



# Effect of Upper Limb Ergometer on Atherogenic Index and Quality of Life in Postmenopausal Obese

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## Abstract :

**Purpose:** was to evaluate and recognize the effect of the upper limb ergometer as a type of aerobic exercise and its effect on the atherogenic index of plasma as a major predictor of cardiovascular hazards and quality of life in obese postmenopausal women, also to detect the changes occur on waist circumference and body weight after four weeks of performing upper limb ergometer .

**Methods:** One-hundred and three obese postmenopausal women aged 45-55 years old with body math index ranged 30-40 kg/m<sup>2</sup>. Ladies randomly allocated into two equal groups, study and control group. Atherogenic index, waist circumference, body weight and quality of life using Obesity and Weight Loss Quality of Life were evaluated before and after the intervention. Four weeks of moderate aerobic exercise training using upper limb ergometer was performed by the experimental group in addition to their usual medication for dyslipidemia prescribed by physician. The control group was adherent to dyslipidemia medication only.

**Results:** A significant improvement was noticed regarding the study group in (atherogenic index, body weight, waist circumference and quality of life) where P-value was (P< 0.05). There was a significant change in body weight and waist circumference only as P-value was (0.020, 0.004) respectively, in the control group.

**Conclusion:** Upper limb ergometer has a significant effect on the atherogenic index of plasma, body weight, waist circumference and quality of life in postmenopausal obese women.

**Key words:** Aerobic exercise, Atherogenic index of plasma, Predictor of cardiovascular hazards, Postmenopausal woman.

## 1.Introduction:

There are plenty of questions regarding the relation between weight gain and postmenopausal problems, so many studies are still examining this relationship (1). Menopause and obesity had a major influence on the social, physical, and perceptual well-being of women. Compared to premenopausal women, postmenopausal women have greater levels of total cholesterol, low density lipoprotein(LDL-C), and triglycerides (TG) (2).

A recent study suggested that the disturbance in the lipid profile in postmenopausal ladies sets them at great hazard of cardiovascular problems and stroke, unless a proper lifestyle modifications are employed (3). Menopause is mostly a reason of many apprehensions among ladies, one of these worries is weight gain. Obesity takes place in ladies in postmenopausal age three times more than ladies in premenopausal age (4).

Current studies have showed that atherogenic index of plasma (AIP) considered a strong predictor of

cardiovascular diseases.(5). Atherogenic index of plasma (AIP) is a new index composed of triglycerides and high-density lipoprotein cholesterol (6). Certainly, obesity considered a key challenge for health and has extended epidemic proportions globally. Furthermore, it turns out to be a main risk reason for many acute and chronic diseases, and some types of tumors (7).On another hand, obesity is noticeable to create a great medical and financial troubles. It signifies a chief and vital global health problematic and be likely to rise while getting older, and also an identified risk issue for the comorbidities acknowledged as disposing factors for adverse effects in COVID-19 pandemic (8).

Aerobic workout is described as any form of physical activities that produce an improvement in heart and breathing parameters in an extent to satisfy the oxygen requirements of the activated muscle (9). The concept that aerobic exercise decrease triglyceride concentration and bad cholesterol is supported by a lot of researches. In addition, a lot of researchers confirmed that exercising increases heart lipid metabolism and protects us from cardiovascular disorder (10).

## 2.Material and methods:

A randomized controlled trial was followed in this study. The study was accomplished between November 2020 and December 2021 and recorded on the clinicaltrials.gov website with identification number: NCT04676074. All patients were learned about the study's purpose and the potential risks, all ladies signed a consent form signifying their approval to join the research study. Ethical approval had been given by the Ethical Committee through faculty of physical therapy Cairo University (NO: P.T.REC/012/002974).

