Original Study

Effect of Aerobic Training on Exercise Capacity and Quality of Life in Middle Aged Obese Fishermen:a Comparative Study

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Abstract

Background: Fishermen have risk conditions like obesity due to high amount of food intake and relatively sedentary work type. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health and reduce functional exercise capacity and Quality of life.In this study effort is taken to find optimal physiotherapy intervention for middle aged obese fishermen.

Method: 72 Subjects participated for study two of them did not come for the follow up. Remaining 70 subjects which were screened for 6MWD and SF36 scores and were put in either of the two groups.Group A received Free active exercises and Group B received Aerobic training.Interventions were carried out for a period of 6 weeks(3 times / week).The post treatment improvement was noted with the outcome measures.

Results: The results showed very significant difference between the groups on 6MWD,Group B(experimental)showing better improvement than Group A(Control).(p=0.0047).Also extremely significant difference(p>0.0001)was noted on all the 8 domains of SF36 within both the groups and no significant difference between the groups post intervention.

Conclusion: We found that Aerobic training showed better effect on exercise capacity in middle aged obese fishermen.And Quality of life improved significantly with Aerobic training and also with Free active exercises.

Keywords: *Fishermen,Obesity,Overweight,Aerobic training,Free active exercises,6MWD,SF36.*

Introduction

India is having one of the largest fresh and marine water resources.Thus,a huge chunk of population is involved in fishing.[1] Fishermen have high risk conditions like obesity due to high amount of fish intake with low priority to other nutrients especially in long voyages.

The prevalence of overweight and obesity was marked first amongst fishermen in 2005 as 76.6% and 30.6% respectively in denmark population by JAN L.HOEYER and HENRIK L.HANSEN.(2)Later on the prevalence was found in Turkish as 26%,Greek as 33% and Spanish as 37% in fishing population according to the systematic review in 2014(16)

Then the prevalence of overweight and obesity amongst fishermen was found in India in 2018 which was reported as 42.8% in Tamilnadu,and 13.3% of population were having abdominal obesity.(23)

Prevalance of obesity in fishermen was also found as 38.79% in Chennai district in 2018 and 12% in rural coastal areas in south india.(24)(25)

One of the possible explanation for obesity in fishermen given by JAN L.HOEYER and HENRIK L.HANSEN was easy access to abundant quantities of

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food,which goes back to the days when fishing was hard work and required high caloric intake.Today most of the work is sedentary.However,the traditions with regard to food have not changed and the risk of an excess intake is likely.[4]Other explanations were consumption of fish on a daily basis,regular alcohol intake and relatively sedentary lifestyle.[23][24][25]

Overweight and obesity are major risk factors for a number of chronic diseases,including diabetes,cardiovascular diseases and cancer in fishermen. Around 44% of the diabetes,23% of the ischemic heart disease and 7%-41% of certain cancer burdens are attributable to overweight and obesity.[1]Once considered a problem only in high income countries,2,3 overweight and obesity are now dramatically on the rise in low- and middle-income countries,particularly in urban settings. In India;Punjab,Kerala,and Delhi are the states with the highest level of overweight and obesity in fishermen but the prevalence is increasing in states of South India.[25] Obesity affects the functional status as well.[4]

Materials and Method

This was a Comparative study which was conducted to evaluate effect of Aerobic training amongst middle aged obese fishermen.The subjects who meet the inclusion and exclusion criteria and willing to participate in the study were included.We had approached and assessed 72 subjects as our study population out of which 2 did not come for the follow up.The participants were explained about the study and the evaluation procedure. The informed consent was obtained from the individuals.

Inclusion Criterias were as follows**:1)**Fishing since 5 years **2)**Age group – 25 to 44 years **3)**Overweight and Obesity grade 1 according to Asian grading scale.

Exclusion Criterias were as follows:**1)**Past history of cardiovascular and neurological conditions.**2)**Recent musculoskeletal conditions.**3)**Diabetes mellitus **4)** Hypertension grade 2 or more **5)**Subjects who are on any planned exercise program.

