

A Study to Compare the Effect of Bicycle Ergo Meter & Treadmill Training on Blood Pressure & Heart Rate in Post Menopausal Hypertensive Females

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Abstract

Aims and Objectives: The aim of research is to compare the effectiveness of aerobic exercise training on treadmill and bicycle ergometer on physiological parameter in hypertensive post menopausal women. **Methodology:** A sample of 30 hypertensive post menopausal subjects were recruited for this experimental study. The subjects were randomly divided into 2 groups Group A (Treadmill exercise) and Group B (Bicycle ergometer). The exercise session of 30 minutes with intensity set at 60%-65% of the reserve heart rate according to the Karvonen method for 4 weeks 5 training session/week. Data collected in the form of Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and Heart Rate (HR) every pre & post exercise session. **Results:** Comparing of SBP of Group A and Group B at 4 weeks of aerobic training is significant. Comparison of SBP variable has significant difference between the two groups. **Discussion:** Results of our study explained that aerobic exercise training on treadmill and bicycle ergometer showed the significant lowering effect SBP & DBP but not on HR variable for both groups. Treadmill exercise is much more impressive in decreasing systolic blood pressure (SBP) with significant change as compared to bicycle ergometer. **Conclusions:** Aerobic physical activity should be considered an important component of lifestyle modification for prevention and treatment of high blood pressure in post menopausal females.

Keywords: SBP; DBP; HR; Treadmill exercise; Bicycle ergometer.

Introduction

Menopause is a cessation of monthly cycles or menstrual cycles of female and characterized by stoppage of regular menstrual cycle more than 1 year. Menopause usually happens in mid life (45-55

yr of age), signaling end of fertile phase of women life. It is related to conditions like mood swings, hot flashes, obesity & high blood pressure. More than 1 in 3 women are postmenopausal and are affected by cardiovascular disease and is the primary cause of death among women of postmenopausal age¹.

Menopause starts as a function of ovaries begin to change the ripening & release of ovum become unpredictable, ovulation starts to skip, gradually ovaries almost completely stop producing progesterone & estrogen hormones. A natural or physiological menopause is that which occurs as a part of a woman's normal aging process.

This causes an increase in circulating follicle stimulating hormone (FSH) and luteinizing hormone (LH) levels as there is a decrease in producing estrogen. This decrease in the production of estrogen leads to the perimenopausal symptoms

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of hot flashes, insomnia and mood changes, as well as post-menopausal osteoporosis and vaginal atrophy².

Menopause increases risk of high blood pressure. Clinical studies have proved that, once other factors are eliminated, the menopause does indeed place women at a higher risk of developing high blood pressure. During the menopause women experience a dramatic decrease in levels of the hormone estrogen. It is thought that this hormone plays a protective role in maintaining healthy blood pressure, and when it declines suddenly, high blood pressure can be the result³.

Menopause women's systolic pressure can go up by an average of about 5mm Hg, due to the decrease in estrogen levels. Estrogen withdrawal during menopause has a detrimental effect on metabolism and brings changes in body fat distribution. From a gynoid to an android pattern, reduced glucose tolerance, abnormal plasma lipids, increased blood pressure, increased sympathetic tone, endothelial dysfunction and vascular inflammation⁴.

Life style modification in the form of regular physical activity is considered a cornerstone in the prevention and management of hypertension and keeping menopause women physically and mentally fit. Epidemiological studies indicate that greater physical activity or fitness is associated with a lower blood pressure (BP), and meta-analyses of randomized controlled trials have shown that chronic dynamic aerobic endurance training is able to reduce BP⁵.

It is well known that exercise plays a vital role in physical fitness, it also helps in keeping blood pressure normal. Aerobic exercise may have a potential role in blood pressure management of long-term-treated hypertensive. So we have done this study to reduce hypertension in postmenopausal females, to provide them easy aerobic exercise regime which can further improve their quality of life.

The aim of study is to compare the effect produced by aerobic exercise in reducing the blood pressure by on treadmill & bicycle ergometer in post menopausal females with hypertension. The purpose of this study is to provide a better treatment regime for the post menopausal females for lowering down their elevated B.P and to create awareness about the risk of hypertension.

Methodology

Research design & sampling

Total 100 subjects were screened for this experimental study and 30 subjects were selected as per inclusion criteria and exclusion criteria. All subjects were divided in two equal 15 subjects/ group Treadmill Group A and Bicycle ergometer Group B by randomization method. Dependent variables of this experimental study were SBP,DBP,HR.Independent variables of this experimental study were Treadmill exercise and Cycle ergometer exercise.

