Dyspnea is seen in 60% of patients with Bron Chi ectasis. Them MRC is a0 – 4-point category scale which selects the best expression to define the dyspnea levels among five expressions related to dyspnea[27].

0- No breath lessness other than during severe activity

1- Shortness of breath when rushing on level ground or walking upas light hill

2- Walks slower than people their age on level ground due to breathlessness

3- Stops for breath after walking 100 mor after few minutes on level ground

4- Too breath less to leave the house, or breath less when dressing run dressing

Procedure

The subjects of the study after meeting inclusion criteria will be divided in to 2 groups. The group A will receive High Intensity Treadmill Training [HIIT] and the group B will receive Low Intensity Tread Mill Training [LITT].

All the subjects will undergo a treatment protocol of 8 weeks for 3 sessions per week 30 minutes every training session. Exercise Tolerance will be measured with six Minute walk test (6-MWT).

Dyspnea will be measured with (Modified medical research council) mMRC-Dyspnea scale are measured before and after the intervention.

Bruce Protocol is used in this study which is a maximal exercise test where the person works to complete exhaustion as the tread mill speed and inc line is increased every three minutes. The Bruce tread mill test protocol was designed in 1963 by Robert. A. Bruce, MD, as a non-invasive test to assess patients with suspected cardio pulmonary diseases.

In a clinical setting, the Bruce treadmill test is sometimes called a Stress Test or Exercise Tolerance Test.

The High Intensity Treadmill Trainings individual walking programme from Bruce protocol. The Low Intensity Tread mill training is individual walking programme from Modified Bruce protocol.[27]

High intensity tread mill training:[28]

Group A: After selection of subjects according to the inclusion criteria, the group A will be trained with maximal tread mill walking.

Phase-I: Warmup exercises

Flexion and extension with both and alternate extremity counts. Abduction and adduction with both and alternate extremity counts.

Slow jogging. Duration: 3minutes

Phase-II

Individualized walking program in tread mill training with 7 stages of Bruce Protocol.

Intensity of training -High intensity is given up to 80% of target heart rate. THR =RHR+80% [MAX HR –RHR]

Duration of training - Warm up3 minutes, training 21minutes, cooldown 3minutes, the total time is 27 minutes. Frequency of training

3 sessions/ week.

Phase III

cool down period, exercise for 3 minutes like; jogging, running walking with slow.

Stage	Duration	Speed mph	Grade%
1	3 min	1.7MPH	10
2	3min	2.7MPH	12
3	3min	3.4MPH	14
4	3min	4.2MPH	16
5	3min	5.0MPH	18
6	3min	5.5MPH	20
7	3min	6.0MPH	22

Bruce protocol

Fig 1: Subject Performing High Intensity Tread Mill Training

Low intensity tread mill training:[28]

Group b

Low intensity training After selection of subjects according to thein collusion criteria, the group B will be trained with Low Intensity Tread mill walking of Modified Bruce Protocol.

Phase-I

Warm up Reriod

Flexion and extension of neck. Abduction and adduction with both and alternate extremity counts. Slow jogging Duration: 3 minutes

Phase-II

Individualized walking program in tread mill training with 7 stages of modified Bruce protocol.

Intensity of training - Low intensity is given up to 60% of target heart rate. THR =RHR + 60% [MAX HR – RHR].

Duration of training - Warm up 3 minutes, training 21 minutes, cool down 3 minutes, the total time is 27 minutes. Frequency of training: 3 sessions / week

Phase-III

Cool down period Exercises for 3 minutes like mild stretching, neck rotations walking with slow intensity.

Stage	Duration	Speed mph	Grade%
1	3min	1.7MPH	0
2	3min	1.7MPH	5
3	3min	1.7MPH	10
4	3min	2.5MPH	12
5	3min	3.4MPH	14
6	3min	4.2MPH	16
7	3min	5.0MPH	18

