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THE EFFICACY OF COMBINED AEROBIC ENDURANCE TRAINING WITH TARGET HEART RATE AND DASH DIET PLAN IN POSTMENOPAUSAL STAGE-1 HYPERTENSIVE ELDERLY WOMEN

[1]*Dr. Jyothi Seshan, [2]Dr. Senthil Selvam, [3]Dr. Sundaram and [4]Vijisha K. R.

[1]M.P.T (Ortho), Asst. Prof in School of Physiotherapy, VISTAS, Thalambur, Chennai.

[2]M.P.T (Ortho), Ph. D, Prof and HOD in School of Physiotherapy, VISTAS, Thalambur, Chennai.

[3]M.P.T (Sports), Ph. D, Prof in, School of Physiotherapy VISTAS, Thalambur, Chennai.

[4]B.P.T Final Year Student in School of Physiotherapy VISTAS, Thalambur, Chennai.

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***Corresponding Author**
Dr. Jyothi Seshan
M.P.T (Ortho), Asst. Prof in School of Physiotherapy, VISTAS, Thalambur, Chennai.

ABSTRACT

Background: Hypertension is the major risk factor for various cardiovascular complications, this increases in women with postmenopausal phase because of oestrogens deficiency. The need of the study is to investigate the effectiveness of combined aerobic endurance training with DASH dietary plan. **Aims and Objectives:** The aim of the study is to examine the efficacy of combined aerobic endurance training with DASH dietary plan among postmenopausal stage-1 hypertensive women. **Materials and Method**: 30 Women of age group 50-65 years were included for the study according to the the inclusion criteria. After clear instruction given to the subjects, they were allotted into two groups. Experimental group (n= 15) and control group (n=15), these groups underwent combined aerobic endurance training with DASH dietary plan and controlled breathing exercises with DASH dietary plan for 5 weeks. **Result:** The result shows the outcome of experimental group with a p-value of 0.000 (i.e, <0.05) and control group with a p- value of 0.000 (i.e, <0.05) but experimental group showed statistically significant improvement than control group. **Conclusion:** This study supports the effectiveness of combined aerobic endurance training with DASH dietary plan among postmenopausal stage-1 hypertensive women.

KEYWORDS: Menopause, hypertension, nitric oxide, aerobic training, endothelial dysfunction, DASH diet.

INTRODUCTION

Post menopause is the phase after menopause in which women experience the absence of menstrual cycle for twelve consecutive months or longer, early in the menopause transition when cycle irregularities is first seen, a decrease in estradiol and a fluctuating rise in serum follicle stimulating hormone is seen at the mean age of 50 year onwards.[1,2] There are many symptoms associated with postmenopause in which hypertension is one of the problematic factor for future risk of cardiovascular diseases, In menopause transition many women have vasomotor symptoms which may affect their normal daily activities.[3] During post menopausal phase numerous changes occur in the body, from biological and hormonal changes to changes in the blood pressure.[4] A few factor which affects the blood pressure are aging as the metabolism slows down and the arteries stiffen thus becomes less active which contributes to high blood pressure, decreased level of oestrogen and increased salt sensitivity.[5]

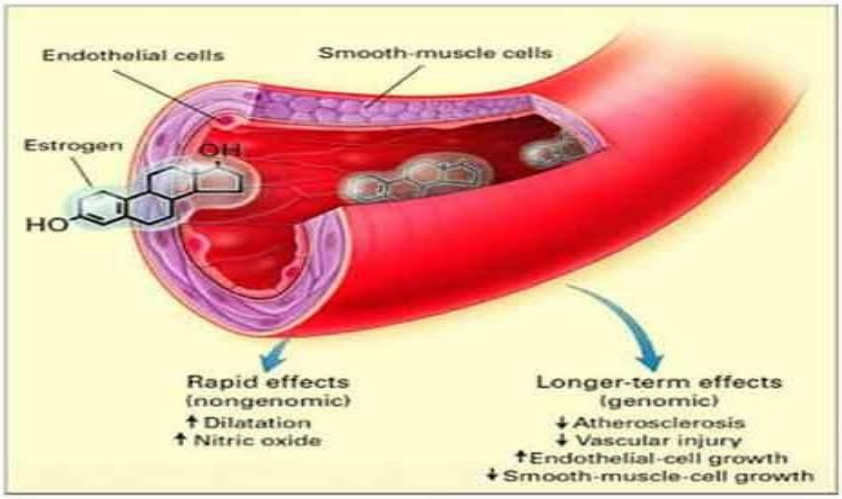


Fig. 1: Effects of Estrogen on Blood Vessels.