Inclusion criteria

Postmenopausal women with age 45–55 yr old and no natural menses for at least 1 yr

Blood pressure should be Stage 1 hypertension >130/99 mm Hg monitored for continuously three days

Women should be physically capable of exercise; participants must be able to exercise safely at the required doses⁶.

Exclusion criteria

Significant any disorders including arrhythmias, myocarditis, cardiomyopathy, congestive heart failure, heart disease etc⁷.

Bmi should taken and obesity should considered.

Equipments used

- Treadmill, Model –T 7000
- Cycle ergometer, Model –R8000
- Digital Sphygmomanometer, Model no CH-432B⁸.



Procedure

The exercise session consisted of 30 minutes of aerobic exercise on treadmill/ cycle-ergometer and 5 minutes of warm-up and cool-down. Exercise intensity was set at 60%-65% of the reserve heart rate according to the Karvonen method. Entire training period for both the groups is designed for

4 week aerobic exercise with 5 training session/ week. Blood pressure and heart rate is taken every pre & post exercise session⁹.

Data analysis is performed by the SPSS11. the significant level is set at p-value ≤0.05. with confidence level 95%, t- test is used for inter group and one way ANOVA for intra group analysis.

Data Analysis

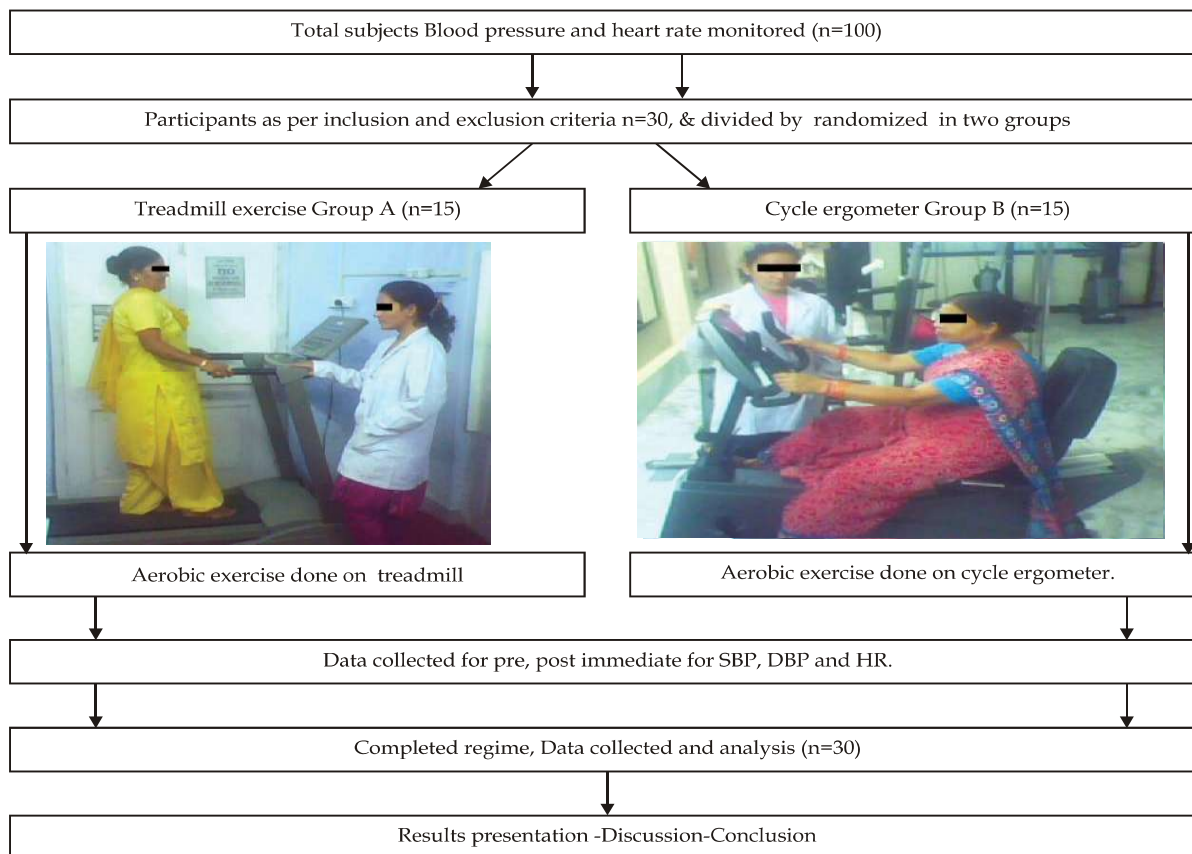


Fig. 1: Research flow chart.