Modified bruceproctol

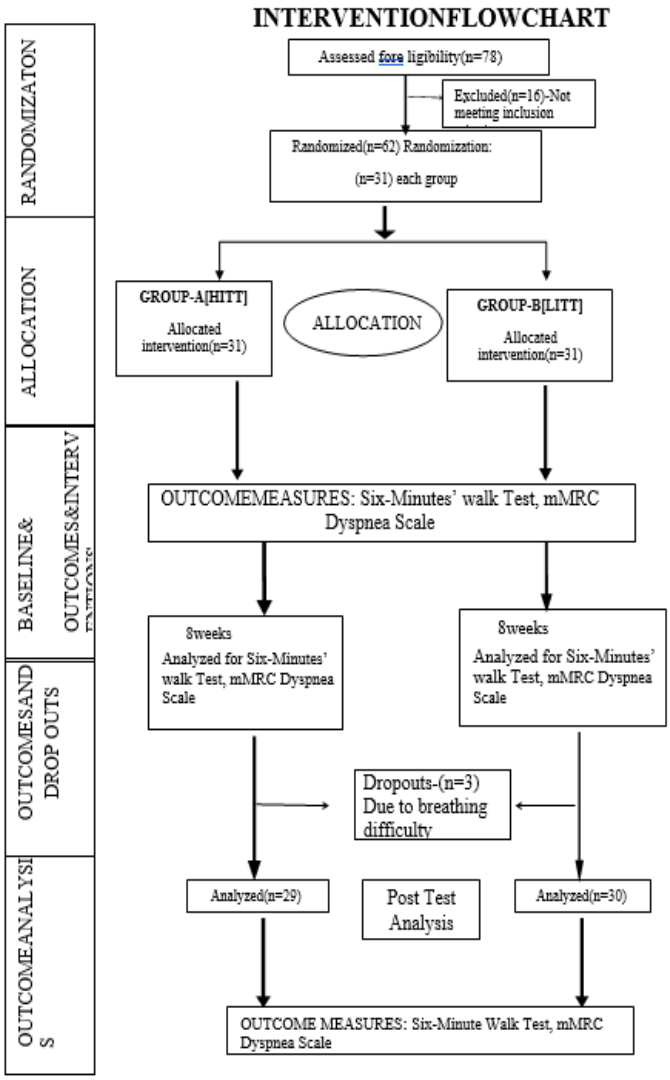
Fig 2: Subject Performing Low Intensity Tread Mill Training

Fig 3: Subject Performing Warmup Exercise Neck Rotations.

Fig 4: Subject Performing Shoulder Abduction

Fig 5: Subject Performing Shoulder Flexsion

Fig 6: Subject Performing Six-Minute Walk Test



Statistical analysis

All Statistical analysis was done by using SPSS software version 21.0 and Microsoft excel-2007. Descriptive data was presented in the form of Mean +/- standard deviation and Mean difference percentages were calculated and presented.

Within the groups: Paired student "t" test was performed to assess the statistical difference within the groups for six minute walk test and Mmrc from pre-test and post-test values.

Between the groups: Independent student "t" test was performed to assess the statistically significant difference in Mean value between the groups for six – minute walk test and mMRC.

For all statistical analysis, $p \leq 0.05$ will be considered as statistically significant

Results

Aim of the study was to find out the effectiveness of High Intensity Treadmill Training and Low Intensity Treadmill Training on improving Exercise Tolerance in subjects with Bronchiectasis. The flow chart of the study showed the study organization in terms of Subjects Screening, Random allocation and analysis following the Intervention.

A total 78 subjects were screened for eligibility, amongst 62 subjects were included in the study trail. All the 62 subjects who met inclusion criteria have undergone baseline assessment and included subjects were randomized in to two groups consisting of 31 and 31 subjects.

In this study, 29 participants completed training in Group - A and 30 subjects completed training Group-B.

Tables 1: Analysis of Mean Scores of Six -Minute Walk Test With in GROUP-A

Group-A		Mean	N	SD	P – value	Inference
6-MWT	Pre-test	268.226	31	28.9122	0.001	Highly significant
	Post-test	405.161	31	30.754		

Table 1

Results

The above Table shows Mean score of Six – Minute Walk Test with in Group-A of pre- test and post -test were found to be statistically Highly significant.

Table 2: Analysis of Mean Scores of Six-Minute Walk Test with in Group-B

Group-b		Mean	N	SD	P–value	Inference
6 MWT	Pre test	258.548	31	33.9410	0.001	Highly significant
	Post test	313.710	31	29.0106		

Results

The above Table shows Mean scores of Six-Minute Walk Test with in Group – B of pre-test and post- test were found to be statistically Highly significant.

Table 3: Comparison of Pre-Mean Scores of Six-Minute Walk Test in Between Groups

6-MWT		Mean	SD	P-value	Inference
6-MWT pretest	Group-A	268.226	28.9122	0.231	Insignificant
	Group-B	258.548	33.9410		
6-MWT Post-test	Group-A	405.161	30.7540	0.001	Highly significant
	Group-B	313.710	29.0106		

Results

The above Table shows Pre-Test-Mean Scores of Six - Minute Walk Test between Groups were found to be statistically Insignificant and Post-Test Was Statistically Highly Significant.

