

## Research Article

### Effect of Garlic, Ginger, and Exercise on Lipid Profile in Healthy Postmenopausal Women

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#### Abstract

**Background:** Coronary artery disease (CAD) is a significant health problem and attains one of the highest susceptibilities among women population. It risks women of every age, but it is more evident after the onset of menopause.

**Objective:** The objective of the study was to assess the effect of garlic, ginger extracts alone and with aerobic exercise on cardiovascular disease (CVD) risk in post-menopausal women.

**Methods:** A total of 160 post-menopausal women aged (50-60 years) fulfilling the inclusion criteria were randomly recruited equally into four groups: G=1. Garlic supplement, G=2. Ginger supplement, G3=Ginger +aerobic exercises, G4=Garlic +aerobic exercise group. Baseline body mass index (BMI), body fat %, and lipid profile took before and after 16 weeks. The Ginger group used ginger extract 1000 mg/day and garlic group used 900mg/day; G3 used the same amount of garlic with aerobic exercise, Group 4 used the same amount of ginger with aerobic exercise. Combined groups performed aerobic exercises at 50-60% heart rate intensity, 30min/days for five times/week.

**Results:** Body weight, body mass index and body fat %, level of cholesterol, low-density lipoprotein, and triglyceride significantly reduced in the combination therapy of garlic and exercise versus any single treatment group ( $p<0.05$ ). Moreover, the garlic demonstrated superior effects vs. ginger alone ( $p<0.05$ ).

**Conclusion:** It was concluded that 16 weeks of combination therapy of garlic and exercise were found useful in CVD prevention. However, ginger alone failed to demonstrate any significant effects.

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#### Introduction

Menopause is considered to be a well-known risk factor for cardiovascular disease and can lead to disturbing metabolic parameters.<sup>1</sup> Changes in reproductive hormones affect the metabolic system as well vascular functions of the body due to an increased level of homocysteine in women after

menopause such as an increase in obesity tendency, diabetes mellitus, hypertension, endothelial dysfunction.<sup>2</sup> There are impaired lipid metabolism disturbance and increased risk of oxidative stress and associated cardiac malfunction. Cardiovascular disease (CVD) is a complex and multifactorial disease characterized by elevated serum lipids and triglycerides, cholesterol, increases plasma fibrino-

gen, and coagulating factors with increased platelet production or activation, disturbance in glucose metabolism.<sup>3,4</sup>

There are lots of strategies used to prevent cardiovascular risk factors,<sup>5</sup> especially aerobic exercises as improved cardiopulmonary endurance, improved physical fitness, significantly reduce cardiovascular disease risk.<sup>6</sup> Previous studies suggest that regular fitness exercise training also affects endothelial function, which increases vasodilatory enzymes hence improve vasodilatation and keep blood pressure at an optimum level both in CV diseased and non-diseased individuals.<sup>7</sup> Diet can play a crucial role in reduction and treatment CVD risk in suspected population as there are phytochemicals which produce beneficial effects in postmenopausal women.<sup>8,9</sup>

Garlic is considered to be originated in Asia. It is used widely and universally as a flavoring component of food, also as medicine and functional food to improve physical and mental health. It has been suggested to be useful in the treatment of heart disorders.<sup>10</sup> It is also considered to have a role in the reduction of cancer and other chronic diseases,<sup>11</sup> and inflammatory disorders.<sup>11,12</sup> It also has analgesic, antipyretic, antibacterial, and hypoglycemic effects.<sup>13</sup> Garlic and ginger both have a role in the reduction of blood pressure, keeping blood cholesterol low, and maintaining healthy blood flow, also help in the reduction of CVD.<sup>14</sup> Aged garlic prepared from garlic that has been aged at room temperature is considered beneficial more than fresh garlic for CVD.<sup>10</sup>

After menopause, it suggested that the chances of CVD increased. The underlying mechanism and effects of ginger, garlic, and aerobic exercises are known, so the study aimed to investigate the effects of diet and exercise therapy on body weight and lipid profile of postmenopausal women.

