

“Effects of Isoflavones on Lipid Profiles and Lipid Peroxidation of Hypercholesterolemic Post Menopausal Women”

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Abstract: The study has been conducted to evaluate the effects of isoflavone, a non-steroidal phytoestrogen, on lipid and lipid peroxidation in hypercholesterolemic postmenopausal woman hypercholesterolemic postmenopausal women (n=22) showed significant reduction of lipid levels and lipid peroxidation product formation on oral administration of forty milligram of isoflavone daily for three months. Total cholesterol and LDL-cholesterol were reduced significantly ($p<0.001$) with an increase in HDL-cholesterol. Our study observed reduction of triglyceride in 50% cases while the rest showed a little elevation. Interestingly, isoflavone intake group with hyperlipidemia showed less lipid peroxidation (malonaldehyde formation) than the isoflavone untreated groups with hyperlipidemia (n=30) or without hyperlipidemia (n=25) confirming the antioxidant activity of isoflavone. Thus it provides a similar action like ‘statin’ group of lipid lowering agents (HMG coA reductase inhibitor). Such results indicate that isoflavone has immense beneficial effect on human health.

Key Words : *Isoflavone, hyperlipidemic postmenopausal woman, lipid profile, lipid peroxidation, antioxidant action, lipid lowering agent.*

Introduction

Isoflavones are ‘flavonoid’ class of compounds derived from plant sources having weak estrogenic activities. They are nonsteroidal phytoestrogen and act as partial agonist or antagonist for mammalian estrogen and also possess the property of natural selective estrogen receptor modulator (SERM). They also have many other beneficial effects on human health. Genstein, Daidzein, Glycetin are the main isoflavones present in legumes like soyabeans, lentils, beans, chickpeas etc. Postmenopausal women, lacking in estrogen, usually have a hypercholesterolemic state and imbibe the danger of vascular damages leading to heart disease, hypertension etc. Epidemiological studies on hormone replacement therapy in post menopausal women show the favourable effects of estrogen on reduction of the risk of coronary heart diseases with a cardioprotective role.^{1,2,3}

The present study emphasizes the role of isoflavones in the management of lipid profile and oxidative stress, as monitored by lipid peroxide formation in hypercholesterolemic postmenopausal women stressing the fact that isoflavones provide a similar action like ‘Statins’ group of drug (HMG CoA reductase inhibitor), which are used as a lipid lowering agent.

Materials and Methods

Fifty two (52) hypercholesterolemic post menopausal women were selected from the menopausal clinic of the department of Obstetric & Gynecology of IPGME & R and SSKM hospital, Kolkata, of them were taken as *controls* receives only vitamins and minerals for three months while remaining (22) received 40mgs of isoflavone daily for three months and constituted the ‘*study group*’.

Twenty five (25) postmenopausal women with normal lipid profile were also selected as basal group. Isoflavones were supplied by British Biologicals for clinical trial and also as Soy-Estro Capsule of Gland Chemical Pvt Ltd. Chemicals used were of analytical

grade material of Glaxo and Sigma Chemicals.

Assay of lipid profiles : Serum triglycerides were assayed following the principle of Fossati et al and Mc. Gown et al in a digital spectrophotometer^{5,6}. Total cholesterol was assayed by Ferric percholate reaction and the lavender colour complex was measured at 560nm in a spectrophotometer⁷. HDL-cholesterol was assayed with the supernatant after precipitation of VLDL and LDL in serum by magnesium chloride and phosphotungstic acid reagent. LDL-cholesterol was determined by using Friedewalds formula.

Assay of lipid Peroxidation product : Malonaldehyde, a lipid peroxidation product, was assayed in serum by thiobarbituric acid reaction. The colour complex was measured at 532nm in a digital spectrophotometer⁸. Results of different assays were statistically evaluated by student ‘t’ test and significant ‘p’ values were given in the table.

Results

Table 1 shows the changes in lipid profile in hypercholesterolemic postmenopausal women after intake of isoflavone (40mg daily) for three months. A significant reduction in total cholesterol and LDL-cholesterol in peripheral blood ($p<0.001$) is observed. Triglyceride level is little bit higher in the treated group than that

Table 1. Lipid Profile in Hypercholesterolemic Postmenopausal women at baseline and changes after 3 months of Isoflavone intake.