Table 4: Analysis of Mean Scores of mMRC with in Group-A

Group a	N	Mean	SD	Mean Rank	Sum of Ranks	P-value	Inference
mMRC PRE	31	3.452	.5059	16.00	496.00	0.001	Highly significant
mMRC Post	31	.484	5080	0.00	0.00		

Result

The above Table shows Mean Score of mMRC of Group A were found Statistically Highly significant in post-Test.

Table 5: Analysis of Mean Score of mMRC Dyspnea Scale with in GROUP-B

Group b	N	Mean	SD	Mean Rank	Sum of Ranks	P-Value	Inference
mMRC Pre	31	3.710	.4614	16.00	496.00	0.001	Highly significant
mMRC Post	31	1.161	.8601	0.00	0.00		

Results

The above Table shows that Mean Scores of mMRC with in GROUP-B were found statistically Highly Significant in Post-Test**.**

Table 6: Comparison of Mean Scores of mMRC in Between the Groups

Group		N	Mean	Sd	Mean rank	Sum of ranks	P -value	Inference
mMRC pre-test	HITT	31	3.452	0.5059	27.5	852.5	0.061	Insignificant
	LITT	31	3.71	0.4614	35.5	1100.5		
mMRC Post-test	HITT	31	0.484	0.508	24.58	762	0.001	Highly Significant
	LITT	31	1.161	0.8601	38.42	1191		

Results

The above Table shows that Comparison of Mean Score of mMRC in Between the groups were found Insignificant in Pre-Test and Highly Significant in Post-Test.

Discussion

The aim of our present study was to evaluate the effectiveness of High Intensity Treadmill Training versus Low Intensity Treadmill Training on improving Exercise Tolerance in subjects with Bronchiectasis. In this study, subjects were assessed for six-minute walk test for Exercise Tolerance and mMRC scale for dyspnea. The main finding of the study is High Intensity Treadmill Training was more effective than Low Intensity Treadmill Training in subjects with Bron Chi ectasis.

The outcome parameters of the present study are six-minute walk test and mMRC dyspnea scale which are measured before and after the intervention these parameters are used to measure the Exercise Tolerance and dyspnea in subjects with Bron Chi ectasis.

The results of the study showed significant difference between High Intensity Treadmill Training and Low Intensity Tread Mill Training in subjects with Bron Chi ectasis who received eight weeks of intervention.

Both the High Intensity Tread Mill Training group and Low Intensity Tread Mill Training group showed statistically significant differences, but the High

Intensity Treadmill Training group: [Mean –six-minute walk test - 405.161; mMRC dyspnea scale Mean-0.484) showed clinically effective slightly when compared to the Low Intensity Treadmill Training group: [six-minute walk test Mean -313.710; Mean of mMRC dyspnea -1. 161).

Bron Chi ectasis is a relatively frequent condition characterized as an "irreversible localized or wide spread dilatation, usually resulting from chronic infection, proximal airway obstruction, or congenital bronchia lab normality1In Bron Chi ectasis There is increased dyspnea rating due to bronchial wall constriction occurs in these conditions other will be poor gaseous exchange occurs there by leading to dyspnea and Also muscle weakness. By using intensity interval training there will be chance of getting improved lung elasticity and leads to more oxygen and carb on dioxide exchange occurs.

The repeated exposure to a high -intensity training stimulus increases muscle pain tolerance, which is in dependent of the improvements in aerobic fitness induced by endurance training, and may contribute to the increase in Exercise Tolerance following HIIT11,13

A dissociation of lung function, dyspnea ratings, and pulmonary extension in Bron Chi ectasis the effect of pulmonary rehabilitation in patients with Bron Chi ectasis showed improvements in Exercise Tolerance with help ofthe6-min walk test (6 MWT) in Bron Chi ectasis14.

High intensity interval training [HIIT] requires a greater quantity of work carried out at a higher intensity within a single exercise session which is progressed by alternating high - intensity exercise intervals with low-intensity exercise or rest intervals.11,15

Low intensity interval training [LIIT] is been a effective way to target the patients with lower levels of exercise participation, also can lead to substantial increase in the exercise ability over base lines.17

Exercise training for subjects with Bron Chi ectasis i. e chronic respiratory disease is based on the general principles of exercise physiology: intensity, specificity, and reversibility. In general, high intensity training is targeted to 80 % or more of the maximum work rate determined on incremental exercise testing at baseline, then increased as tolerated as the exercise training progresses. This level, although Ata high fraction of symptom limited maximum, is none the less at relatively low intensity compared to individuals without chronic disease.