Research flow chart

Result

Table 1: Comparison of mean values of SBP at Pre interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 st week	142.20	5.44	9.56	P <0.05
2 nd week	139.73	14.14		
3 rd week	134	10.68		
4 th week	130	8.01		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 st week	143.06	6.61	7.91	P < 0.05
2 nd week	138.80	8.34		
3 rd week	135	6.32		
4 th week	134	8.30		

Table 2: Comparison of mean values of SBP at Post interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	135.26	11.21	9.46	P < 0.05
2 nd week	134.27	11.14		
3 rd week	131.66	7.39		
4 th week	122.86	8.00		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	136.93	13.31	7.29	P < 0.05
2 nd week	133.20	9.17		
3 rd week	131.60	7.41		
4 th week	127.13	6.96		

Comparison of mean values for pre SBP at 1st week, 2nd week, 3rd week and 4th week between Group A and Group B

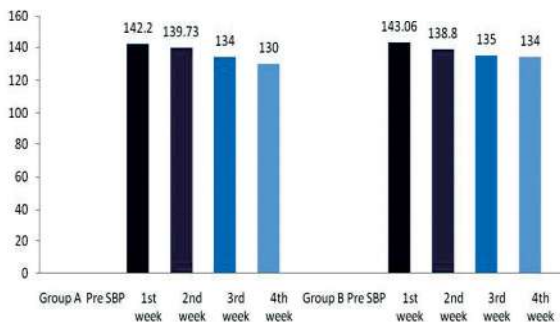


Table 3: Comparison of mean values of DBP at Pre interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	86.06	6.45	1.816	P < 0.05
2 nd week	85.00	10.47		
3 rd week	84.00	6.65		
4 th week	82.33	8.36		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	86.20	10.21	2.814	P < 0.05
2 nd week	85.00	8.11		
3 rd week	85.00	10.82		
4 th week	84.5	7.27		
SBP After four weeks				
	Mean	SD	F value	P value
<i>Treadmill exercise Group A</i>	130	8.01	3.47	P < 0.05
<i>Cycle ergometer exercise Group B</i>	134	8.30		

Comparison of mean value for Post SBP at 1st, 2nd, 3rd and 4th weeks between Group A and Group B

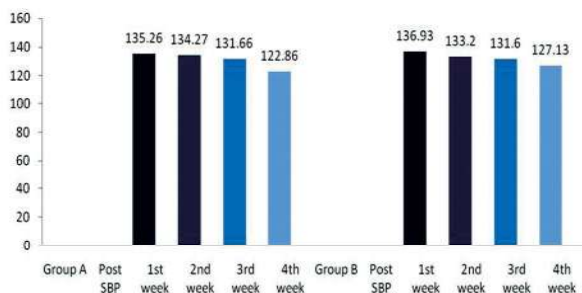
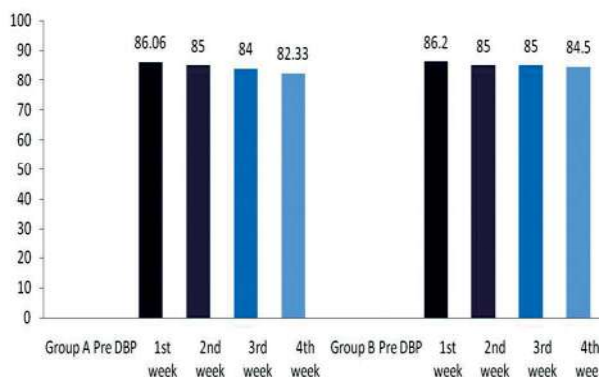


Table 4: Comparison of mean values of DBP at Post interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	85.00	7.80	4.123	P < 0.05
2 nd week	81.66	7.26		
3 rd week	80.86	7.44		
4 th week	79.86	6.78		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	84.73	10.03	1.995	P < 0.05
2 nd week	84.66	4.56		
3 rd week	82.93	7.44		
4 th week	81.00	7.06		
DBP After four weeks				
	Mean	SD	F value	P value
Treadmill exercise Group A	79.86	6.78	-2.948	P > 0.05
Cycle ergometer exercise Group B	81.00	7.06		