### Participants:

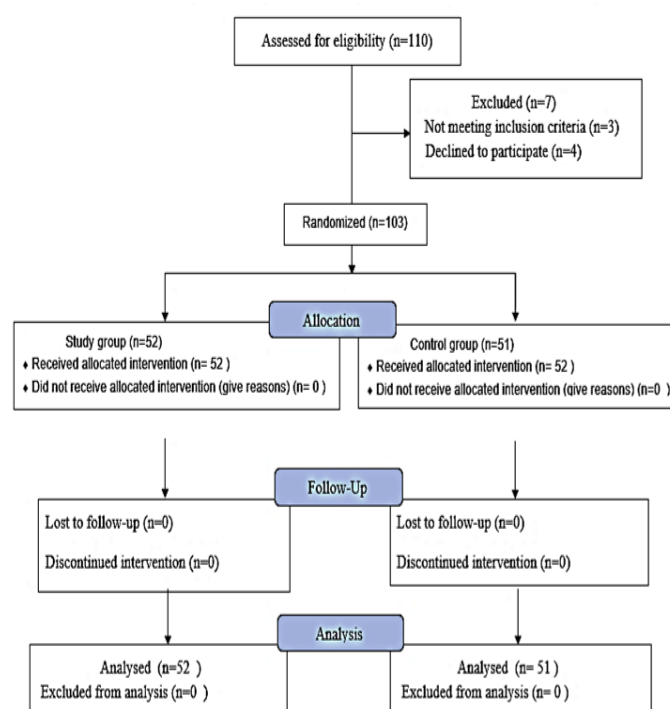
One-hundred and three females in the postmenopausal period had allocated randomly into 2 groups. They were excluded once they met one or more of the following criteria; uncontrolled diabetes mellitus, uncontrolled hypertension, class III and morbid obesity, mentally unstable person and any shoulder, hand or elbow orthopedic or neural disorders. Inclusion Criteria; patients had involved in the study if they were; female in postmenopausal period, aged 50-60 years old, body mass index (30 to 40 kg/m<sup>2</sup>), triglycerides level >150 mg/dl and HDL level<60 mg/dl.

### Enrollment:

### Evaluative procedure:

The participants were asked to fast overnight (9 to 12 hours) then a blood sample was taken by laboratory physician to assess triglyceride(mg/dl) and HDL(mg/dl) to calculate the atherogenic index of plasma. Tape measurement was used to measure the waist circumference at the level of umbilicus three

times in three successive days and the mean was recorded. The body weight was measured using (mechanical patient weighing scale M306800). The evaluative procedure was done prior and post to the protocols deigned for the study and the control groups. Quality of life was assessed using The obesity and weight loss quality of life (OWLQOL) questionnaire. The participants were advised to limit fatty acid in their diet especially saturated fats, to limit processed and refined sugar intake, increase water consumption to at least three liters per day and stop eating processed and fast food during the study period. Intervention program; each participant received a detailed clarification of the study's aims and purpose, in addition to a detailed information about the equipment and techniques used.



Fifty-two patients were assumed in the study group, received their usual routine medication in addition to program of moderate intensity upper limb ergometer training (using Monark 881e device) for 15 minute working phase (in addition to 5 minutes warming up with no load and 5 minutes cooling down also with free load), two times per week for one month. The intensity of the upper limb exercise training is calculated from the following equation (50 to 70 % the heart rate reserve (HRR)).

The training phase is performed while the participants sitting with full back support and feet rested on the floor. A smart watch (garmin hrm-dual heart rate monitor) was worn during the session, in addition to a close observation to any signs and symptoms of sudden fatigue (headache, dizziness, intolerable sore or aching muscles, blurry vision, poor concentration or reduced ability to pay attention to the situation of hand).

Fifty-one participants were assigned in the control group, received their usual routine medication only. Statistical analysis: This study conducted statistical analysis by using SPSS version 22. Descriptive statistics, for mean of age, height, weight and BMI was calculated by using unpaired T-test. Significant changes in weight, BMI, waist circumference, Triglyceride, HDL and atherogenic index before and after intervention within groups were analysed by Paired T-test but the differences between groups before and after treatment were analysed by using independent sample T-test. Significant changes in OWLQOL questionnaire score before and after intervention within groups were analysed by Wilcoxon Signed Ranks Test, the differences between groups before and after treatment were analysed by using Independent Samples Mann-Whitney U test. ( $\alpha = .05$ ) was the level of significance.