Subjects were assessed for exercise capacity using 6MWD and Quality of life using Short Form 36 Scale

Procedure

The study protocol was presented in front of protocol and Institutional Ethics Committee of LTMMC,Sion. Middle aged obese fishermen were approached,purpose of the study was explained and written informed consent was taken from those willing to participate.They were then assessed as per inclusion and exclusion criteria and divided into 2 groups.

After the initial assessment,treatment was given 3 times a week for 6 weeks for both the groups.

TREATMENT FOR GROUP A(Free active exercises)

Warm up(5 mins)- stretching,spot marching

Conditioning(20 mins)- Shoulder ROM all movements and Circumduction:10 reps each,3 sets

-Elbor ROM :10 reps each,3 sets

-Wrist ROM:10 reps each,3 sets

-Hip ROM all movements in standing and Circumduction:10 reps each,3 sets

-Knee ROM:10 reps each,3 sets

-Ankle ROM:10 reps each,3 sets

-Trunk Rotations:10 reps each side,2 sets

-Trunk Flexion:10 reps each side,2 sets

Cool down(5 mins)- ankle toe movements,pursed lip breathing,shavasana

TREATMENT FOR GROUP B(Aerobic training)

PHASE 1(40-50% THR)for 3 weeks(30 mins session)

Warm up(5mins)-Stretching,whole body mobility,spot marching

Conditioning(20 mins)- -V marching :30 reps,2 sets

-Side walks :30 reps each side,2 sets

-Brisk walk forward:10 mins

-low Jumps :15 reps,2 sets

-Jumping Jacks:10 reps,2 sets

-Step up and step down:20 reps each,2 sets

Cool down(5 mins)- ankle toe movements,pursed lip breathing,shavasana

PHASE 2(50-60% THR)for 3 weeks(40 mins session)

Warm up(5mins)-Stretching,whole body mobility,spot marching

Conditioning(30 mins)- -V marching :30 reps,4 sets

-Side walks :30 reps each side,4 sets

-Brisk walk forward:15 mins

-low Jumps :15 reps,4 sets

-Jumping Jacks:10 reps,4 sets

-Step up and step down:20 reps each,4 sets

Cool down(5 mins)- ankle toe movements,pursed lip breathing,shavasana

Findings:

· Data was analysed using Graphpad Prism 8.1.2(332).

· All the test were performed considering 95% confidence interval and significance at 0.05.

· The data was initially tested for Normal Distribution using Kolmogorov-Smirnov test

for normality.And,the data followed normal distribution pattern.

· Comparison of mean between and within 6MWT(6 minute walk test)groups were analysed using unpaired t test and paired t test respectively for quantitative variables.

· Short Form 36(SF36)scale is ordinal.To compare the difference pre and post SF36 we used Wilcoxon and Mann Whitney test

Results

Table 1:Comparison of values of 6MWD

6MWD	Pre-treatment		Post-treatment		'p'	
(Group)	Mean±SD	Mean±SD	Mean±SD	Median		
A	623.6±68.431	623.6±68.431	646.8±65.420	645	p<0.0001	ES
B	625.86±62.469	625.86±62.469	691.314±61.946	704	p<0.0001	ES
'p'	0.8858		P=0.0047			
	NS		VS			

Table 1 shows a statistically extremely significant improvement within both the groups.And very significant improvement between the groups with p value 0.0047.