Comparison of mean value for Pre DBP at 1st, 2nd, 3rd and 4th weeks between Group A and Group B



Comparison of mean value for Post DBP at 1st, 2nd, 3rd and 4th weeks between Group A and Group B

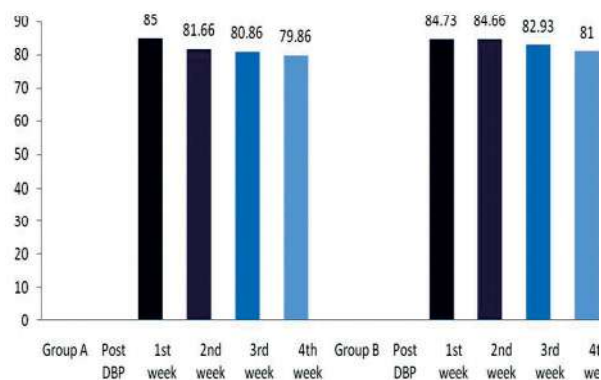


Table no 6: Comparison of mean values of HR at Post interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	86.00	8.21	0.498	P <0.05
2 nd week	85.06	12.52		
3 rd week	84.53	10.92		
4 th week	83.86	9.17		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	86.73	10.31	0.208	P < 0.05
2 nd week	86.00	9.58		
3 rd week	85.46	9.14		
4 th week	84.86	9.67		

Table no 6: Comparison of mean values of HR at Post interval between 1st week, 2nd week, 3rd week and 4th week within Group A and Group B.

<i>Treadmill exercise Group A</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	85.66	9.65	2.96	P <0.05
2 nd week	84.93	10.70		
3 rd week	84.06	7.69		
4 th week	83.53	8.45		
<i>Cycle ergometer exercise Group B</i>				
Pre SBP	Mean	SD	F value	P value
1 nd week	86.20	5.93	0.588	P < 0.05
2 nd week	85.86	5.98		
3 rd week	84.53	9.17		
4 th week	84.13	7.31		

Discussion

The important findings of our study are that, the aerobic exercise reduces the blood pressure. After four weeks of aerobic exercise we found that blood pressure has reduced with significant changes in the mean of systolic & diastolic blood pressure in both the groups. There is slight reduction in heart rate by aerobics exercise training in both the groups but not significant.

First important finding of our study is that while doing aerobic exercise on treadmill in four weeks significantly reduced systolic blood pressure up to 11.97mmhg. Aerobic exercise on cycle ergometer in four weeks significantly reduced systolic blood pressure upto 9.8 mmhg. Aerobic exercise on treadmill seems to be much benefiting and significance as compare to cycle ergometer. A result of our study shows that SBP and DBP was reduced in first few weeks of training but not up to

statistically significant level. It reduced significantly in 3rd & 4th week of our study.

Timothy S.& T-M Asikainen et al. have studied on post-menopausal women with aerobic exercise training done on treadmill for 40-45 min 3 days a week at 70-75% of maximum heart rate for 12 weeks. They found that systolic blood pressure was reduced approximately 8mmhg^{7,10}.

T.Sai et al. examined the effects of regular exercise on blood pressure in 20 and 60 years old adults. The exercise program consisted of 10 minutes of warm up, 30 minutes of treadmill walking or jogging, and 10 minutes of cool down 3 times per week for 10 weeks. Blood pressure was statistically significantly reduced up to 13.1 mm Hg in the exercise group at 10 weeks¹¹.

Dubbert, P M et al. did a study on endurance exercise in mild hypertension on treadmill with intensity of 50-60% of maximal heart rate, for 40 min 3 days a week up to 36 weeks. They found that systolic blood pressure was significantly reduced¹².

Emmanuel G. Ciolac et al have demonstrated that Exercise intensity with 60% of the reserve heart rate on Cycle ergometer was able to decrease the SBP up to 8.6 mmhg¹³.

Another study by Peter F. Kokkinos, Ph.D et al also supports the reduction of systolic blood pressure by aerobic exercise done on cycle ergometer. They observed a significant reduction in Systolic blood pressure by 7 mm Hg and 6 mm Hg after 16 and 32 weeks of exercise, respectively¹⁴.

Second finding of present study is that diastolic blood pressure was also reduced significantly up to 5.14mmhg on treadmill and up to 3.73 mmhg on cycle ergometer. There was no significance difference between two group on the bases of reduction in DBP.

