

EFFECT OF SOYBEAN DIET ON SERUM LIPIDS AN LIPOPROTEINS OF POSTMENOPAUSAL WOMEN

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ABSTRACT

Background: To investigate the effect of soybean on serum lipids and lipoproteins in hypercholesterolemic postmenopausal women.

Methodology: One hundred participants were included and divided randomly into two arms. One arm received two grams of soy every day, while the other group received similar shaped capsules filled with placebo. Subjects and outcome assessors were kept blind to the contents of the capsules. Serum cholesterol, triglyceride and low- and high-density lipoproteins were measured before and after the intervention.

Results: The two groups were similar in their baseline characteristics. We observed no favorable changes in lipid profile in either of the two groups. The two arms of the study responded similarly to the intervention and no statistically significant difference was observed between these responses.

Conclusion: This double-blind randomized controlled trial does not support the hypothesis that the use of soybean improves serum lipid constituents in postmenopausal women having hypercholesterolemia.

KEYWORDS: Soybean, Postmenopausal.

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INTRODUCTION

Menopause is defined as the permanent cessation of menstruation and reproductive capability, but this is only one of the many clini-

cal and psychological aspects of this state.¹ Menopause may be presented by irregular menstruation followed by termination of menstruation. Reduction in sexual hormones affects different tissues and organs which result in various clinical and psychological conditions such as flushing, excitability and osteoporosis.¹ Cardiovascular diseases (CVD) are the leading cause of death among postmenopausal women in developed countries.² Hypoestrogenemia is a risk factor for CVD in postmenopausal women and it may be easily treatable with hormone replacement therapy (HRT).³ High serum lipids and lipoproteins also play a role in the formation of atherosclerosis and coronary artery diseases (CAD) which lead to CVD.

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There is evidence that estrogen reduces serum low-density lipoproteins (LDL) and increases serum high-density lipoproteins (HDL). Together with the lowering serum total cholesterol levels, this delays the development of CVD. In the premenopausal women, this leads to a lower incidence of CVDs compared to men of the same age. In postmenopausal women, this effect is mimicked by administration of HRT. Dietary estrogens, also known as phytoestrogens are a diverse group of naturally occurring non steroidal plant compounds that have structural similarities with estradiol and have estrogenic effects. The best-researched phytoestrogens are isoflavones, which are commonly found in soy.

The incident of CVD and hormone-related cancers (breast and prostate) is lower in Asian than in Western countries; this is at least partly attributed to consumption of soy.^{4,5} Effect of soybean on serum lipids and lipoproteins has been investigated since mid-twentieth century. Sachs was among the first authors to publish reports proving a lipid lowering effect of soybean phosphatides in animal models.^{6,7} Studies have shown that substituting animal protein and fat with soybean products has favorable effects on serum lipids, biliary lipids and fecal steroids in normal and diabetic subjects.^{8,9}

The effect of soybean on serum lipid profile of postmenopausal women hasn't been studied very broadly yet. Two double-blind randomized clinical trials (RCT) have suggested that soybean doesn't have a significant favorable effect on blood lipids.^{10,11} Ironically, a newer RCT with cross-over design depicted that soy proteins improve blood pressure and LDL in postmenopausal women.¹²

METHODOLOGY

We included 50 hypercholesterolemic postmenopausal women in each arm of this double-blind randomized clinical trial. Subjects were randomly selected from a group of hypercholesterolemic postmenopausal women who were previously referred to the gynecology clinics of Lorestan University of Medical Sciences. They were included only if they didn't use lipid-lowering drugs and had no history of cardiovascular, respiratory or renal diseases. Salt and fat diets were not considered as inclusion or exclusion criteria in this study.

Consenting participants were introduced to the nature of the study in the initial visit and were randomly assigned to either arm of the study. Enough number of capsules was given to each participant; this capsule either contained 500mg soy powder or placebo and the participant was unaware of the contents of the capsule. Subjects were required to take two capsules in the morning and two in the evening and continue this procedure for 12 weeks. Subjects were provided with more capsules if needed. Appropriate administration of capsules was ensured through follow up visits.