Hypertension is the most important risk factor that affects women in the early post-menopausal phase. The new high blood pressure guidelines has changed the definition of high blood pressure and stage 1 hypertension as systolic 130 to 139mmHg or diastolic 80 to 89mmHg.[6]

Hypertension is more common in younger men than women but this is inverted at the age of 60 years thus thereafter hyper tension is more common in women because of the oestrogen Deficiency.[2] Global estimates suggest that hypertension rate tends to be low in premenopausal women and steeper rise in hypertension rate in postmenopausal women.[7] Over all prevalence of 5.06% in the postmenopausal women with 40 years of age to 10.7% to 12.36% in women with 50 years of age.[8,9] Aging and decreasing level of estrogen after menopause are accompanied by increase in blood pressure, as the blood pressure level is inverse to the circulation of estrogen. A drop in the level of estrogen hormone disturbs the entire physiology and mechanisms they are like - reduced vascular protective effects, endothelial dysfunction which in turn leads to improper secretion of vasodilator substance nitric oxide, activation of sympathetic regulation and renin-angiotensin activity, increase in the endothelin production which is an amino acid peptide responsible for constriction of blood vessels, increase in the oxidative stress and decreased production of antioxidants.[3,10,11]

In various studies regular exercises like moderate aerobic endurance training and, dietary approaches to stop hypertension(DASH) eating plan and controlled breathing reduces the salt sensitivity thereby pulse pressure variation and blood pressure reduces in postmenopausal hypertensive women.[12] Aerobic endurance training will produce a large amount of metabolic end products which will be accumulated in the skeletal muscles, effect in the exercising muscle results in drop in the total peripheral resistance, stimulates the production of nitric oxide and prostaglandin release thereby vasodilation occurs and blood pressure lowers.[13,1415] Controlled breathing training activates the parasympathetic nervous system which decreases the heart rate and dilates the blood vessel and thus reduces the overall blood pressure.[26] Endurance training enhances the vascular endothelial capacity which thereby dilation of blood vessels occur and blood pressure is lowered, So by aerobic endurance training and DASH dietary plan it may significantly reduce the postmenopausal hypertension.[17]

AIM OF THE STUDY

To determine the effectiveness of combined aerobic endurance training with life style modification in postmenopausal stage 1hypertensive women.

OBJECTIVE OF THE STUDY

- The study is to find the effectiveness of of aerobic endurance with THR and DASH dietary plan in postmenopausal stage -1 hypertensive elderly women.

- The study is to find the effectiveness of controlled breathing with DASH dietary plan in postmenopausal stage -1 hypertensive elderly women.

NEED OF THE STUDY

- Postmenopausal hypertension is becoming a problematic symptom and major risk factor for cardiovascular diseases among the age of 50 onwards. Many studies have shown the efficacy of aerobic training in reducing the hypertension, and a few studies have showed the effectiveness of DASH dietary plan for the reduction of blood pressure in postmenopausal hypertensive women.
- None of the study have seen the effectiveness of combined DASH dietary plan with aerobic endurance training for improving the stage 1 hypertension in postmenopausal women.

Background of The Study

- Veronique A Cornelissen, Robert H. Fagard (2005) this study states that aerobic endurance training decreases ther blood pressure through the reduction of vascular resistance.
- Stephen P Juraschek (2017) this study states that reduced sodium intake and the DASH diet lowered SBP throughout the range of pre and stage-1 hypertension individuals.
- Grossman et.al (2001) states that breathing control reduces the hypertension.