In study of Richard Zu Wallack, Exercise training in pulmonary rehabilitation D Datta and R Zu Wallack, 144 the feasibility of ahigh intensity exercise training protocol in 42 patients with chronic obstructive pulmonary disease (COPD). The training consisted of 25 – 30 – minute sessions Ona tread mill training three times weekly for 12 weeks targeted to 80 % of maximal base line work rate. Intensity was adjusted with the objective of not only reaching target but also ensuring a specified duration. At week 12, the Mean exercise in tensity was only 60 % of maximal work rate and only five patients achieved their high intensity target levels. However, despite the failure to reach target intensity in the majority of patients, significant physiological training effects were observed. For those unable to tolerate higher levels of exercise, interval training, consisting of two to three minutes of high intensity training alternating with equal periods of rest, is an alternative.16

Exercise physiology is essential to understand the various aspects of Cardio Pulmonary Exercise Training. During exercise, to provide the energy equired by the

muscles, oxygen (O2) is in haled in to the lungs, trans ported by the pulmonary vessels to the heart and delivered to the muscles by the arterial circulatory system. QO2is the O2 utilized by the muscles and QCO2 is the carbon dioxide (CO2) produced by muscles with exercise which is then transported by the venous system to the heart and lungs and then exhaled. Analysis of the measured inspired and expired gases during exercise enables quantification of the oxygen consumed or oxygen uptake (VO2) and the CO2 generated (VCO2). In steady state, QO2 =VO2 and QCO2 = VCO2. Increased O2 utilization by the muscles is achieved by increased O2extraction from blood perfusing exercising muscles, increased O2 delivery by dilatation of the arteries, increased cardiac output (by increasing stroke volume and heart rate) and increasing pulmonary blood flow by recruitment of the pulmonary vasculature. As exercise results in increased CO2 production, it i sex haled by the lungs by an increase in ventilation by ariseintidal volume (VT) and respiratory rate.22

And a continuous intensity interval training will allows the adaptation of the bronchial wall opening and also improves the lung elasticity there by chance of having high volumes of oxygen and carbon dioxide exchange occurs .17

The first study that thoroughly assessed the physio logical foundation of the increase in Exercise Tolerance following exercise training of COPD patients was presented by Casaburi,30 and colleagues in 1991. 19 people with moderate COPD were randomly assigned to training groups for high or low intensity exercise. For eight weeks, both groups used a cycle ergo meter for 45-minute search day, five days per week. The target exercise intensity for the high work rate group was 60% of the difference between an aerobicthres hold and VO2 max, or 80 % of maximal tolerated work rate, while the aim for the low work rate group was 90% of anaerobic threshold, or 50% of maximal work rate. The later group's work period was lengthened in order to enhance the overall amount of work performed was the same in the two groups.24

Subsequently, in their and omizedtrials of outpatient pulmonary rehabilitation 29, Ries etal., O' Don nellet al. Wijkstra et al.," Bend strup et al., Hernandez et al., and Bernard et al. all utilized rather high intensity exercise training protocols. Exercise intensity was targeted using either a high fraction of the maximal work rate discovered by baseline incremental exercise testing or symptoms that were close to their maximum intensity. For instance, treadmill and free walking at the greatest tolerated symptom-limited level for as long as 30 minutes constitute supervised steady state exercise training as described by Ries et al. At the conclusion of formal outpatient pulmonary rehabilitation, this strategy increased tread mill en durance time by 10.5 minutes (at around 95 % of maximal), an increase of 85% over baseline. For instance, Ries et al. describe supervised steady state exercise training that includes free walking and treadmill use "at the greatest tolerable symptom limiting level for as long as 30 minutes." After rigorous outpatient pulmonary rehabilitation [PR], this method resulted in an increase of 10.5 minutes in tread mill endurance time (at around 95% of maximal), which was an increase of 85 % over baseline.25

The present study has also demonst rated an improvement in outcomes parameters which include six-minute walk test and MMRC for dyspnea in both High Intensity Treadmill Training and Low Intensity Treadmill Training from pre-test to post-test. However High Intensity Treadmill Training [HIIT] group was

more improved when compared to Low Intensity Treadmill Training [LIIT]. Hence High Intensity Tread Mill Training may be incorporated in the Treatment Protocol of Bron Chi ectasis.

