

OUTCOMES OF SOY PROTEIN CONSUMPTION ON THE BIOCHEMICAL  
PARAMETERS OF PLASMA IN HUMAN VOLUNTEERS -  
POSTMENOPAUSAL WOMEN

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**ABSTRACT :**

In the recent decade the pre and post menopausal complications and symptoms are increasing alarmingly posing a multidisciplinary intervention. Various chronic & temporary diseases in postmenopausal women are caused by rapid changes in hormones and stressful conditions and are accompanied by rapid changes in body composition (muscle, bone, and fat). In order to maintain a healthy body composition and overall well being the post menopausal women in the ageing society are ingesting high quality protein foods these days. Literature is proving the beneficial effects of soy protein in post menopausal women as soy proteins are rich in isoflavones. Nutrigenomics and personalized nutrition are taking big seat in treating the subjects. But there is limited /no public data available on the consumption of soy protein – and its impact on various plasma parameters. In conjunction with this, the present study was aimed at the impact of various types of soy proteins on the plasma parameters of female human volunteers aged 45± 7 years mean age being 45 years for a period of 12 weeks. The present study is showing hypoglycemic effect and has impact on lipid profile with less significant changes on proteins, but much intensive research has to be done to establish the results

**Keywords:** Plasma, Pre menopause, Post menopause, Soy proteins, Isoflavones, plasma parameters , glycemic index, lipid profile

## Introduction

The findings of the Women's Health Initiative resulted in a sharp decline in the use of estrogen therapy to treat menopause transitional phase and menopausal women. In the recent past it was observed that the menopausal women were interested in ingestion of soya meal as it was considered as an alternative to estrogen therapy for the treatment of menopausal symptoms. The evaluation of the effectiveness of soy foods / textured soy protein to ease the vasomotor and urogenital symptoms analysis studies are scarce, and a small number of them are presented in this article. Due to marginal number of trials detailing the disputing results, the substantiation of the effectiveness of Glycine max protein to ameliorate menopausal symptoms is limited.

## Review of the Literature

The soya bean protein and the flavones contained in soy proteins can enhance muscle and bone density and quality and lower the body weight. The soy protein was found to be productive in preventing low bone mass and low muscle mass and a rise in BMI that may occur after menopause. (1), Soya protein has significant effect on lipid profile(2) it decrease cholesterol and triglyceride levels, which is beneficial for systemic metabolism and cardiovascular health. Recent epidemiological evidences and experimental data from animal studies strongly support the useful outcomes of isoflavones in averting various chronic diseases (3,4).Soybeans contain 12 types of isoflavones (5,6) and the content of soy isoflavones can vary from 50mg/100g to 300 mg/100 g of Glycine max seed protein (7). Soy phytoestrogens have been reported to lessened the bone density loss from the lower part of the spinal column in perimenopausal women (8), to lower blood cholesterol levels (9, 10, and 11) and to have antioxidant properties *in vivo* and *in vitro* experiments (12, 13).Attributable to these potential of edible bean isoflavones ,it is mentioned in a few studies that it has the helpful results on averting and attenuation in chronic diseases such as cancers (14) cardiovascular diseases (15), osteoporosis (16) and menopausal symptoms (17, 18). soya bean oils are rich with poly unsaturated fatty acids predominantly with the essential fatty acid – linoleic acid and smaller amounts of  $\alpha$ - linoleic acid (19)The unsaturated fatty acid of soy, such as n-3 long-chain polyunsaturated fatty acids, enables improvement in blood glucose level and insulin resistance ( 20 ). The research studies also established the consequences of soy foods on the endocrine status of the post menopausal women.(21) Soy can also improve the metabolic health of postmenopausal women( 22) In laboratory animals, dietary soy protein intake is associated with obesity, decreased blood glucose and insulin, and improved lipid distribution and insulin sensitivity, so this shows that soy isolates are effective in improving obesity ( 23,24,25) Despite of the reality that the studies on soy bean meal remains at issue (26) as a source of protein rich food , it is important for maintaining bone density in postmenopausal women. Soya meal has cholesterol reduction function and effectively balance gut microbiome, shifting the gut microflora constitution towards an augmentation in Lactobacilli, Bifidobacterium, and Firmicutes to Bacteroidetes ratio (27) Soy isoflavone intake led to a reduction in both the transaminases - Alanine trasminase and Aspartate transaminase ( 28)