## Methods

In this randomized controlled interventional study, 160 women were enrolled who experienced menopause from 2 years, were not using any hormonal therapy or suffering from the diet, significant health issues. They were selected from the general population of Punjab (Pakistan) from public health centres and gynecology clinics. Exclusion criteria were women with a history of any cardiovascular problem, diabetes, and deep venous thrombosis (DVT). The sample size was calculated through G power analysis

software (Heinrich-Heine-University, Düsseldorf, Germany), with power 90%, effect size 0.25 and  $\alpha$  level of 0.05. The estimated sample size was 160, but 10% of participants were added due to drop out factor and included 177 subjects, but 17 females dropped as they suffered from the vascular problem, knee osteoarthritis. One hundred sixty females aged 50-60 years were divided equally into four groups; G=1. garlic supplement, G=2. ginger supplement, G3= ginger +aerobic exercises, G4=garlic+ aerobic exercise group. The ginger group used ginger extract 1000mg/day and garlic group used 900mg/day; G3 used the same amount of garlic with aerobic exercise, Group 4 used the same amount of ginger with aerobic exercise. Combined groups performed aerobic exercises at 50-60% heart rate intensity, 30min/days for five times/ week. Measurements were taken at baseline and after 16 weeks. Weight, height, body mass index (BMI), body Fat% (assessed by Tanita body composition analyzed), lipid profile including low-density lipoprotein (LDL), high -density lipoprotein (HDL), triglyceride (TG), total cholesterol (TC) and homocysteine as CVD markers. Height and weight equation used to measure BMI. Fasting Blood samples were taken and send to a laboratory for lipid profile. After taking baseline measurements, women were educated about their treatment regimen. Women in the garlic intervention group were asked to take 900mg/day garlic with water. Ginger intervention group were asked to take 1000 mg/day ginger<sup>15</sup> with water daily for 16 weeks, and combination therapy group women were asked to perform aerobic exercise at 50-60% heart rate intensity, 30 mint five times/ week in the respective group of therapies. The compliance of participants was ensured by regular reminders to follow the instructions and meet the follow-up plans.

Data represented as mean and standard deviation. Data were analyzed to measure the effect of diet and exercise on BMI, body fat percentage, and lipid profile by two way ANOVA with repeated measures. Bonferroni posthoc test was used to assess the effects among groups. SPSS version 23 (SPSS Inc., Chicago, IL) for a window was used for analysis. Statistical significance was set at  $p < 0.05$ .

## Results

At baseline, there was no difference in all groups. However, after 16 weeks, a statistically significant reduction was seen in weight, body fat%, and BMI in garlic alone and garlic combined therapy group as

**Table 1:** Participant characteristics at before and after the study

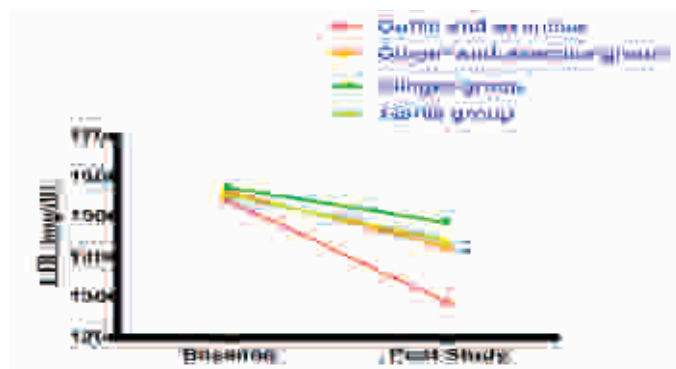
	Garlic and exercise		Garlic group		Ginger group		Ginger and exercise	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Age (Years)	56.6±4.9	----	53.8±2.7	-----	55.8±4.1	-----	54.3±5.1	----
Height (Cm)	152±7.2	----	153±6.2	----	154±6.1	----	156±4.2	----
Weight (Kg)	78.5±1.1	70.5±1.4*	75.7±1.4	71.8±1.4*	73.7±1.2	72.9±.9	67.7±1.1	64.9±1.3
BMI	27.5±1.5	24.9±1.2*	26.7±1.4	24.5±1.3*	25.6±1.7	25.4±1.3	23.9±1.8	22.5±1.7
Fat (%)	32.3±1.7	29.5±1.3*	33.3±1.9	31.1±1.5*	34.1±1.8	33.1±1.5	32.9±1.9	31.3±1.1

Mean and SD \*P < 0.05 compared to baseline. (Applied repeated measures ANOVA)

compared to ginger alone and ginger exercise group ( $p < 0.05$ ). No difference observed in Ginger, ginger, and exercise group (Table 1).

### Effect on Lipid profile:

At baseline, there was no difference in all groups. However, after 16 weeks, total cholesterol (TC) and low-density lipoprotein (LDL) was decreased significantly in all groups except in the ginger group (Fig 1). However, there were no significant changes in found high-density lipoprotein (HDL) and triglyceride (TG) (Table 2).



