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The Impact of Soy Milk toward Perimenopause Syndrome and Estrogen Hormone Level among Women Older Than 50 Years in Semarang, Indonesia

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ABSTRACT

Background: Menopausal symptoms have an important impact on daily activities, social life and sexual life of menopausal women that require more respect, attention, and an intensive care especially in relation to food consumption and physical activity. Soy isoflavones, which are chemical compounds found in soy, have estrogen-like effects and may help reduce hot flashes and other symptoms of menopause. This study investigated whether soy milk can impact the perimenopause syndrome among women older than 50 years in Semarang, Indonesia.

Methods: In a quasi-experimental research with a pre-test and post-test study design, data was collected by using simple random sampling among 81 respondents who were involved in this study; while 24 women belonged to intervention group and 57 females were assigned to control group. The frequency distribution, average and standard deviation were employed to describe independent variables.

Results: Educational level had a significant contribution to perimenopausal syndrome symptoms (p=0.001). The age and hormonal levels showed a significant contribution to perimenopausal syndrome symptoms too (p=0.064 and p=0.097, respectively). The control and experimental groups had significant differences regarding estrogen hormone level (p=0.05).

Conclusion: This study concluded that soy milk intake could increase estrogen level and reduce complaints of perimenopause syndrome which was also influenced by age and educational level too.

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Introduction

In human life span, menopause is the normal aging process that subjects women (48-60 of age) (1). It occurs when the ovaries stop its function and the production of peptide hormones, steroid, and estrogen are decreased (1). During this period, around 75% of menopause women have several symptoms during that stage including extreme discomfort, such as joint pain, dryness, fever, sweating, burning, and irritation; sexual symptoms such as urgency, dysuria, and recurrent urinary tract infections (1). In addition, during the transition

stage, menopause is stressful too (1). Low estrogen level in menopause often result in vasomotor symptoms, atrophy of the vaginal epithelium, and bone loss. Most menopausal symptoms are relieved or disappear with estrogen therapy; thus, until recently, symptoms have been primarily managed with hormone therapy (1). The findings of increased risk of breast cancer and cardiovascular complications revealed the correlation with estrogen/progestin arm (2, 3), and with hormone therapy (1, 4).

Therefore, the best strategic to reduce the problem during menopause stage must be conducted. However, different complaints during menopause stage, several factors are associated with early and late menopause including socio-economic conditions, general health and lifestyle, nutritional status and physical activity (5-8). To minimize these complaints, it was shown that daily exercise and consuming phytoestrogen-rich diets and soy foods can be beneficial (9-11). Soy foods have been consumed by Asian populations for centuries. Many soy foods are sources of the essential omega-3 (n–3) fatty acid α-linolenic acid (12, 13). Soy milk is made from soybeans and milk possessing many essential ingredients (14, 15). Other soy products, such as tofu and tempeh, are not milk alternatives but are part of the protein foods group. Tofu is made from condensed soy milk and is lower in calories and half the fat of tempeh, but it has half the protein and almost no fiber compared to tempeh. Tempeh is made from fermented soybeans and is higher in protein than tofu due to the additional legumes, grains, seeds, and nuts used to make tempeh. Tempeh has more calories and fat than tofu, but it is a good source of protein and fiber and has a naturally nutty flavor (15, 16). Soy milk may be added with calcium, vitamin A, vitamin D, riboflavin, and vitamin B12, but it does not offer the same nutritional value as dairy milk, which has 13 essential nutrients. The isoflavone from soy milk may be responsible to enhance triglycerides level, induce slight change in HDL, and possess higher antioxidant capacity, and helps prevent estrogen deficiency in postmenopausal woman (11, 15, 16). Estrogenic and antiestrogenic effects of isoflavones were shown in rodents before and the possibility that isoflavone-rich soy foods can be especially helpful to women transitioning through menopause was demonstrated (17).

Diaz et al. showed that daily exercises have various health benefits for postmenopausal women, such as preventing falls, improving balance, physical and psychological functioning, flexibility, range of motion, reducing pain, positively changing body composition and enhancing quality of life (18). The exercise program for postmenopausal women should include the endurance exercise (aerobic) and balance exercise for two hours in each week. In addition, other deep breathing and stretching exercises can help manage the stress of life and menopause-related symptoms (19). The initial years of menopause are often accompanied by vasomotor symptoms such as hot flashes and night sweats, somatic symptoms such as fatigue, body pains, and vaginal dryness, and psychological symptoms such as irritability, anxiety, depression, decreased libido, and difficult sleeping (20).