Demographic data was recorded in the initial visit. Serum cholesterol, triglyceride (TG), LDL and HDL were measured before the administration of capsules and after the 12th week. Normal values used were as follows: total cholesterol < 200mg/dL, TG < 150mg/dL, LDL < 130mg/dL and HDL > 40mg/dL. Data was stored digitally and analyzed using t-test and a p-value less than 0.05 was considered as statistically significant. The process of the study was approved by the ethics committee of Lorestan University of Medical Sciences.

Table-I: Baseline characteristics of the two groups of the study

	<i>Soy group</i>	<i>Placebo group</i>	<i>P-value</i>
Age (years)	57.7 ± 6.58	57.6 ± 6.08	0.937
Serum total cholesterol (mg/dL)	240.6 ± 82.51	239.5 ± 73.26	0.944
Serum triglyceride (mg/dL)	163.8 ± 76.75	150.6 ± 48.94	0.303
Serum LDL (mg/dL)	43.8 ± 4.77	44.5 ± 3.49	0.404
Serum HDL (mg/dL)	128.8 ± 28.61	131.0 ± 34.38	0.729

*LDL, Low-density lipoprotein; HDL, high-density lipoprotein.

Table-II: Differences in serum lipids and lipoproteins before and after intervention.
Values are presented as mean \pm standard deviation

		<i>Before intervention</i>	<i>After intervention</i>
Soy group	Serum total cholesterol (mg/dL)	239.50 \pm 67.29	236.82 \pm 72.26
	Serum triglyceride (mg/dL)	150.62 \pm 48.94	159.64 \pm 42.64
	Serum LDL (mg/dL)	131.04 \pm 24.38	134.26 \pm 23.89
	Serum HDL (mg/dL)	44.54 \pm 3.49	44.54 \pm 3.52
Placebo group	Serum total cholesterol (mg/dL)	240.60 \pm 82.51	241.92 \pm 82.40
	Serum triglyceride (mg/dL)	163.80 \pm 76.75	182.86 \pm 75.50
	Serum LDL (mg/dL)	128.80 \pm 28.49	140.24 \pm 28.61
	Serum HDL (mg/dL)	43.82 \pm 4.77	43.84 \pm 4.84

*LDL, Low-density lipoprotein; HDL, high-density lipoprotein.

RESULTS

Our participants were aged between 45 and 71 years with mean \pm standard deviation (SD) equal to 57.66 \pm 6.33 years. The two arms of the study were similar regarding their age or baseline serum lipids (Table-I). Comparing the serum levels of cholesterol, TG, LDL and HDL before and after the 12 weeks of intervention showed that in both arms of the study no significant changes were made in response to the intervention (Table-II).

Comparing these insignificant changes across the two arms of the study showed that the two groups have reacted similarly to the intervention and there was no statistically significant difference between the changes of serum lipids and lipoprotein across the two the arms of the study (Table-III).

DISCUSSION

Our findings suggest that soy intake alone doesn't have favorable effect on serum lipids and lipoproteins. This is consistent with the results of two major double-blind RCTs conducted in similar populations.^{10,11} Engelman et al noted that unlike other studies, they observed no change in serum LDL in the group taking soy; they attributed this different result to the different nature of subjects (postmenopausal women) as well as taking baseline data into consideration.¹⁰ We believe the same reasoning applies to our findings too.

Dent et al had similar results to ours, reporting no difference in circulating lipids after consumption of soy protein for 24 weeks.¹³ Additionally, Hsu et al reported that supplementation of postmenopausal women with 150mg isoflavones for six months resulted in no

Table-III: Comparison of changes in serum lipids and lipoproteins after intervention between the two arms of the study

		<i>Mean difference</i>	<i>P-value</i>
Before intervention	Serum total cholesterol (mg/dL)	1.10	0.944
	Serum triglyceride (mg/dL)	13.18	0.308
	Serum LDL (mg/dL)	-2.24	0.674
	Serum HDL (mg/dL)	-0.72	0.391
After intervention	Serum total cholesterol (mg/dL)	5.10	0.339
	Serum triglyceride (mg/dL)	23.22	0.061
	Serum LDL (mg/dL)	5.98	0.258
	Serum HDL (mg/dL)	-0.70	0.410

*LDL, Low-density lipoprotein; HDL, high-density lipoprotein.

significant change in serum lipids.¹⁴ These results suggest that postmenopausal women don't benefit from soy supplementation, with regards to their lipid profile. It was suggested that this effect may also depend on the lipidemic state of the subjects,¹⁰ our results indicate that such a relation is not present and the effect of soy protein is the same for hypercholesterolemic postmenopausal women.