II. Short form 36(SF36)

Table 2:Comparison of values of SF36

	Controls(n=35)			Experimentals(n=35)			
Domains	**Pre**	**Post**	**P value**	**pre**	**post**	**P value**	**P value(post-post)**
Physical functioning	75.514±12.601	84.828±9.835	p<0.0001	75.6±10.293	87.514±6.451	p<0.0001	0.1812
Role-Physical	67.828±9.407	83.457±8.012	p<0.0001	71.857±9.233	86.971±7.857	p<0.0001	0.0701
Bodily Pain	68.558±10.352	84.6±7.109	p<0.0001	71.648±8.203	87.052±6.489	p<0.0001	0.1350
General Health	77.514±10.176	84.714±8.101	p<0.0001	74.228±9.774	86.771±6.486	p<0.0001	0.2450
Vitality	55.485±10.853	66.228±8.465	p<0.0001	55.771±9.935	66.571±10.274	p<0.0001	0.8793
Social Functioning	73.5±7.907	85.028±7.524	p<0.0001	76.657±7.456	86.742±6.938	p<0.0001	0.3969
Role-Emotional	76.857±6.436	81.942±5.765	p<0.0001	78.6±6.165	84.971±6.002	p<0.0001	0.0751
Mental Health	73.914±7.098	86±6.259	p<0.0001	76.2±6.516	87.114±5.487	p<0.0001	0.4439

Table 2 shows a statistically significant improvement within both the groups and no significant improvement between the groups in all the 8 domains of SF36.

Discussion

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health and reduce functional exercise capacity and Quality of life. [(1)]The prevalence of overweight and obesity amongst fishermen was found in India in 2018 which was reported as 42.8% in Tamilnadu,and 38.79% in Chennai district in 2018 and 12% in rural coastal areas in south india.[(24)] [(25)]

Fishermen have risk conditions like obesity due to high amount of food intake and relatively sedentary work type.[2][(3)]

According to literature,there are very few studies done on the fishermen community especially addressing their exercise capacity and Quality of Life(QOL).There are various studies available showing effectiveness of Aerobic training in Obese subjects on their Exercise capacity and QOL.Hence the objective of this study was to see the effect of Aerobic training on exercise capacity and QOL in middle aged obese fishermen.

In this study 70 subjects were divided into 2 groups viz.Controls and Experimental.Controls were given free

active exercises whereas Experimental group was given Aerobic training.Pre and post outcome measure were taken(6MWD and SF36)before and after 6 weeks.

According to Table1,Control group showed statistically extremely significant improvement post intervention($p<0.0001$)in 6MWD

Fishermen have reduced exercise capacity due to sedentary lifestyle with recent advancement in fishing and no exercise routine in their daily schedule in particular.[3].In our study we gave ROM exercises along with sideward,forward and backward walks in our control group.These showed the effect on 6MWD due to following possible mechanisms.

- There was increase in muscle power and endurance due to increased tension created in muscles especially in Lower limb muscles due to resistance offered by the body weight on them.The tension also increased in large muscles while doing ROM exercises due to mechanical leverage provided by a long and heavy limb.[21]

- One of the other reason is also an increase in the number of capillaries surrounding each muscle fiber post free active exercises.This effect is similar to the study in 2003 by Rico Sanj et al where they found that With long periods of exercise training,the number of capillaries may increase by more than 15%[9]. Having more capillaries allows for greater exchange of gases,heat,nutrients,and metabolic by-products between the blood and contracting muscle fibers.[11]

- Free active exercises also increased venous return to the heart which results in increase in the cardiac output.[20]

In the present study for 6MWD,Experimental group showed statistically extremely significant improvement post intervention.$p<0.0001$

Improvement of 6MWD in obese fishermen after Aerobic training can be explained by following reasons

- Better cardiac adaptation:increased left ventricular size thus increased filling and stroke volume thereby increasing blood supply to exercising muscles and fulfilling increased oxygen demand[18].

- Decrease lactic acid production,as studies have shown that in trained state one can exercise at a higher percentage of one's VO2max before lactate begins to accumulate in the blood and reduction in metabolic cost for exercise[19].

- increase in capillary density resulting in increased blood supply,oxygen and nutrients to the exercising muscles as stated by W kenny,Jack Wilmore et al in 2011 in their publication of 'Physiology of sport and exercise",edition 5[11]

- Increase in lower limb type I fibers cross sectional area and transition from type II to type I fibers[10].The similar effect was seen by Wilson JM et al in 2012 after giving endurance training in athletes.

- changes in the mitochondrial function that improves the muscle fibers capacity to produce ATP. Studies have also shown that aerobic training increases the number and size of mitochondria which helps in generating more ATP.[9]

Intergroup analysis showed very significant difference between Controls and Experimentals($p=0.0047$).Hence Experimental group showed better effect on 6MWD post interventionally.