I have taken six-minute walk test, as a outcome for measuring Exercise Tolerance. I have observed improvement in the post test values of group A compared to group B, But compare to continuous exercise training group, interval exercise training group got more improvement in Exercise Tolerance and amount of distance covered was increased during six-minute walk test. I also observed that resting intervalsorgaps taken by the subjects during six-minute test was reduced after the completion of interval exercise training than continuous exercise training. There a son behind this change may be due to leg dis comfort after continuous training which limit the ability to walk during six-minute test compared to interval training.

Limitations

- Small sample size
- Lack of control group in the present study
- No blinding of the participants is present
- The study did not include long term follow up
- As the measurements were taken manually, there may be a chance of error

Recommendations for further research

- Follow up programs can be included to assess the short term and long-term effects of treatment.
- Further study can be done to check the effects of these techniques on other conditions.
- Further study can be done to check the lung functional capacities.
- Further studies can be done by adding along with conventional physiotherapy.

Conclusion

The present study concludes that after 8 weeks of intervention both groups showed significant improvement on Six Minute Walk Test and decreased Dyspnea rating in subjects with Bronchiectasis. However High Intensity Interval Treadmill Training is more effective when compared to Low Intensity Interval Treadmill Training. Thus, this study concludes that High Intensity Interval Treadmill Training is a useful adjunct in Bron Chi ectasis.

Reference

1. Winter DH, Manzini M, Salge JM, Busse A, Jaluul O, Jacob Filho W, Mathias W, Terra-Filho M. Aging of the lungs in asymptomatic lifelong nonsmokers: findings on HRCT. Lung. 2015 Apr; 193:283-90.

2. Sapru K, Hill AT. Advances in Bronchiectasis. Clinical Medicine. 2019 May;19(3):230.

3. King PT, Holdsworth SR, Freezer NJ, Villanueva E, Holmes PW. Characterization of the onset and presenting clinical features of adult Bronchiectasis. Respiratory medicine. 2006 Dec 1;100(12):2183-9.

4. Chandrasekaran R, Mac Aogáin M, Chalmers JD, El born SJ, Choti mall SH. Geographic variation in the aetiology, epidemiology and microbiology of Bron Chi ectasis. BMC pulmonary medicine. 2018 Dec;18(1):1-4.

5. King PT. The patho physiology of Bron Chi ectasis. International journal of chronic obstructive pulmonary disease. 2009; 4:411.

6. Nicolson CH, Holland AE, Lee AL. The Bron Chi ectasis toolbox—a comprehensive web site for the management of people with Bron Chi ectasis. Medical Sciences. 2017Jun 12;5(2):13.

7. Singh D, Agusti A, Anzue to A, Barnes PJ, Bourbeau J, Celli BR, Criner GJ, Frith P, Halpin DM, Han M, Varela MV. Global strategy for the diagnosis,

management, and prevention of chronic obstructive lung disease: the GOLD science committee report 2019. European Respiratory Journal. 2019 May 1;53(5).

8. Polverino E, Goeminne PC, McDonnell MJ, Aliberti S, Marshall SE, Loeb Inger MR, Muris M, Canton R, Torres A, Dima Kou K, DeSoyza A. European Respiratory Society guide lines for the management of adult Bron Chi ectasis. European Respiratory Journal.2017Sep1;50(3).

9. Zhang X, Pang L, Lv X, Zhang H. Risk factors for Bron Chi ectasis in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Clinics. 2021 Apr16;76.

10. O'Neill K, O'Donnell AE, Bradley JM. Airway clearance, mu coactive therapies and pulmonary reha bilitation in Bron Chi ectasis. Respirology.2019 Mar; 24 (3):227-37.

11. Park J, Han D. Effects of high intensity aerobic exercise on tread mill on maximum-expiratory lung capacity of elderly women. Journal of physical therapy science. 2017;29(8):1454-7.

12. Basavaraj A, Choate R, Add Rizzo-Harris D, Ak samit TR, Barker A, Daley CL, Daniels ML, Eden E, Di Mango A, Fennelly K, Griffith DE. Airway clearance techniques in Bron Chi ectasis: analysis from the United States Bron Chi ectasis and Non-TB Mycobacteria Research Registry. Chest. 2020 Oct 1;158(4):1376-84.