Treatment status	Total cholesterol (mmol/L) Mean+SD	HDL-C (mmol/L) Mean+SD	LDL-C (mmol/L) Mean+SD	Triglyceride (mmol/L) Mean+SD
which isoflavone (n=52)	8.5+0.30	2.73+0.15	4.8+0.20	1.82+0.25
with isoflavone (n=22)	5.4+0.50*	2.34+0.12	1.9+0.20*	2.27+0.18

P values = $p<0.001$, * - Significant

of the postmenopausal hyperlipidemic women without isoflavone intake.

Table 2 shows the maximum and minimum levels of lipid profiles at base as well after three months intake of isoflavones. The treated group shows eighty percent reduction in total cholesterol and ninety per cent reduction in LDL-cholesterol among the total cases in a significant way ($p < .001$) and there is increase HDL-cholesterol in thirty per cent cases. As regard to triglyceride content fifty per cent of total cases shows decrease from the base line value and the rest fifty per cent shows increase from the base line value.

Table 2. Maximum and minimum levels of Lipid Profile in hypercholesterolemic Postmenopausal women at baseline and changes after 3 months of Isoflavone intake

	Total cholesterol (mmol/L)	HDL-C (mmol/L) Range:	LDL-C (mmol/L) Range:	Triglyceride (mmol/L) Range:
Baseline (n=52)	5-15	1.30-4.48	1.52-9.59	0.56-5.6
Change after 3 months of Isoflavone intake (n=22)	4.54-7.5 (% reduction-80% cases)	1.52-3.60 (% increase 30% cases)	2.0-3.92 (% reduction 90% cases)	0.55-5.40 (% increase/decrease 50% each case)

Table 3 shows the result of lipid peroxidation formation, malonaldehyde in hypercholesterolemic postmenopausal women treated with isoflavone. Interestingly, malonaldehyde formation, (an index of oxidative stress- for peroxidation of poly-unsaturated fatty acids) in hypercholesterolemic post menopausal women, show less lipid peroxidation formation when they are treated with isoflavone showing the antioxidant activities of isoflavone.

Table 3. Lipid peroxidation product formation in hyperlipidemic postmenopausal women with or without Isoflavone intake (Anti-Oxidant action of Isoflavone)

Groups	Malonaldehyde formed (nmol/ml) Mean + SD
1. Postmenopausal women with normal lipid profile (age 45-55 yrs) without Isoflavone (n=25)	1.47 + 0.25
2. Postmenopausal women with hyperlipidemia without Isoflavone (age 45-60 yrs.) (n=52)	2.07 + 0.38
3. Postmenopausal women with hyperlipidemia + 40mg. Isoflavone intake daily for 3 months (age = 45-60 yrs.) (n=22)	0.63 + 0.20

* - p value : $p < 0.001$, significant

Discussion

Hypercholesterolemia increases the degradation of nitric oxide, an important modulator of endothelial function. Improvement in endothelial function is demonstrated in hypercholesterolemic patients, treated with the statin group of drugs (lipid lowering agent, HMG-reductase inhibitor)^{9,10}. The present study shows that isoflavone intake for three months by hypercholesterolemic postmenopausal

women has a significant ($p < .001$) reduction in total cholesterol and LDL-cholesterol concentration in peripheral blood. Furthermore, 50% of the study group showed decrease in triglyceride level while the rest shows a little elevation. Similar observations have made by earlier workers; the latter also observed been that they also up regulate LDL-receptors in liver and increase bile acid synthesis and reduce lipoprotein-a (Lp (a)) levels.^{11,12,13}

The present study reveals that malonaldehyde formation (an index of oxidative stress) is also counteracted by isoflavone because structural similarities with estradiol. It prevents lipid peroxidation product formation responsible for causing atherosclerosis in hypercholesterolemic postmenopausal women. Isoflavone derived from *dietary soya* is less expensive as compared to statin group of drugs and is of immense help in prevention of hyperlipidemia in postmenopausal women as well as in slowing down the process of atherosclerosis due to less oxidative stress phenomenon. Moreover, when hormone replacement therapy is contraindicated, isoflavone may find a place for its substitute.

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