METHODOLOGY

- STUDY TYPE : Experimental study
- SAMPLING METHOD : Randomised sampling
- STUDY DURATION : 5 weeks
- STUDY SETTING : Clinical setting
- SAMPLE SIZE : 30 samples

Inclusion Criteria

- Early Post menopausal period /amenorrhic for least 1 yr.
- More that 50 years of age and BMI between 25 to 27.
- Stage-1 hypertension
- No regular exercise during the preceding 2 years.

Exclusion Criteria

- ✞ Cardiovascular diseases
- ❖ Premature menopause.
- ✞ Hystrectomy
- ✞ Under treatment of hormonal therapy and medication with hypertensive drugs.
- ❖ Diabetes

OUTCOME MEASURE

- ✞ Blood pressure.

MATERIALS REQUIRED

- ✞ Manual mercury sphygmomanometer
- ✞ Stethoscope
- ✞ Pulse oximeter

Fig 2: Manual Mercury Sphygmomanometer.

Fig 3: Pulse Oximetry.

Fig 4: Stethoscope.

PROCEDURE

Blood pressure was measured at the first Screening visit for 50 hypertensive postmenopausal women with the use of standardized procedure and instrument, it was measured in left arm with a conventional mercury sphygmomanometer after the participants were seated comfortably in arm rest position, in which 35 women were ranging in stage-1 hypertension but 30 women were included to the study as they met the inclusion criteria and the rest 20 women were excluded from the study.

30 participants were randomly allotted into 2 groups, 15 women in experimental group rest 15 women in control group.

Initially they were instructed about the intervention.

Experimental Group

1 5women underwent combined aerobic endurance training and DASH dietary plan.

Aerobic endurance protocol has three phases followed by relaxation period.

Before initiatiting as well as during the exercise sessions, the resting heart rate is administered in pulse oximeter and maximum heart rate were examined for fixing an appropriate target heart rate(THR).

Aerobic training is performed at three phases

(i) Warming up phase

(ii) Conditioning phase

(iii) Cooling down phase

✞ **Warming Up Phase**

Gentle stretching exercise: Static and dynamic stretching improves flexibility and range of motion respectively for **10 minutes.**

Warming up exercises	**Hold and Repetition**
Neck side stretch	Hold for 20 sec, repeat 2 times for each side
Shoulder and upper back stretch	Hold for 20 sec, repeat 4 times
Arm swing front and across	Repeat for 15 times simultaneously with both hand
Cat and cow pose	Inhale and lift the head up for cow pose and exhale and drop head and neck for cat pose, repeat it for 10 times.
Hamstring in supine lying and quadriceps in side lying	Hold for 20 sec, repeat 2 times for each leg
Ankle rotation	10 to 20 rotation clock and counter clock wise.

✞ **Conditioning Phase**

Brisk walking on treadmill with fixed targer heart rate to 60% of the maximum heart rate, once a day for **20minutes.**

Sessions Per Week	Walking Protocol
3 sessions for 1st week	2.5 mph speed
4 sessions for 2nd week	2.5 mph speed
5 sessions for 3rdweek	3 mph speed
6 sessions for 4th week	3.2 mph speed
6 sessions for 5th week	3.2 mph speed

✞ **Cooling Down Phase**

Gentle stretching and deep breathing exercise for **10 minutes.**

Deep breathing exercise: diaphragmatic breathing and pursed lip breathing (relax the neck and shoulder muscle then inhale for 2 sec through nose keeping the mouth closed and then exhale for 4 sec through pursed lip.)

After 10minutes of termination of exercise training, resting blood pressure were examined. DASH DIATRY PLAN emphasize fruits, vegetables, low- fat daitry foods and menimising the sodium (salt) intake in daily day foods.