13. Wadell K, Sundelin G, Henriksson- Larsen K, Lundgren R. High intensity physical group training in water—an effective training modality for patients with COPD. Respiratorymedicine.2004 May 1;98(5):428-38.

14. Lee AL, Button BM, Ellis S, Stirling R, Wilson JW, Holland AE, Denehy L. Clinical determinants of the 6-Minute Walk Test in bronchiectasis. Respiratory medicine.2009May1;103(5):780-5.

15. Ross LM, Porter RR, Durstine JL. High-intensity interval training (HIIT) for patients with chronic diseases. J Sport HealthSci.2016;5(2):139–44

16. Dattal D, Zu Wallack R. High versus low intensity exercise training in pulmonary rehabilitation is better? Chronic respiratory disease.2004Jul;1(3):143-9

17. Clark CJ, Cochrane L, Mackay E. Low intensity peripheral muscle conditioning improves Exercise Tolerance and breath lessness in COPD. European Respiratory Journal. 1996 Dec1;9(12):2590-6.

18. Lee AL, Hill CJ, Cecins N, Jenkins S, McDonald CF, Burge AT, Rau Tela L, Stirling RG, Thompson PJ, Holland AE. The short- and long-term effects of exercise training in non- cystic fibrosis Bron Chi ectasis–a randomised controlled trial. Respiratory research. 2014 Dec; 15 (1):10.

19. Dattal D, Zu Wallack R. High versus low intensity exercise training in pulmonary rehabilitation: is better? Chronic Respiratory Disease. 2004Jul;1(3):143-9.

20. Natori H, Kawayama T, Suetomo M, Kinoshita T, Matsuoka M, Matsunaga K, Okamoto M, Hoshino T. Evaluation of the Modified Medical Research Council Dyspnea Scale for Predicting Hospitalization and Exacerbation in Japanese Patients with Chronic Obstructive Pulmonary Disease. Intern Med. 2016; 55 (1): 15-24. [Medline]

21. Launois C, Barbe C, Bert in E, Nardi J, Pero tin JM, Dury S, Lebargy F, Deslee G. The modified Medical Research Council scale for the assessment of dyspnea in daily living in obesity: a pilot study. BMC Pulm Med. 2012 Oct 1; 12: 61.

22. Datta D, Normand in E, Zu Wallack R. Cardio pulmonary exercise testing in the assessment of exertional dyspnea. Annals of thoracic medicine. 2015 Apr; 10 (2):77.

23. Norman din EA, McCusker C, Connors M, Vale F, Gerardi D, Zu Wallack RL. An evaluation of two approaches to exercise conditioning in pulmonary reha bilitation. Chest. 2002Apr1;121(4):1085-91.

24. Casaburi R, Patessio A, IoliF, Zanaboni S, Donner CF, Wasserman K. Reductions in exercise lactic acidosis and ventilation as a result of exercise training in patients witho bstructive lung disease. Am Rev Respir Dis. 1991 Jan;143(1):9-18. doi: 10.1164/ajrccm/143.1.9.PMID: 1986689.

25. Ries AL, Kaplan RM, Limberg TM, Prewitt LM. Effects of pulmonary rehabilitation on physiologic and psycho social out comes in patients with chronic ob structive pulmonary disease. Annals of internal medicine. 1995 Jun 1;122(11):823-32.

26. BRUCE, R. A., & PEARSON, R. (1949). Varia bility of respiratory and circulatory performance during stan dardized exercise. The Journal of clinical in vesti gation, 28(6 Pt 2),1431–1438. tps: // doi.org/ 10. 1172/ JCI10220

27. Boeselt T, Nell C, Lütteken L, Kehr K, Koepke J, Apelt S, Veith M, Beutel B, Spielmanns M, Greulich T, Vogel Meier CF. Benefits of high-intensity exercise training to patients with chronic obstructive pulmonary disease: a controlled study. Respiration. 2017;93(5):301-10.

28. Mahler DA, Wells CK. Evaluation of clinical methods for rating dyspnea. Chest.1988 Mar 1; 93 (3): 580-6.

29. Troosters T, Gosse link R, Janssens W, DE Cramer MJ. Exercise training and pulmonary rehabilitation: new insights and remaining challenges. European Respiratory Review. 2010 Mar 1;19(115):24-9.

30. Troosters T, Casaburi R, Gosse link R, DE Cramer M. Pulmonary rehabilitation in chronic obstructive pulmonary disease. American journal of respiratory and critical care medicine. 2005 Jul 1;172(1):19-38