### 3.Results:

103 women were allocated randomly into two groups, study group and control group. There was no significance difference in age, height, weight or BMI between the two groups ( $P < 0.05$ ) as in **table (1)**.

**Table 1: Demographic data and physical characteristics of patients in both groups.**

Items	Group A		Group B		Comparison		S
	Mean	±SD	Mean	±SD	t-value	P-value	
Age (yrs)	49.98	±1.86	49.2	±1.9	1.87	0.06	N
Height (m)	1.71	±0.07	1.17	±0.0	1.15	0.24	N
Weight (kg)	102.1	±5.9	99.9	±3.9	2.28	0.02	N
BMI (Kg/M <sup>2</sup> )	34.7	±3.2	33.7	±2.3	1.18	0.07	N

\*SD: standard deviation  
S: significance

P: probability  
NS: non-significant.

Regarding study group, there was a significant alteration in (body weight, BMI, waist circumference, triglyceride and atherogenic index) was noticed pre and post intervention using Paired T-Test as P-value was ( $< 0.05$ ), there was no significant change found in HDL level as shown in **table 2**.

For control group, there was a significant change was noticed in (body weight, BMI, waist circumference) pre and post treatment using Paired T-Test as p value was ( $< 0.05$ ) but there was no significant change found in (triglyceride, HDL and atherogenic index) as in **table 2**.

Comparison was conducted between both groups and was analyzed using Independent Samples T-test. There were no significance differences between the study group and the control group pre intervention means of all variables. Regarding post treatment comparison, there was a significant difference in Waist

circumference between both groups as ( $P < 0.05$ ) table 2 while the percentage of change in study group was 1.7% which was greater than the control group 0.03% as shown in **table 2**. The percentage of improvement in weight and BMI for study group was 3.3% and 3.1%, respectively. While The percentage of improvement in weight and BMI for control group 0.1% and 0.3%, respectively as in **table 2**.

Regarding OWLQOL questionnaire, significant change was noticed in OWLQOL questionnaire score before and after intervention for study group that analysed using Wilcoxon Signed Ranks Test, where P value was ( $P < 0.05$ ) **Table 3**. No significance changes were noticed in control group (P value was 0.066). The difference between groups before and after treatment were analysed by using Independent Samples Mann-Whitney U test, where there was no significance different before treatment.

**Table 3: comparison between both groups in pre and post treatment mean of OWLQOL questionnaire score**

	Study group		Control Group		P value between groups	
	Pre-treatment X ± SD	Post-treatment X ± SD	Pre-treatment X ± SD	Post-treatment X ± SD	Pre-treatment	Post-treatment
OWLQOL score	62.5 ±4.9	49.6 ±4.8	64.3 ±5.2	64.2 ±5.2	0.091	P < 0.05
P value within Group	P < 0.05		0.066			

X: mean SD: standard deviation

\* P < 0.05 is statistically significant

### 4. Discussion:

The current researchers focused on how upper limb ergometer training impacts plasma atherogenic index and quality of life in obese postmenopausal women. Upper limb ergometer exercise training reduced triglyceride levels, improved plasma atherogenic index, and improved quality of life in postmenopausal obese women. It also resulted in a considerable reduction in waist circumference and body weight. Menopause is a state once ladies don't menstruate for one year or more.

Lipid metabolic disorders happens due to hormonal variations. Improper lipid metabolism causes disturbance in the body fat mass and adiposity. Furthermore, menopause is linked with changes in the levels of blood lipids as low-density lipoproteins (LDLs), high-density lipoproteins (HDL) and triacylglycerol (TG). Consecutively, leads to central adiposity, and alteration in lipid profile (11).

Many studies were done and came in a conclusion that exercise can produce a beneficial effect in the blood lipids, specially the aerobic exercise, results in markable improvement in the fat metabolism which

consequently produce improvement in cardio-metabolic parameters (12).

Aerobic training under water initiated an enhancement in cardiovascular risk issues in weighty

postmenopausal ladies and it is highly recommended to practice this type of training to avoid the risk of atherosclerosis and other cardiovascular illnesses (13).