The frequency, severity, and duration of vasomotor symptoms vary according to the population (20, 21). Hot flashes are the most common menopausal symptoms in North America and Europe; whileup to ~70% of women are affected. Symptoms can begin during the menopausal transition up to 2 years before the cessation of menses. The average duration of hot flashes is 6 months to 5 years, although 20% of women continue with symptoms into their 70s and 80s. Night sweats can interfere with sleep and lead to chronic sleep deprivation, chronic fatigue, and mood changes. Estrogens are effective in decreasing the frequency and severity of these symptoms and are commonly used as a positive control in clinical trials. However, the management of menopause has changed considerably since the publication of the WHI results in 2002 (21).

Menopausal women now account for one for the largest segments of alternative medicine users; while 80% of women aged 45-60 years reported consuming nonprescription therapies for the management of menopausal symptoms (22). The greatest growth was seen in soy-based meat alternatives followed by soymilk and tofu. Consequently, many have increased the use of foods or herbal products containing phytoestrogens, believing that "natural" estrogens would provide all of the benefits, but none of the risks of prescription hormones. Soy foods are particularly popular because of their isoflavone content, probably based on the fact that Chinese and Japanese women, who traditionally consumed a soy-rich diet had a lower risk of breast cancer, heart disease, and experience less vasomotor symptoms than American women (23, 24). So supporting menopausal women from physical, psychological, and decrease in estrogen are essential. Menopausal health status in women has been assessed by using Menopause Rating Scale (MRS) that can be completed by the women to report their perceived symptoms (25). Thus, the aim of this paper was to investigate the impact of soy milk and exercise toward perimenopause syndrome among women older than 50 years in Semarang, Indonesia.

Materials and Methods

Data was collected from two difference areas as the intervention area was Bendan Ngisor village and the control region was Ungaran village. The respondents were selected by simple random sampling due to the limited amount of respondents who could satisfy the inclusion criteria as women aged 45 years and older, adhered to exercise club and did not have any allergic toward soy milk consumption. There were 90 respondents as samples of this research including 30 women in the intervention group and 60 females in the control group. Only 81 subjects finally participated in the study until the end, consisted of 24 in the intervention group and 57 in the control group based on $\alpha/2=1.96$, $\beta=0.84$, power=80% and SD=19.55. This study was a quasi-experimental study design too.

A bottle of 350-milliliter soy milk was given to the intervention group right after they did exercise twice a week for 3 months, while the control group only did the routine exercise in their exercise club. This study examined the socio-demographic characteristic, age, educational level, job status, estrogen hormone, and MRS in assessments (25). Moreover, the women age was measured in years based on birthday. The educational level was categorized as no education, elementary, junior high school, senior high school, and university. The women's occupation was coded as 1 for unemployment, 2 for pension and 3 for working. Hormonal level was evaluated for estrogen which was measured by ELISA to examine changes before and after the intervention. Respondents have to report their perception toward the 11 items in MRS. The MRS questionnaire consisted of 11 common menopausal symptoms which were further grouped into three subscales of somatic, psychological and urogenital. Each of the 11 symptoms were scored from 0 (none) to 4 (very severe). The total score of MRS was categorized to 4 levels of low (coded as 1), medium (coded as 2), moderate (coded as 3), and high (coded as 4) (25). This study was approved in Ethics Committee of Faculty of Public Health, Diponegoro University, Indonesia (number: 25/EA/KEPK-FKM/2020 dated 23 March 2020).

Frequency distribution was used to describe the variables. Data analysis was by descriptive statistics using SPSS software (Version 20, Chicago, IL, USA). Frequency distribution, mean and standard deviation were utilized to describe the independent variables. Leneve's test checked the homogeneity of the intervention group and the control group with a p value<0.05. Generalized Linear Model was employed to determine variables associated between perimenopausal syndrome and age, educational level, occupation, and hormonal level before and after intervention. After analyzing the skewness and kurtosis test for normality, it was found that hormonal level in pre and post tests, and age had a normal distribution. Student t-test was applied to determine hormonal changes for perimenopausal syndrome.

Table 1: General characteristics of intervention and control groups.

Variable	Group		Total		Homogeneity	*P* value	
	Intervention (n=24)	Control (n=57)	n	%		β	p
Age							
	Min=52 Max=77 Mean=63.12 SD=7.079	Min=46 Max=71 Mean=59.95 SD=5.283			0.068*	-0.047	0.064***
Educational level							
No education	4.2	3.5	3	3.7	0.367*	0.502	0.001**
Elementary	12.5	3.5	5	6.2			
Junior high school	4.2	1.8	2	2.5			
Senior high school	45.8	45.6	37	45.7			
University	33.3	45.6	34	42			
Occupation							
Unemployment	33.3	42.1	32	39.5	0.180*	-0.085	0.406
Pension	33.3	36.8	29	35.8			
Worker	33.3	21.1	20	24.7			
Hormonal level							
Increased	Min=382 Max=689 Mean=476.45 SD=93.48	Min=211 Max=542 Mean=364.54 SD=80.00			0.143*	0.003	0.097***

*Homogeneity of the intervention and the control groups with a p value >0.05. **significant at 0.05. ***significant at 0.01.