**Fig 1:** LDL in Different Groups at Baseline and Post-Study

**Table 2:** Changes in Lipid Profile in different Groups at Baseline and Post-Study after 16 Weeks

	HDL (mg/dl)	TC (mg/dl)	TG (mg/dl)
Garlic and exercise			
Pre	55.6±3.5	237.1±16	214.8±4.2
Post	59.1±3.6	201.2±9.8*	185.1±30.5
P-value	0.23	0.00	0.10
Garlic group			
Pre	55.8±2.7	234.8±17	204.4±45
Post	58±4.1	220.1±8*	192.7±35
P-value	0.25	0.001	0.19
Ginger group			
Pre	55±3	235.9±18	217.6±38
Post	56.8±4.6	228.3±13	203.6±34
P-value	0.32	0.09	0.15
Ginger and exercise			
Pre	54.7±3.1	236.8±17	215.6±48
Post	57.3±3.3	214.8±10*	197.8±33
P-value	0.31	0.035	0.14

Mean and SD. \*sig. difference compared to the pre-study level. (Applied repeated measures ANOVA)

### Discussion

The current study aimed to observe the effect of 16 weeks intervention program including garlic, ginger supplementation and in combination with exercise on body composition and lipid profile. The outcome measures were weight, BMI, body fat%, serum lipid, hormones (homocysteine) level, and vascular functions as these factors are considered to be associated with increased susceptibility of CVD. Results of the study showed that garlic or garlic combination therapy had a profound effect on BMI, Fat %, weight, LDL, TC, and homocysteine concentration. Menopause also a risk factor for CVD in women. In these women, there is an increase in weight, fat %, total cholesterol, and endothelium dysfunction resulting in narrowing of vessels as well as decrease dilation of the vessel due to vessel wall elasticity disturbance.

All changes can be controlled by different interventions, including hormone therapy<sup>16</sup> diet<sup>8</sup> and exercise.<sup>17</sup> Aged garlic can be used as supplements for weight reduction and blood-thinning agents. Garlic lowers blood level of LDL, TC, and TG concentration and also helped in body weight management.<sup>18,19</sup>

Ginger was used previously as a blood pressure-lowering agent as it thought to act as a calcium channel blocker.<sup>15</sup> Increase weight and hormonal imbalance after menopause lead to fat accumulation and hypercholesteremia in the body. The aerobic exercise involved dynamic physical activity, which helps in managing weight, lipid blood level, and their complications.<sup>6,20</sup>

Increased Homocysteine (5-15 μmol) not only causes the symptom of CVD but a risk factor for atherosclerosis.<sup>2</sup> Data also concluded that aged garlic reduced the homocysteine level by increasing Hydrogen sulphide (H<sub>2</sub>S) in the body.<sup>21,22</sup> It suggested that an individual should change their living behaviours to reduce risk factors after menopause.<sup>6</sup>

Garlic and exercise both reduced levels of homocysteine associated atherosclerosis effects in combination and separately. Garlic and Ginger separately studied for fat reduction, lipid, TC reduction, and hormonal balance for 16 weeks. Results showed that garlic had a significant effect on lipid profile versus



ginger.

Aerobic exercises are considered an effective therapy for fitness, functional capacity, hormonal balance, weight reduction, and anxiety.<sup>23</sup> The low glycemic diet was also found useful in managing postpartum obesity.<sup>24</sup> There is a need to investigate whether it would be more useful to manage weight in women if combined therapy of low glycemic diet, garlic therapy, and exercise is used. In the current study, diet and exercises were used as prophylactic in menopausal females to improve hormonal balance to minimise low oestrogen hormone side effects and other CVD risks. It is therefore, garlic and exercise therapy is suggested to have a beneficial effects on cardiovascular disease reduction.

### Conclusion:

It is suggested that combination therapy of garlic and exercises is effective in CVD prevention and should be included in a normal diet routine.