## Menopausal symptoms

In the process of the commencing years of menopause women many a time experience episodes of temperature dysfunction leading to nocturnal hyperhidrosis, somatic indicators such as weariness, myalgia, and vulvovaginal atrophy, and emotional signs such as irritability, impatience, unhappiness, low libido, and insomnia. The prevalence, rigorousness, and the time span of changes in gonadal hormone features vary according to the population (29).The manifestations can begin during the menopausal transformation up to two years before the cessation of menstruation. The mean time scale of hot flashes is six months to five years, although 20% of females go on with symptoms into their 70s and 80s.Chronic sleep insufficiency, constantly recurring fatigue and impulsive were found to occur due to the horning in night flashes with sleep. Estrogens were productive in lowering the frequency and criticality of these indicators and are commonly used as positive controls in clinical trials. Nevertheless the handling of climacteric symptoms has changed considerably since the publication of the WHI results in 2002 (30). Fair segments of Post menopausal women now report of holistic approach; four score percentage of women aged 45–60 old announce the usage of nonprescription therapies to get along the menopausal symptoms (31). Soya trading in US has expanded from 300 million dollars in 1992 to 4.5 billion dollars in 2009 (32) designating its significance. The substantial growth was seen in soy-based meat alternatives like soymilk and tofu.Soy Protein is currently the subject of extensive research, mainly because it is a unique and abundant source of isoflavones. There is no public data available on the soy protein – and its impact on the plasma parameters that in turn may have positive effects to combat the post menopausal symptoms. Soyprotein often exhibits a beneficial outcome on the bone health.

## Subjects for the study

A 12 weeks preliminary study has been conducted on two groups ( sample size of 24 subjects) of human female post menopausal volunteers, were considered for the analysis each group consisting of twenty four members (Group I was used as controls who doesn't use soy protein , Group II were Soy food users ). All volunteers, were of 43-50 years old (mean age 45±3 years) residing in Hyderabad, Telangana state who have attained menopause and are showing one or few symptoms of post menopause have showed that the ingestion of soja in systematic basis had a potential effect on various parameters of plasma.

**TABLE1: CHARACTERISTIC FEATURES OF STUDY PARTICIPANTS**

| Parameter  | Group          |                   |
|--|----------------|-------------------|
|  | Control        | Soy protein users |
| Number (n)   | 24             | 24                |
| Age (years) & Gender                                   | 45 ±3 (female) | 45 ±3 (female)    |
| Soy protein (gm/day)                                   | Not used       | 15-20 gm          |
| Period of Soy protein use in diet                      | Not applicable | 60 days           |
| Subjects suffering from any Chronic diseases/illnesses | Nil            | Nil               |

Values are expressed as Mean ± SEM, n=24 Data were subjected to student 't' test

\* Values represent the differences between groups which are statistically striking at  $P \leq 0.05$ .

The 12 week design comprised of subjects consuming a controlled diet containing the assigned 20 gms of textured protein in their daily breakfast indifferent edible forms, the miracle bean was supplied to subjects as per nutritional guide lines and assessed for plasma parameters where as Controls (age, sex and diet matched) who did not use any soy protein in their were selected for the study. A written consent form was secured from the study subjects selected for the study after explaining to them the experimentation procedure thoroughly. This study was approved by the institutional ethical committee. Blood samples from overnight fasted subjects were used for the study. It was also ensured that all the participants in the current study did not suffer from any chronic disease or illness and is teetotalers with no smoking habit and free from use of any tranquillizers, drugs and anesthetics.

**TABLE: 2 TYPES SOY PROTEINS GIVEN TO THE SUBJECTS**

| S.No | Week  | Type of Glycine max         |
|------|-------|-----------------------------|
| 1    | 1 &7  | Boiled & seasoned soy seeds |
| 2    | 2 &8  | Soya milk                   |
| 3    | 3&9   | Soya chunks curry           |
| 4    | 4&10  | Tofu                        |
| 5    | 5 &11 | Soya nuts                   |
| 6    | 6& 12 | Soya sprouts                |

### Methodology:

#### Blood collection

Blood was drawn from human female volunteers by venipuncture between 7 to 10 AM into heparinized test tubes and was analyzed immediately for plasma, red cell and platelet analysis. Biochemical studies using plasma included mainly determining the concentration of glucose, amino acids, triglycerides, cholesterol, HDL, LDL, VLDL, phospholipids, glycolipids, nitrites, nitrates, plasma lipid peroxidation, iron, proteins, albumins, globulins, A/G, C/P ratios, SGOT, SGPT. Plasma glucose was estimated by using Monozyme diagnostic kit, originated from the method of Tinder, (1969). Free amino acids in plasma were estimated by using the method of Moore and Staen, (1948) Total protein content in the plasma was estimated by using Biuret method of Reinhold, (1953). Plasma albumin and globulin were estimated by the method described by Wotton, (1974).Lipid Profile by Kit method

