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Do Phytoestrogens Improve Bone Density in Post-Menopausal Women – A Case Control Study

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Abstract: ***Isoflavone phytoestrogen therapy has been proposed as a natural alternative to hormone replacement therapy (HRT). HRT has a beneficial effect on bone, but few trials in humans have investigated the effects of isoflavones on bone. The objective of the study was to determine the effect on bone density of isoflavone supplementation in post-menopausal women. A total of 106 women were divided into 2 groups (isoflavone group and placebo group) out of which 94 women completed the study duration. At the end of 1 year we have found that BMD at hip increased from -1.20 ± 0.31 to -1.08 ± 0.32 and BMD at spine increased from -1.32 ± 0.34 to -1.20 ± 0.33 in the isoflavone group and this was a statistically significant improvement. This suggests that isoflavones may be beneficial in attenuating age-associated bone loss in post-menopausal women.***

Keywords: Post menopause, Phytoestrogens, Isoflavones, Bone density

1. Introduction

Menopause is characterized by a decrease in estrogen, which triggers the uncomfortable symptoms of hot flushes, night sweats, sleep disturbances, and vaginal dryness. The symptoms of menopause as a result of decreasing estrogen levels can significantly affect quality of life [1]. While hormone replacement therapy (HRT) effectively reduces vasomotor symptoms associated with the decrease of estrogen levels during menopause, it is associated with increased risk of venous thromboembolism (VTE), breast cancer and cardiac events. Estrogens play an important role in skeletal homeostasis, and ovarian hormone deficiency is one of the most important risk factors for osteoporosis. Phytoestrogens are plant compounds with estrogen-like properties [2]. The two major classes of phytoestrogens are isoflavones and lignans. There is much interest in the use of phytoestrogens to treat menopausal symptoms, in part because vasomotor symptoms are much less frequently experienced by Asian women than by women in America or Europe, and because the Asian diet being rich in phytoestrogens may be an important contributing factor [3]. Similarly rates of hip fracture in Asian populations, whose traditional diets are rich in soy, are substantially lower than those in whites residing in the United States. In humans, some cross-sectional studies in Asian populations reported significant positive associations between soy protein or isoflavone intakes and bone mineral density (BMD) [4,5].

In the current study we aimed to determine the effects of consuming isoflavone supplement for 1 year on the BMD of the lumbar spine and hip in post-menopausal women.

2. Material and methods

The study is a prospective randomised case control study which was conducted from June 2014 to August 2016. A total of 106 post-menopausal women are included in the study. Randomisation was performed based on random charts and throughout the study blinding of both the patients and observer was maintained. Women with past or family history of breast cancer, VTE and previous hip or vertebral fractures or surgery were excluded.

Participants were randomly assigned to receive daily either a isoflavone supplementation powder 30 gms/ day (Protein(28 G) , Carbohydrate(55 G) , Vitamin E(300 IU) , Vitamin K(100 Mcg) , Vitamin D(10 Mcg), Isoflavone(1500IU) (Meno pro, British biologicals, India) or a placebo of identical appearance (which contained similar ingridients except for isoflavones for 1 year. Bone density and body composition were assessed by dualenergy X-ray absorptiometry (DEXA) at baseline and after 12 months with the use of anHologicQDR-4500A scanner. Individual scans of the lumbar spine (L1–L4), hip (femoral neck, trochanter, and intertrochanteric region), and whole body were taken.

All statistical analysis is done with SPSS 12.0 software and p value of >0.05 is considered significant.

3. Results

Base line demographic data and other parameters are shown in table 1.

Table 1: Comparison of baseline parameters among the 2 groups (Isoflavone group and placebo group)

Parameter	Isoflavone group (n-47)	Placebo group (n-47)	P value
Age	57.04 ± 3.32 yrs	56.27 ± 3.85 yrs	>0.05
Post menopausal< 2 yrs	15	14	>0.05
Post menopausal> 2 yrs	32	33	>0.05
BMD Spine T Score	-1.32 ± 0.34	-1.32 ± 0.36	>0.05
BMD Hip T Score	-1.20 ± 0.31	-1.18 ± 0.30	>0.05

Difference between two groups for all comparable parameters is found to be non-significant (P value > 0.05). A total of 12 women, 6 from each group have withdrawn from the study before completion of 1 year duration. Changes in spine and hip BMD at 1year in both groups are shown in table 2.

Table 2: Comparison of change in BMD at hip and spine by the end of 1 year among the 2 groups

Parameter	BMD at Hip			P value	BMD at Spine			P value
	Beginning	After 1 yr	Change		Beginning	After 1 yr	Change	
Isoflavone group	-1.20 ± 0.31	-1.08 ± 0.32	0.12 ± 0.01	0.002	-1.32 ± 0.34	-1.20 ± 0.33	0.11 ± 0.01	0.010
Placebo group	-1.18 ± 0.30	- 1.17 ± 0.28	0.01 ± 0.00	0.12	-1.32 ± 0.36	-1.28 ± 0.30	0.04 ± 0.01	0.15

Changes of spine BMD as well as hip BMD were significant in the isoflavones group.

4. Discussion

One of the consequences of aging is the progressive loss of bone-mineral density, a process that accelerates during perimenopause and increases fracture risk. Estrogens help maintain normal bone mineral density, and it has been hypothesized that phytoestrogens may confer similar benefits. Numerous phytoestrogens including isoflavones and others have been reported to have bone sparing effects in the rat but efficacy appears to depend on dose, route and duration of administration, and, to some degree, the animal model employed [6,7]. In the current study we evaluated the effects of isoflavones on bonemineral density of post-menopausal women.

Potter et al [8] previously reported an increase in lumbar spine BMC and BMD among postmenopausal women whose diets were supplemented daily for 24 wk with soy protein isolate providing 90 mg/d. In our study, we did not see an increase in BMC or BMD with the isoflavone supplement, but the daily dose of isoflavones was lower than that used by Potter et al [9]. However, in a study of perimenopausal women, Alekel et al [9] did not see an increase in lumbar spine BMC or BMD with a daily dose of 80.4 mg isoflavones (as soy protein) for 24 wk, but, similar to our study, they saw a reduction in the extent of bone loss. In a recent study of 28 premenopausal women there were no significant effects of a soy protein supplement that provided either 0 or 90 mg isoflavones/d for 12 months [10]. This suggests that isoflavones may be beneficial in attenuating age-associated bone loss rather than in enhancing peak bone mass in younger premenopausal women.

Because of both the structural similarity of isoflavones to mammalian estrogens and their ability to bind to estrogen receptors [11], it is widely hypothesized that the actions of isoflavones are mediated via the estrogen receptors. However, the exact mechanism of action of isoflavones on bone remains to be fully elucidated. In our study though the BMD at hip as well as spine didn't increase in any of the groups, there has been significant positive effect of isoflavones on the BMD at both hip and spine. The strength of our study is that it is a randomised case control study. However the sample size and inability to study other bone turnover markers remain the main weakness of our study.

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