**Table 2: Comparison between both groups and within groups in pre and post treatment mean of weight, BMI, waist circumference, triglyceride, HDL and atherogenic index**

	Study group		Control Group		P value between groups	
	Pre X ± SD	Post X ± SD	Pre X ± SD	Post X ± SD	Pre	Post
Weight (kg)	102.17±5.9	98.9±5.5	99.9±3.9	99.8±3.9	0.061	0.387
P value	P<0.05*		0.020			
% of change	3.3%		0.1%			
BMI (Kg/M2)	34.74±3.2	33.65±3.09	33.7±2.3	33.59±2.4	0.073	0.919
P value	P<0.05*		0.038			
% of change	3.1%		0.3%			
Waist circumference	99.45±1.48	97.71±1.74	99.29±1.2	99.26±1.2	0.550	P< 0.05
P value	P<0.05*		0.004			
% of change	1.75%		0.03%			
triglyceride	132.4±13.9	132.28±13.94	128.63±13.5	128.6±13.6	0.167	-
P value	P<0.05*		0.070			
% of change	0.1%		-			
HDL	62.01±2.6	62.00±2.56	62.17±2.74	62.18±2.76	0.761	-
P value	0.842		0.627			
% of change	-		-			
Atherogenic index	0.3273±0.05	0.3270±0.05	0.3137±0.048	0.3135±0.048	0.162	-
P value	0.018		0.230			
% of change	0.1%		-			

**X: mean, SD: standard deviation,**

**\* P< 0.05 is statistically significance.**

It was obvious that high intensity interrupted training has been designed to reduce the body weight and improve the atherogenic index of plasma (14).

Excessive intensity interrupted workout that can be performed 20 min for three to four days per week has proved to make a great alteration in the LDL level and lowering the diastolic blood pressure. Moderate workout is proved to lower the BMI and enhance the overall performance (15).

Eight weeks of upper-body exercise training produce improvement in lipid profile and body composition in paraplegic men (16).

Plans combining controlled physical recommendation and a hypocaloric eating regimen can offer benefits in body composition and enhancements on lipid profile. This support the idea that an intervention application of endurance or mixed supervised training protocol with diet restriction did an enhancements in the lipid profile in obese men and women (17).

Eight weeks of moderate aerobic dancing working out program at 50% -70 % heart rate reserve (HRR), three sessions per week results in positive impact on lipid profile and body composition in ladies with multiple sclerosis disorder (18).

Improved levels of blood lipids were in response to garlic supplementation and exercise schooling in overweight girls, even as the combination of interrupted training and garlic supplement can also have more effect on lipid profiles (19). It became assumed that usage of interrupted aerobic workout program had a sizeable advantageous impact in adjusting of the level of blood lipids as one of the coronary artery hazard element in overweight patients (20).

Aerobic exercise combined with limited calorie intake resulted in improving lipid profile, and metabolic parameters, as well as the aerobic exercise produce a great effect in improving hepatic steatosis in Postmenopausal Ladies with Non-Alcoholic Fatty-Liver Disease (21). A resistive aerobic training



workout can improve health-related quality of life (HRQoL) in postmenopausal females with vasomotor symptoms (22).

A study done on One hundred post-menopausal obese female from Saudi Arabia with age ranged from 50-58 years, affords proof that aerobic workout is effective in modifying inflammatory cytokines and quality of life in obese post-menopausal females (23).

The study's limitations were the participants' psychological condition and level of cooperation, individual differences among participants, environmental and cultural factors that might impact treatment outcomes, and age group as well as sample size.

## 5. Conclusion:

The upper limb ergometer exercise training significantly decreased the triglyceride level, improve the atherogenic index of plasma and improve quality of life in postmenopausal obese women. Also, it caused a significantly decrease in the waist circumference and the body weight that may be a prospective indicator of success in reducing the cardio-metabolic risk factors in post-menopausal obese ladies.

## Recommendations:

We recommend conducting study to know the effect of more than one type of exercises combined with different diet modification on the cardiovascular parameters in the post-menopausal obese female.

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