Table 2: Comparison of perimenopause syndrome between intervention and control groups using independent t-test.

Estrogen level	Intervention group (n=4)		Control group (n=57)		t-test	*P* value
	Mean	SD	Mean	SD		
Before	436.3	17.43	409.87	8.68	1.511	0.135
After	476.4	19.08	364.54	10.59	5.46***	0.000
t-statistic	-1.89		4.86			

*=significant at 0.01**=significant at 0.05***=significant at 0.001

Results

The intervention group consisted of 24 cases and the control group consisted of 57 women. Table 1 shows that the intervention and control groups had homogeneous characteristics. In the intervention group, the average age of respondents was 63.12 years, the educational level was senior high school, the average hormonal level was 476.45 and identical number for occupation. In the control group, the average age of the respondents was 59.95, years the educational level was senior high school and university, the average hormonal level was 364.54 and the majority of occupations was unemployment. It was shown that educational level significantly contributed significantly to symptoms of perimenopausal syndrome and age and hormonal level also significantly contributed to symptoms of perimenopausal syndrome. Table 2 reveals estrogen level in intervention and control groups. The control and intervention groups demonstrated significant difference regarding estrogen level after soy milk intake (t=5.46, p=0.0001).

Discussion

Nutrition and nutritional ingredients were illustrated to play an important role in health status (26); while the impact of nutritional status in reproductive age women has been emphasized (27, 28). Our findings indicated that the postmenopausal women's quality of life significantly increased by consuming soy milk as soybeans are considered phytoestrogens of daidzein, glycerin and genistein, which are included as isoflavones (29). Some women were shown to consume isoflavone supplements and soybean-derived foods to substitute conventional hormonal therapy (9). Although it is pointed out that it has been associated with various health outcomes (22).

Soybean-derived foods are considered to have the potential to be used a variety of menopausal transition-associated diseases and conditions including the reduction of ischemic heart diseases, and lowering the level of blood low-density lipoprotein-cholesterol as the saturated fat in soybean is low and it is rich in fatty acids including omega-3 fatty acid, alpha-linolenic acid, omega-6 fatty acid and linoleic acid (6, 9, 29, 30). Moreover, isoflavones can improve the function of endothelial cells, slow the subclinical atherosclerosis progression and relieve menopausal hot flashes (6, 9, 29-31). On the contrary, there is inadequate evidence that in postmenopausal women, isoflavones could lessen bone loss. It is also arguable that the consumption of soybean-derived food could alleviate the breast cancer risk too. Nonetheless, based on considerable evidences, consuming soy food during childhood and/or adolescence has been recommended to reduce the risk of breast cancer (6, 9, 32).

It was shown that the consumption of soybean or its extracted protein can improve the menopausal women's quality-of-life (22, 33). Consumption of cow milk enriched with soy isoflavones not only improves postmenopausal women's quality of life, but has the potential to reduce the vasomotor symptoms (23). Furthermore, at menopausal age, soybean products can provide positive effects on the vasomotor symptoms, lipoproteins, bone formation and resorption markers (24, 25, 34), maturation of vaginal epithelium (35), visual memory (36), nonverbal short-term memory, and frontal lobe function (37). Soy milk also has a similar composition to cow milk that can provide the total minerals needed by individuals, including calcium and iron (24, 25).

It was shown that isoflavones decrease during hot flashes (38) as soya bean is rich in omega-3 and proteins, and possesses a lower glycemic index (39). The finding of this study is in accordance with previous studies confirming that consumption of isoflavones can positively impact quality of life. As the main isoflavones property in soya beans, genistein effectively increases life quality including social and physical functions, vitality, pain, and mental and general health (40). Therefore, understanding the complexity of menopausal symptoms and providing appropriate health care interventions for women suffering from menopausal symptoms is crucial for health care professionals. The health care intervention should have the main purpose of alleviating menopausal symptoms burden and improve the quality of life, particularly by raising awareness of the semi-urban and rural postmenopausal women. There was a limitation in this research too as it did not use matching respondents between intervention and control groups.

Conclusion

Our findings showed various variations could influence perimenopause syndrome including age, educational level, and estrogen level. There was a significant difference in MRS score between the control and the intervention groups. MRS score was significantly lower in intervention group. Also, soy milk intake had a positive impact on improving the estrogen level. These findings can strengthen the benefits of consuming phytoestrogens and exercise in reducing the effects of perimenopause syndrome.

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Authors' Contribution

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Conflict of Interest

The authors declare that there is no conflict of interest, financial or otherwise.

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