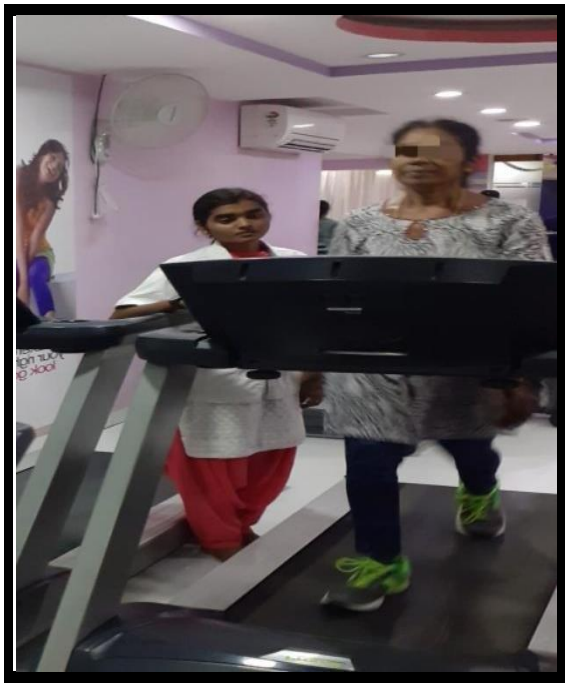


Fig. 5: Treadmill Walking.

Fig. 6: Pursed Lip Breathing.

Fig 7: Deep Breathing.

CONTROL GROUP

15 women were following the controlled breathing exercise with DASH DIETARY PLAN for 5 weeks, follow up was done once in a week for administrating the resting blood pressure.

Controlled Breathing Exercise

Controlled breathing is performed by 4 seconds of deep inspiration via the nasal cavity followed by 6 seconds of slow expiration. In this training there is only 6 cycles of breathing per minute.

Fig. 8: Controlled Breathing.

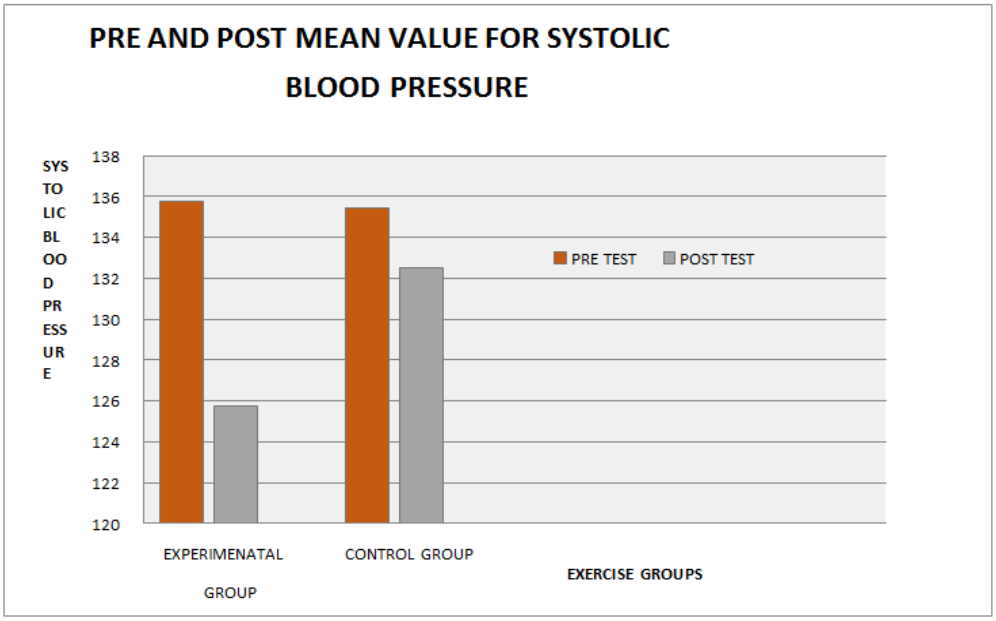
Data Analysis and Interpretation

Statistical analysis was performed by using SPSS software version 20.

SYSTOLIC BLOOD PRESSURE

Table 1: Shows The Pre And Post Values of Experimental Group and Control Group.