This may be because of the following reasons

- Free active exercise are lesser intensity exercises as compared to exercises we gave in Aerobic training.[19]

- Free active exercises are localized to individual joints and specific group of muscles associated with that joint,whereas Aerobic exercises are the rhythmic movements involving upper extremity,lower extremity and trunk all together simultaneously,

- Aerobic training was given at a target heart rate and at a specific intensity.

- Aerobic training was also progressed in intensity and duration after 3 weeks of intervention whereas free active exercises were carried out at same intensity throughout the 6 weeks of intervention.

Control group showed extremely significant difference post interventionally in all 8 domains of SF36.($p<0.0001$)in all the domains.

This might be explained by the following reasons

• Relaxation:Rhythmical swinging movements in ROM exercises assist the relaxation of muscles due to alternating and reciprocal contraction and relaxation of the opposite muscle groups.This might relieve pain due to spasms in the muscles.Hence we got the significant difference in our Bodily pain Domain post intervention. [20]

• Mobility:Improvement in joint mobilty and flexibility of muscles hence preventing adapting shortening in these sedentary individuals.[20]

• Neuromuscular co-ordination:The co-ordination was improved due to repetition of exercises. [20]The achievement of Co-ordinated and efficient movement assures the patient of his ability to maintain subjective control of his body,giving him confidence to attempt other and new activities[20]

• Perceived improvement of energy levels:which showed difference in the Vitality Domain which asseses the energy and fatigue levels subjectively.

• Increased Social interaction amongst fishermen and instructor improved the social functioning domain[21]

• Subjective feeling of well being:which must have improved due to regular participation in exercises and positive social relationships.Positive social relationships have previously been linked with various indicators of well being.[22]

• Reduce stress and anxiety:due to increases in circulating β-endorphin levels and thereby increasing mental health.[21]

Experimental group showed extremely significant difference post interventionally in all domains of SF36 post interventionally.P<0.0001 in all the domains The possible reasons attributed for this are as follows

• Increase in peripheral muscle strength which improved the scoring of Domains like Physical functioning and also Role physical because of increase in ability to do ADL with less difficulty.[22]In a meta analysis in 2009 by Chiung-Ju Liu et al,121 randomised controlled trials(6700 participants)showed that improvement in muscle strength improves the performance of simple activities such as walking,climbing steps,or standing up from a chair more quickly.[23]Similar effect was found in our study as our physical functioning domain assess the activities like walking,climibing flight of stairs,lifting etc

• Increase in the production of ATP due to improvement in the mitochondrial activity and increase in the number and size of mitochondria.Hence greater energy levels for doing physical activities[15]and hence improvement in the vitality domain.

• Reduction of Fatigue:Due to delayed lactic acid production in blood.Hence better Physical Functioning. [8]

• Release of endorphins hence Increase in the arousal,and euphoria and reduction in perception of pain and therefore improvement in the Bodily Pain domain as said by Berger and Owen in 1992 and 1998.[17]

• Anish Eric J et al in 2005 conveyed various effects of exercise on CNS like Improvement in stress adaptations due to adrenal gland activity,Improvements in the mood and emotion due to release of serotonin and Improvements in motivational levels due to increased Dopamine levels[16]which improved mental health domain score.

• Increase in social interaction,similar to the effect seen by Reis H in 2000.[13]which improved social functioning domain.

Inter group statistical analysis revealed no significant difference between the groups post intervention for SF36 score.

This might be because of the following reasons.

• Both groups were given exercise in group,hence they had equal opportunities to socially interact amongst each other and instructor.

• Both groups had subjective perception of well being after 6 weeks of exercise

• Improvement in motivation levels in both the groups post exercises

• Also habitual participation of exercise increases the self esteem which was seen in both the groups.

Conclusion

We found that Aerobic training has better effect than free active exercises on exercise capacity and have similar effect on Quality of life in middle aged obese fishermen.

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Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of LTMMC.

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