Engelman et al also found out that soy phytate may not have an antioxidant effect beneficial for hyperlipidemic subjects.¹⁰ They claimed that this effect was observed in previous animal studies but couldn't be duplicated in human studies, due to a different dosing of soy consumption.

The Food and Drug Administration (FDA) has approved the daily intake of 25 g soy protein due to its cardioprotective effect.¹⁵ There is an increase in the consumption of soy and its products which is in general consistent with the current recommendation to increase fiber and antioxidant intake and replacement of saturated fat and cholesterol in diet.⁴ However, there is no clear answer to questions such as the optimal dosage or possible gender differences. In particular, the extent to which postmenopausal women will benefit from this dietary change is still unclear.

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REFERENCES

1. Maturana MA, Irigoyen MC, Spritzer PM. Menopause, estrogens and endothelial dysfunction: current concepts. *Clinics* 2007;62:77-86.
2. Wren BG. The benefits of oestrogen following menopause: why hormone replacement therapy should be offered to postmenopausal women. *Med J Aust* 2009;190:321-5.
3. Grady D, Rubin SM, Petitti DB, Fox CS, Black D, Ettinger B, et al. Hormone therapy to prevent disease and prolong life in postmenopausal women. *Ann Intern Med* 1992;117:1016-37.
4. Tham DM, Gardner CD, Haskell WL. Clinical review 97: Potential health benefits of dietary phytoestrogens: a review of the clinical, epidemiological and mechanistic evidence. *J Clin Endocrinol Metab* 1998;83:2223-35.
5. Beaglehole R. International trends in coronary heart disease mortality, morbidity and risk factors. *Epidemiol Rev* 1990;12:1-15.
6. Sachs BA, Danielson E, Burack B, Leiter L. In vitro and in vivo effects of inositol phosphatide (lipositol) fraction of soybean on serum lipids and lipoproteins. *J Appl Physiol* 1958;13:381-4.
7. Sachs BA. Effect of soybean phosphatides on serum lipids and lipoproteins. *Am J Clin Nutr* 1960;8:337-9.
8. Duane WC. Effects of soybean protein and very low dietary cholesterol on serum lipids, biliary lipids, and fecal sterols in humans. *Metabolism* 1999;48:489-94.
9. Ristic Medic D, Ristic V, Arsic A, Postic M, Ristic G, Blazencic Mladenovic V, et al. Effects of soybean D-LeciVita product on serum lipids and fatty acid composition in type 2 diabetic patients with hyperlipidemia. *Nutr Metab Cardiovasc Dis* 2006;16:395-404.
10. Engelman HM, Alekel DL, Hanson LN, Kanthasamy AG, Reddy MB. Blood lipid and oxidative stress responses to soy protein with isoflavones and phytic acid in postmenopausal women. *Am J Clin Nutr* 2005;81:590-6.
11. Kreijkamp-Kaspers S, Kok L, Grobbee DE, de Haan EH, Aleman A, Lampe JW, et al. Effect of soy protein containing isoflavones on cognitive function, bone mineral density and plasma lipids in postmenopausal women: A randomized controlled trial. *JAMA* 2004;292:65-74.
12. Welty FK, Lee KS, Lew NS, Zhou JR. Effect of soy nuts on blood pressure and lipid levels in hypertensive, prehypertensive and normotensive postmenopausal women. *Arch Intern Med* 2007;167:1060-7.
13. Dent SB, Peterson CT, Brace LD, Swain JH, Reddy MB, Hanson KB, et al. Soy protein intake by perimenopausal women does not affect circulating lipids and lipoproteins or coagulation and fibrinolytic factors. *J Nutr* 2001;131:2280-7.
14. Hsu CS, Shen WW, Hsueh YM, Yeh SL. Soy isoflavone supplementation in postmenopausal women. Effects on plasma lipids, antioxidant enzyme activities and bone density. *J Reprod Med* 2001;46:221-6.
15. Kirk P, Patterson RE, Lampe J. Development of a soy food frequency questionnaire to estimate isoflavone consumption in US adults. *J Am Diet Assoc* 1999;99:558-63.