Exercise Groups	Mean Value		Mean Difference	Standard Deviations		t-Value	p-Value
	Pre	Post		Pre	Post		
Experimental Group	135.8000	125.7333	10.06667	1.89	1.53	21.294	0.000
Control Group	135.4667	132.5333	2.93333	2.09	2.66	9.291	0.000

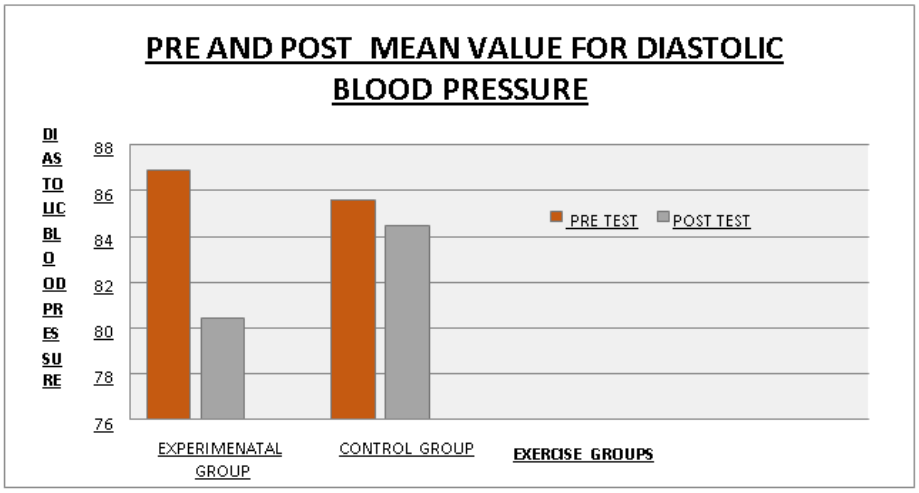


Graph 1: Pre And Post Valus of Sbp.

DIASTOLIC BLOOD PRESSURE

Table 2: Shows The Pre And Post Values of Experimental Group and Control Group.

Exercise Groups	Mean Value		Mean Difference	Standard Deviations		t-Value	p-Value
	Pre	Post		Pre	Post		
Experimental Group	86.8667	80.4000	6.46667	1.72654	2.87352	15.256	0.000
Control group	85.6000	84.4667	1.13333	1.45406	1.99523	4.795	0.000

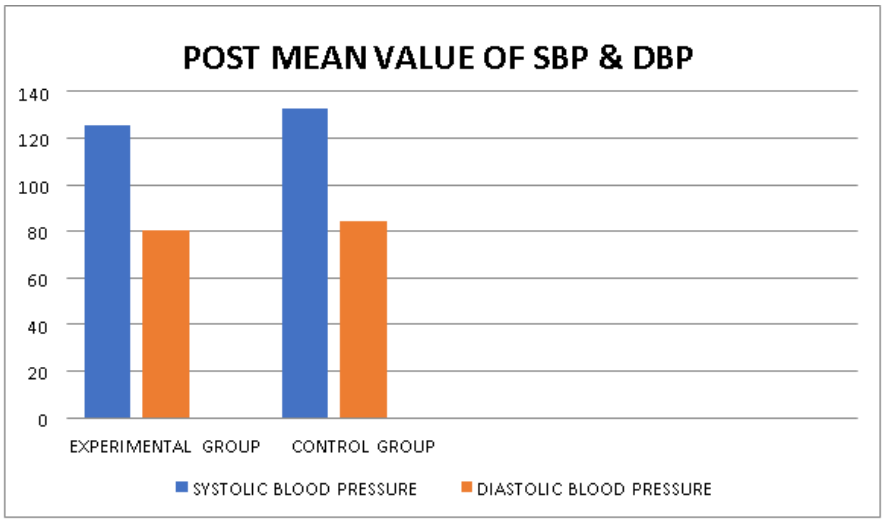


Graph 2: Pre and Post Values For Dbp.

BLOOD PRESSURE

(Table 3) Shows the post mean value of SBP and DBP in experiment and control group.

Exercise Groups	Experimental Group		Control Group	
Blood Pressure	Sbp	Dbp	Sbp	Dbp
Post Mean Value	125.7333	80.4000	132.5333	84.4667



Graph 3: Post Value of Experimental and Control Group.

RESULTS

Experimental Group

For experimental group total number of participants were 15 postmenopausal stage -1 hypertensive women.