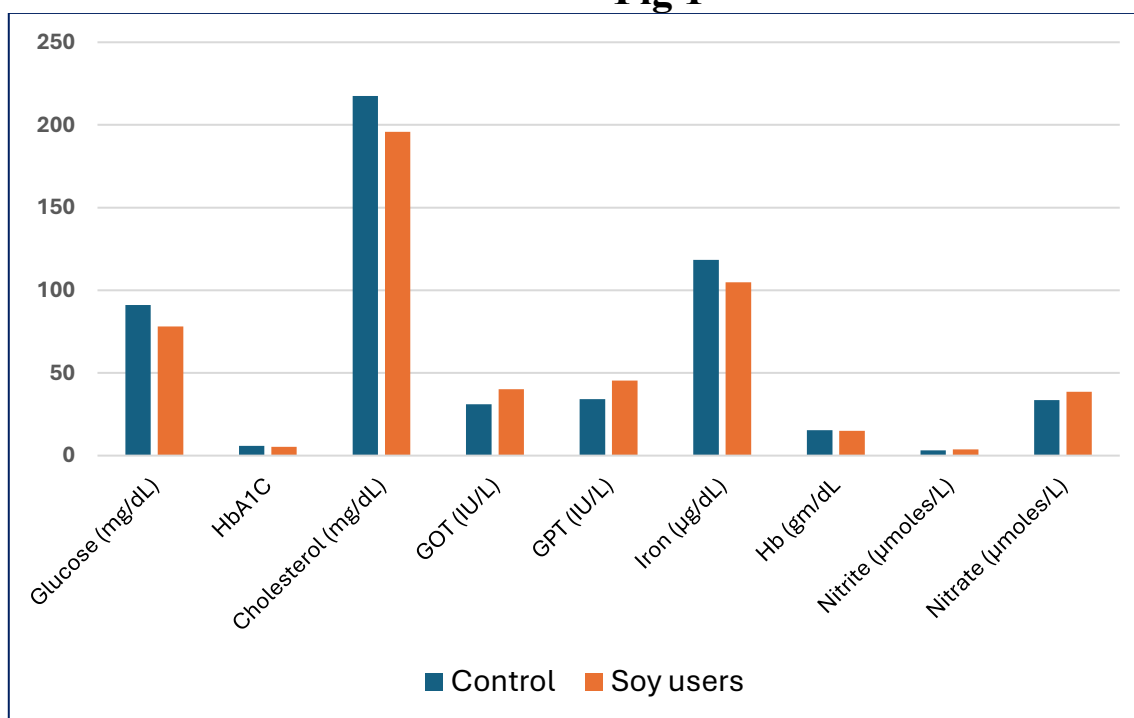
**Table- 3: Levels of glucose, HbA<sub>1C</sub>, Cholesterol, Transaminases, Iron, Hb, Nitrite and Nitrates in plasma of controls and Soy food Users.**

| Parameter           | Group       |                   |
|---------------------|-------------|-------------------|
|                     | Control     | Soy protein users |
| Glucose (mg/dL)     | 91.09±2.68  | 78.03±1.95*       |
| HbA <sub>1C</sub>   | 5.80±0.21   | 5.22±0.19*        |
| Cholesterol (mg/dL) | 217.50±4.25 | 195.78±5.20*      |
| GOT (IU/L)          | 31.13±3.10  | 40.18±1.85*       |
| GPT (IU/L)          | 34.09±2.55  | 45.30±3.28*       |
| Iron (µg/dL)        | 118.32±4.66 | 104.81±3.98*      |
| Hb (gm/dL)          | 15.40±1.40  | 14.90±1.28        |
| Nitrite (µmoles/L)  | 3.09±0.08   | 3.81±0.05*        |
| Nitrate (µmoles/L)  | 33.59±0.11  | 38.69±0.40*       |

Values are expressed as Mean ± SEM, n=24 Data were subjected to student 't' test

\* Values represent the differences between groups which are statistically notable at  $P \leq 0.05$ .