### References

- Morselli E, Santos RS, Criollo A, Nelson MD, Palmer BF, Clegg DJ. The effects of oestrogens and their receptors on cardiometabolic health. *Nat Rev Endocrinol.* 2017; 13(6):352-364.
- Ganguly P, Alam SF. Role of homocysteine in the development of the cardiovascular disease. *Nutrition.* 2015; 14(1):6-7.
- Somani YB, Pawelczyk JA, De Souza MJ, Kris-Etherton PM, Proctor DN. Aging women and their endothelium: Probing the relative role of estrogen on vasodilator function. *Am J Physiol Heart Circ Physiol.* 2019; 317(2):395-404.
- Yuan F, Dong H, Gong J, Wang D, Hu M, Huang W. A Systematic Review and Meta-analysis of Randomized Controlled Trials on the Effects of Turmeric and Curcuminoids on Blood Lipids in Adults with Metabolic Diseases. *Adv Nutr.* 2019; 10(5):791-802.
- Cobin RF, Goodman NF. American association of clinical endocrinologists and American college of endocrinology position statement on menopause. *Endocr Pract.* 2017;23(12):869-879.
- Asghari M, Mirghafourv M, Mohammad-Alizadeh-Charandabi S, Malakouti J, Nedjat S. Effect of aerobic exercise and nutrition education on quality of life and early menopause symptoms: A randomized controlled trial. *J Womens Health.* 2017;57(2):173-188.
- Pescatello LS, Buchner DM, Jakicic JM, Powell KE, Kraus WE, Bloodgood B. Physical Activity to Prevent and Treat Hypertension: A Systematic Review. *Med Sci Sports Exerc.* 2019; 51(6):1314-1323.
- Prentice RL, Aragaki AK, Van Horn L, Thomson CA, Beresford SA, Robinson J. Low-fat dietary pattern and cardiovascular disease: results from the Women's Health Initiative randomized controlled trial. *Am J Clin Nutr.* 2017;106(1):35-43.
- Brandhorst S, Longo VD. Dietary Restrictions and Nutrition in the Prevention and Treatment of Cardiovascular Disease. *Circ Res.* 2019;124(6):952-965.
- Pérez-Torres I, Torres-Narváez JC, Pedraza-Chaverri J, Rubio-Ruiz ME, Díaz-Díaz E, Del Valle-Mondragón L. Effect of the Aged Garlic Extract on Cardiovascular Function in Metabolic Syndrome Rats. *Molecules.* 2016;21(11):1-15.
- Arreola R, Quintero-Fabián S, López-Roa RI, Flores-Gutiérrez EO, Reyes-Grajeda JP, Carrera-Quintanar L. Immunomodulation and anti-inflammatory effects of garlic compounds. *J Immunol Res.* 2015;15(1):1-13.
- Zare E, Alirezaei A, Bakhtiyari M, Mansouri A. Evaluating the effect of garlic extract on serum inflammatory markers of peritoneal dialysis patients: a randomized double-blind clinical trial study. *BMC Nephrol.* 2019;20(1):26-9.
- Thomson M, Al-Qattan KK, Js D, Ali M. Anti-diabetic and anti-oxidant potential of aged garlic extract in streptozotocin-induced diabetic rats. *BMC Complement Altern Med.* 2016;16(1):17-19.
- Chen C, Zhang Q, Wang FQ, Li CH, Hu YJ, Xia ZN. In vitro anti-platelet aggregation effects of fourteen fruits and vegetables. *Pak J Pharm Sci.* 2019; 32(1): 185-195.
- Tabibi H, Imani H, Atabak S, Najafi I, Hedayati M, Rahmani L. Effects of ginger on serum lipids and lipoproteins in peritoneal dialysis patients: a randomized controlled trial. *Perit Dial Int.* 2016;36(2):140-5.
- Hale GE, Shufelt CL. Hormone therapy in menopause: An update on cardiovascular disease considerations. *Trends Cardiovasc Med.* 201;25(6):540-9.
- Orri JC, Hughes EM, Mistry DG, Scala AH. Is Vigorous Exercise Training Superior to Moderate for CVD Risk after Menopause?. *Sports Med. Int. Open.* 2017;1(05):66-71.
- Sun YE, Wang W, Qin J. Anti-hyperlipidemia of garlic by reducing the level of total cholesterol and low-density lipoprotein: A meta-analysis. *Medicine.* 2018;97(18):255-7.
- Ebrahimi T, Behdad B, Abbasi MA, Rabati RG, Fayyaz AF, Behnod V. High doses of garlic extract significantly attenuated the ratio of serum LDL to HDL level in rat-fed with hypercholesterolemia diet. *Diagn Pathol.* 2015; 11(1):74-7.
- Buchanan DT, Landis CA, Hohensee C, Guthrie KA, Otte JL, Paudel M. Effects of Yoga and Aerobic Exercise on Actigraphic Sleep Parameters in Menopausal Women with Hot Flashes. *J Clin Sleep Med.* 2017; 13(01):11-18.
- Weber GJ, Pushpakumar S, Tyagi SC, Sen U. Homocysteine and hydrogen sulfide in epigenetic, metabolic and microbiota related renovascular hypertension. *Pharmacol Res.* 2016;113(1):300-312.
- Bradley JM, Organ CL, Lefer DJ. Garlic-Derived Organic Polysulfides and Myocardial Protection. *J Nutr.* 2016;146(2):403-9.
- Elkington TJ, Cassar S, Nelson AR, Levinger I. Psychological Responses to Acute Aerobic, Resistance, or Combined Exercise in Healthy and Overweight Individuals: A Systematic Review. *Clin Med Insights Cardiol.* 2017; 11(1): 1-23.



24. Basharat S, Gilani SA, Bashir S, Qamar MM. Effect of Low Dietary Glycemic Index on Blood Lipids Profile among Obese Postpartum Women. Annals of KEMU. 2017;23(2):162-8.