- The t – value in postmenopausal stage-1 hypertensive for systolic blood pressure is 21.294
- The t – value in postmenopausal stage-1 hypertensive for diastolic blood pressure is 15.256
- The p – value in postmenopausal stage-1 hypertensive women for systolic blood pressure is 0.000(i.e, < 0.05)
- The p – value in postmenopausal stage-1 hypertensive women for diastolic blood pressure is 0.000(i.e, < 0.05)
- The mean difference of systolic blood pressure is 10.06667
- The mean difference of diastolic blood pressure is 6.46667

CONTROL GROUP

For control group total number of participants were 15 postmenopausal stage -1 hypertensive women.

- The t – value in postmenopausal stage-1 hypertensive for systolic blood pressure is 9.291
- The t – value in postmenopausal stage-1 hypertensive for diastolic blood pressure is 4.795
- The p – value in postmenopausal stage-1 hypertensive women for systolic blood pressure is 0.000(i.e, < 0.05)
- The p – value in postmenopausal stage-1 hypertensive women for diastolic blood pressure is 0.000(i.e, < 0.05)
- The mean difference of systolic blood pressure is 2.93333
- The mean difference of diastolic blood pressure is 1.13333.

DISCUSSION

The primary findings of this prospective, randomized controlled trial indicates the efficacy of aerobic endurance training with DASH dietary plan among postmenopausal stage-1 hypertensive women.[1,3]

There were very limited studies done for postmenopausal hypertensive women thereby this study is to examine the improvement in resting systolic and diastolic blood pressure,

postmenopausal women are at higher risk of cardiovascular complicationsin which hypertension is most common because of the estrogen deficiency and endothelial dysfunction leads to constriction of blood vessels and blood pressure surges which becomes a life threatening problem.[2,5]

Aerobic endurance training with target heart rate is moderate intensity exercise which improves the blood pumping, largely because it improves endothelial function. Endothelium is a thin layer of the cells that lines the blood vessels, these cells produce nitric oxide which keeps the vessel dilated.[16]

Exercising keeps the endothelial cells and blood vessels healthy by increasing the body's natural ability to produce nitric oxide.[10]

Several studies have shown that regular physical activity increases endothelial vasodilation among high blood pressure individuals and also improves the antioxidant activity, which helps inhibit the breakdown of nitric oxide caused by free radicals.[16,19]

Controlled breathing training has reduced hypertension, it is a slow breathing technique, few studies have speculate the repeated response to acute slow and regular breathing reverse the vascular pathology associated with hypertension.

Slow, deep breathing activates the parasympathetic nervous system which decreases the heart rate and dilates the blood vessels, thus reducing the overall blood pressure also performing regular breathing exercise will give relaxation to the brain and relieves various stress.[26]

DASH dietary plan reduces the salt sensitivity as this diet includes reduction in the salt content (less 2.4 g/day) and walking for 30 minutes will improve the cardiovascular system and reduces the high blood pressure.[12,17]

Therefore combined aerobic endurance training with target heart rate and DASH dietary plan and controlled breathing training shows improvement among postmenopausal stage 1 hypertensive elderly women, but when compare to control group, experimental group showed statistically significant improvement in stage1 hypertension postmenopausal women. This proves that combined aerobic endurance training with target heart rate and life style modification effectively reduces the systolic and diastolic blood pressure among postmenopausal stage 1 hypertensive women.

CONCLUSION

This study concluded that both the group showed significant reduction of resting diastolic blood pressure and systolic blood pressure in postmenopausal stage- 1 hypertensive elderly women. But when comparing both the groups individually, experimental group showed statistically more significant reduction of resting diastolic blood pressure and systolic blood pressure when compared to the control group in postmenopausal stage-1 hypertensive elderly women.

LIMITATION AND RECOMMENDATION

Limitation

- Small sample size
- Short duration
- Long term effect of the treatment is not seen

Recommendations

- Further studies should increase the sample size
- Treatment could be given for long duration of time
- Longterm effect has to be assessed with these treatment.