**Fig 1**



**Figure-1 Levels of glucose, HbA<sub>1c</sub>, Cholesterol, Transaminases, Iron, Hb, Nitrite and Nitrates in plasma of controls and Soy protein Users.**

Soy protein use in postmenopausal female human volunteers on the concentrations of plasma glucose, HbA<sub>1c</sub>, Cholesterol, Iron, Hb and activities of GOT and GPT and the concentrations of nitrite and nitrate in plasma of soy protein users and control subjects who do not use Soyprotein at all. There has been a reduction in the concentration of glucose (14.33%), HbA<sub>1c</sub> (10%), Cholesterol (9.98%), Iron (14.1%), and Hb (9.2%) followed by an increment in the levels of plasma nitrite (18%) and nitrate (15%) in soy protein using subjects when compared to controls. Increased activities of plasma GOT (22%) and GPT (32.88%) in soy protein users were also observed in the present work.

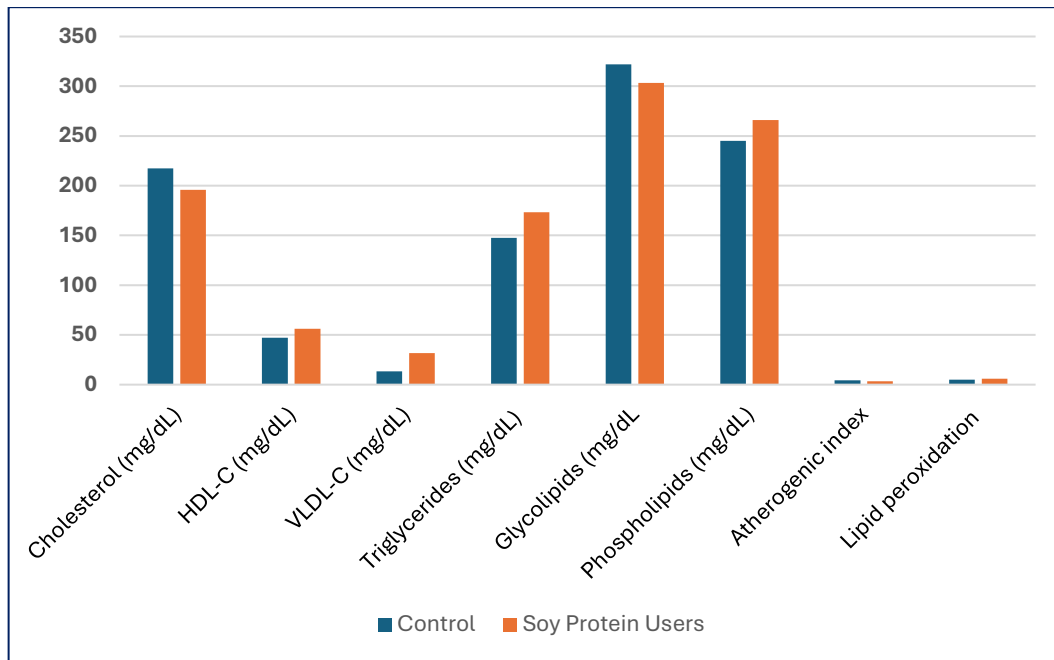
**Table-4 Results of Soy proteins use on plasma lipids, lipoprotein patterns and LPO**

| Parameter                            | Group       |                   |
|--------------------------------------|-------------|-------------------|
|                                      | Control     | Soy protein users |
| Cholesterol (mg/dL)                  | 217.50±4.25 | 195.78±5.20*      |
| HDL-C (mg/dL)                        | 47.23±2.93  | 56.17±2.46*       |
| LDL-C (mg/dL)                        | 67.48±3.67  | 56.78±3.32*       |
| VLDL-C (mg/dL)                       | 13.42±1.84  | 31.73±2.14*       |
| Triglycerides (mg/dL)                | 147.60±6.32 | 173.40±5.26*      |
| Glycolipids (mg/dL)                  | 322.09±4.25 | 303.35±4.58*      |
| Phospholipids (mg/dL)                | 245.10±3.38 | 266.08±4.21*      |
| Atherogenic index                    | 4.41±0.75   | 3.48±0.54*        |
| Lipid peroxidation (µmoles of MDA/L) | 5.11±0.32   | 5.97±0.12         |

Values are expressed as Mean ± SEM, n=24 Data were subjected to student 't' test

\* Values represent the differences between groups which are statistically significant at  $P \leq 0.05$ .