Timothy S.& T-M Asikainen et al, studied that post-menopausal women age with aerobic exercise training on treadmill reduced significantly to diastolic blood pressure up to 5mmhg. Treadmill exercise was done for 40-45 min 3 days a week at 70-75% of maximum heart rate for 12 weeks^{7,10}.

Tsai et al. in 2004 examined the effects of regular exercise on blood pressure in adults. The exercise program consisted of 10 minutes of warm up, 30 minutes of treadmill walking or jogging, and 10 minutes of cool down 3 times per week for 10 weeks. Diastolic blood pressure was statistically significantly reduced up to 6.3 mm Hg in the exercise group at 10 weeks¹¹.

Moreira W.D, Fuchs.F.D et al studied the effect

of different intensities of aerobic exercise on cycle ergometer for 10 weeks at 20% & 60% of their maximum work load. They noted the reduction in DBP up to 6.8 mmHg. Peter F. Kokkinos, Ph.D et al also demonstrated the reduction in DBP up to 7 mm Hg in the patients who exercised^{14,15}.

Seamus P. Whelton et al did meta-analysis of randomized, controlled trials was conducted to determine the effect of aerobic exercise on blood pressure & concluded that aerobic exercise reduces blood pressure in both hypertensive and normotensive persons. An increase in aerobic physical activity should be considered an important component of lifestyle modification for prevention and treatment of high blood pressure¹⁶.

Third finding of our study was that there was decrease in heart rate of 2.13 beats/minute by treadmill and 0.63 beats/minute by cycle ergometer, in 4 weeks of aerobic exercise training, but it was not statistically significant. Kevin D Monahan et al, conducted a intervention study for 3 month aerobic exercise in the form of walking. They explained that cardiovagal tonicity take time to shows its results in sedentary middle-aged and older healthy people¹⁷.

Result of our study suggests that aerobic exercise done on treadmill & cycle ergometer both reduced blood pressure. Aerobic exercise on treadmill seems to be better as compare to cycle ergometer because walking is an activity of daily living and it requires less co-ordination, muscle fatigueness. Walking also involves action of large muscle group so produces more aerobic stress on heart & hence improve vagal strength. Therefore treadmill exercise is more effective in lowering both systolic & diastolic BP than the aerobic exercise done by cycle ergometer^{18,19}.

Thus it can be summarised the importance of physical activity in treatment of hypertension. that regularly performed aerobic exercise for long period of time induces adaptations in the cardiac autonomic nervous system. Aerobic exercise training leads to enhanced vagal activity at rest, which may contribute in part to decrease the blood pressure in long period of exercise training in post menopausal women.

Conclusion

Low levels of cardio respiratory fitness are associated with high risk of cardiovascular disease (CVD) and all-cause mortality and improvements in fitness are associated with reduced mortality

risk. Among women in the postmenopausal age range, 30% report no physical activity at all, and the prevalence of inactivity progressively increases with age²⁰.

Regular physical activity makes positive contributions to health and well-being. The consensus recommended dose described in guidelines is perhaps most clearly presented as obtaining 30 min of moderate-intensity physical activity. Aerobic physical activity should be considered an important component of lifestyle modification for prevention and treatment of high blood pressure in post menopausal females.

Aerobic exercise done by treadmill effectively lowers blood pressure & prevents hypertension. Results of this study showed that early postmenopausal women could benefit from 30 minutes of daily moderate walking on treadmill and cycle ergometer. Aerobic exercise helps to lower high blood pressure by normalizing biochemical, neural and hormonal changes in the blood vessel walls induce an acute and long-term blood vessel relaxation.

Both techniques have their advantages and limitations but treadmill instrumental exercise seems to be better and more effective in reduction of hypertension especially in post menopausal females.

Relevance in clinical practice

Women after menopause face many changes that may lead to loss of health-related fitness (HRF), especially if sedentary. Results of this study elaborate that early post menopausal sedentary females could benefit from 30 minute of daily moderate walking which is feasible & can be incorporated in daily life.

Lifestyle modification in form of aerobic exercise is an important strategy for the prevention and treatment of high blood pressure. It also cut the cost and side effect pharmacologic therapy. Exercise is now relevant for early postmenopausal women and should be routinely performed in order to improve exercise capacity as a preventive measure in subjects with high BP. This can be a informational study that will provide awareness of risks of high blood pressure in postmenopausal women.

Future study

The research can be further extended by taking large sample size, different age group and for long period of time.

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