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REFERENCES

1. F.Al- Azzawi "The menopause and its treatment in perspective" postgrad medical journal, 2001; 77: 292-304.
2. Nikolaos lionakis, Dimitrios Mendrinos68 "hypertension in the elderly". World journal cardiology, 2012; 26: 135-47.
3. Sangeetha salhotra, Sarika Arora "Influence of menopause in biochemical markers of endothelial dysfunction".Maturitas, 2009; 20; 62(2): 166-70.
4. Yi- yuan lin, Shin-Da Lee "cardiovascular benefits of exercise training in postmenopausal hypertension". International journal of molecular science, 2018; 19: 3390; 2523.
5. Franklin lin H. Epstein "The protective effects of estrogen in cardiovascular system". Mechanism of disease, 2018; 340: 23.
6. Mohammad Talaei "Association of elevated blood pressure and stage 1 hypertension with cardiovascular mortality among Asian populations". The American heart association, 2018; 10: 7(8).
7. Paual K. whelton, Robert M Carey "Guideline for the prevention, detection, evaluation and management of high blood pressure in adult". The American heart association, 2017; 23976: 10.
8. Prashant shridar Bagdey, Juveria Ahfas Ansari "Prevalence of epidemiological factors associated with hypertension among post menopausal women". Clinical Epidemiology and global health, 2019; 7,02.008.
9. Malthias Barton "postmenopausal hypertension". The American heart association, 2009; 54: 11-18.
10. Seiji MAEDA, Takumi "moderate regular exercise increases basal production of nitric oxide in elderly women". (Hypertension research, 2004; 27: 947-953.
11. Takeshi otsuki "Nitric oxide and decreases in resistance exercise blood pressure with aerobic exercise training in older individuals". Original research, 2019; 10: 1204.

12. Stephen. P. Juraschek "Effect of sodium reduction and DASH diet in reduction to baseline blood pressure". Journal of the American college of cardiology, 2017; 12; 70(23): 2841.
13. Khalid Tahayassin "Effect of exercise training on postmenopausal hypertension: implications on nitric oxide levels". Original article, 2014; 68: 6.
14. George. A Kelly and Kristi Sharpe Kelly "Aerobic exercise and resting blood pressur in older adults". The journal of gerontology: series A, 2001; 56(5).
15. R.A Preston "Effects of blood pressure reduction on cardiovascular risk estimates in hypertensive postmenopausal women". Journal of climacteric, 2007; 10.
16. Veronique. A.Cornelissen "Effects of endurance training on blood pressure, blood pressure regulating mechanism and cardiovascular risk factors". The American heart association, 2014; 46: 667-675.
17. Sachin Akita (2015) "Effect of dietary approaches to stop hypertension(DASH) diet on the pressure natriuresis relationship". The American heart association, 2015; 42: 8-13.
18. ChikaraGoto "Effect of different Intensities of exercise on endothelium dependent vasodilation". circulation journal, 2015; 108: 530.
19. ChikaraGoto, Kenji Nishioka "Acute moderate intensity exercise induces vasodilation through an increase in nitric oxide bioavailability in human". American journal of hypertension, 2007; 20: 825;830.
20. Doughlas. R.seale "Effect of regular aerobic exercise on elevated blood pressure in postmenopausal women". American journal of cardiology, 1997; 80: 49-55.
21. Dubbert PM "Endurance exercise in mild hypertension: effect on blood pressure and associated and quality of life variables". Journal of hum hypertens, 1994; 8: 265-272.
22. Moreau KL, et.al "Increasing daily walking lowers the blood pressure in postmenopausal women". Medicine and science in sports and exercise, 2001; 33(11): 1825-31.
23. Versari D, et.al "Endothelial dysfunction as a target for prevention of cardiovascular diseases". Diabetes care, 2009; 32: 314-21.
24. Barton M and MR Meyer "postmenopausal hypertension :mechanism and therapy". Hypertension, 2009; 54: 11-8.
25. Sherman S. "Defining the menopausal transition". The American journal of medicine, 2005; 118: 3-7.
26. Grossman et.al "Breathing- control lowers blood pressure". Journal of human hypertension, 2001; 15: 263-269.