**Figure-2 Results of Soy proteins use on plasma lipids, lipoprotein patterns and LPO**



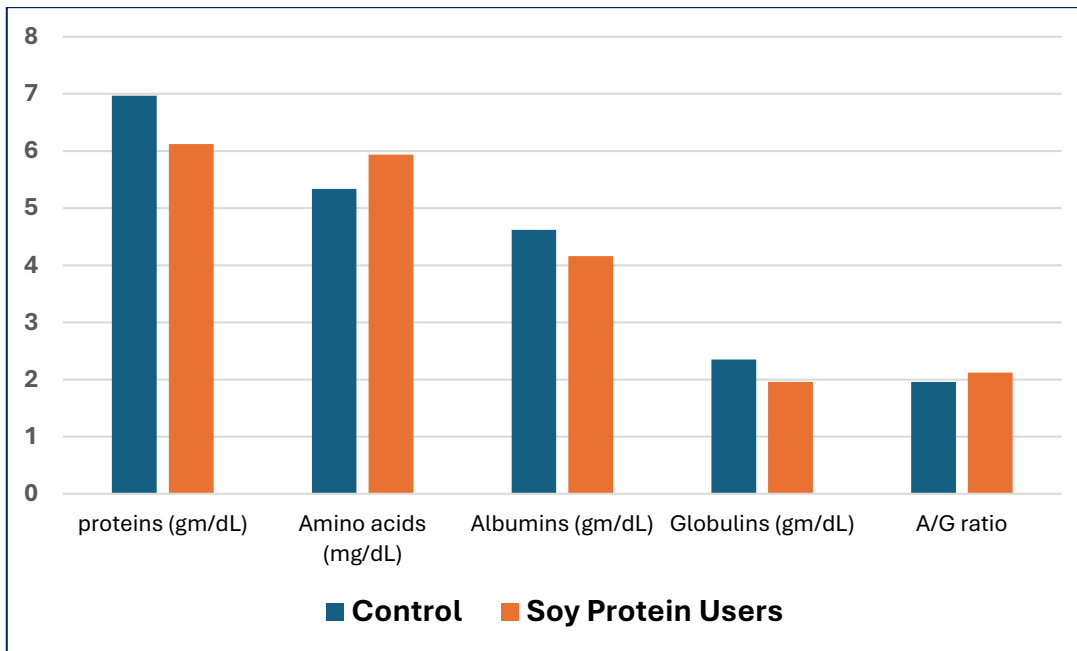
**Table- 5 Outcomes of Soya use on plasma proteins and amino acid content**

| Parameter           | Group     |                   |
|---------------------|-----------|-------------------|
|                     | Control   | Soy protein users |
| proteins (gm/dL)    | 6.12±0.27 | 6.97±0.31         |
| Amino acids (mg/dL) | 5.94±0.22 | 5.34±0.18         |
| Albumins (gm/dL)    | 4.16±0.14 | 4.62±0.16         |
| Globulins (gm/dL)   | 1.96±0.11 | 2.35±0.12         |
| A/G ratio           | 2.12      | 1.96              |

Values are expressed as Mean ± SEM, n=24 Data was subjected to student 't' test

\* Values represent the differences between groups which are statistically important at  $P \leq 0.05$ .

**Figure-3 Outcomes of Soya use on plasma proteins and amino acid content**



### Discussion

The present study is showing hypoglycemic effect and has impact on lipid profile with less significant changes on proteins, but much intensive research has to be done to establish the results.

The limitations of the present study comprise diminutive sample size, minimal duration, and the usage of discrete soya foods that carry varied portions of soy phytoestrogens, and the study subjects are in the age range or who vary in the amount and severeness of menses cessation manifestations therefore, the study has to be ratified and should be extended more than 12 weeks to assess the conservational consequences on plasma parameters.

To conclude, it can be acknowledged that post menopausal signs are frequent, despite the fact that their prevalence differs based on the population under study. The facts of the ongoing research can lessen the usage of hormone replacement therapy among post menopausal females which own lot of side effects as per the various published reports. An escalation in the eating of soya and soya supplements rich with Genistein, Daidzein, Glycitein isoflavones for handling the menopausal issues is encouraging as per current study.

But few works appraised the efficacy of soya in the improvement of vasomotor and genital signs have been piloted globally and have employed a diverse soya foods holding distinct amounts of isoflavones have shown denial outcomes. To deduce and taking into consideration of the contradictory consequences provided by insignificant number of studies, the virtue of soya isoflavones in the betterment of menopausal symptoms remains ambiguous.

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