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Evaluation of Extract Efficacy of Lemon Balm on Sleep Quality Score in Postmenopausal Women: A Double-Blinded Randomized Clinical Trial

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ABSTRACT

Context: *Sleep disorder is one of the most common problems in post-menopausal women.*

Aims*: This study aimed to assess the effects of lemon balm on sleep quality of postmenopausal women.*

Setting and design: *This study is a double-blinded randomized clinical trial in that conducted on 110 eligible postmenopausal women referred to health clinics in Arak that were selected using convenience sampling.*

Material and methods: *Block random allocation was used to assign subjects to lemon balm and control groups. Intervention and control group received Lemon balm capsule containing 250mg Lemon balm extract and 250 mg starch twice a day for 1 month. After the intervention, "Pittsburgh Sleep Quality Index" was completed by subjects again.*

Statistical Analysis Used*: The btained data were analysis was performed using software SPSS (version 20) with Chi-square, paired and independent t-test.*

Results: *The mean score of sleep quality before and after treatment was 13.1 ± 48.60 and 8.1 ± 58.97 in intervention group, respectively. Moreover, the sleep quality score in control group was 12.98 ± 2.50 and 11.72 ± 2.45 before at beginning and end of study. There was a significant difference in mean score of sleep disorder intervention group between before and after the intervention (p<0.001), while this difference was not significant in control group(p=0.155). Also, there was significant difference in mean score of sleep quality between two groups after the intervention (p=0.012).*

Conclusion: *According to results, the extracts lemon balm is effective treatment for improving the sleep quality in post-menopausal women as well as in reducing symptoms of sleep disorders.*

Keywords: *Lemon balm* extract, Sleep disorder, Sleep quality, postmenopausal women, Nervious Sysytem, Neural Trasnsmission.

INTRODUCTION

Sleep disturbances increase in prevalence during the menopausal transition [1]. Women spend about one-third of their lives in menopausal stage [2]. According to the National Statistics in year 2006, 13.8% of Iran's populations are women aged 45-60 [3]. Therefore, considering their large population, attention to their issues at this age has a great importance. The prevalence of sleep disorders in postmenopausal women has been reported up to 65% and is one of the main reasons for postmenopausal women referring to health centers [4,5]. Sleep is one of the most basic human needs, which in addition to maintaining physical and mental health, reduces stress, strengthens reconciliation and focuses on daily activities [6,7]. During sleep, important functions such as energy storage, division of skin and bone marrow cells, regulation and secretion of hormones, regulation of the immune system, as well as storage of psychological function are performed [8-10]. Sleep helps regain mental and physiological abilities and is needed to accept new tasks and roles [10,11]. Sleep disturbances impact health-related quality of life, work productivity, healthcare utilization and can have long-term effects on health and wellbeing across several years of the menopausal transition [12,13]. There are a variety of complementary medicines and methods available to solve this problem. Nowadays, due to the side effects of chemical drugs and the general tendency to use herbal remedies, researchers are now inclined to use herbal remedies [2,3,14-16]. One of the most common herbs in the treatment of sleep disorders is lemon balm. Lemon balm is a plant of mint family and its leaves are used in essential oils, extracts, ointments and brews [3]. The mechanism of action of lemon balm is unknown. Lemon balm contains a phytochemical agent, which inhibits the catabolism of gamma-butyric acid. Another effect is on adenosine and 5HT-5α receptors. No drug interactions and side effects have been reported for lemon balm so far and have been introduced into pharmacopoeia in various countries such as Germany [3,17]. Cases et al. reported that lemon balm improves insomnia by 42% [15]. Also, regarding the effect of lemon juice on sleep disorder, studies such as the study by Haybar et al. reported a significant decrease in the sleep disorder score in the lemon balm group compared to placebo [18]. In the Taavoni et al. study [3], the effects of this herbal medicine on sleep disturbances have been reported useful. Given the lack of studies investigating the effect of Lemon balm on sleep disorder in postmenopausal women, this study was conducted to evaluate the effect of the extract of Lemon balm on sleep quality among postmenopausal women.

MATERIALS AND METHODS

Study setting and subjects

This study is a parallel two-blinded clinical trial that was conducted on 110 postmenopausal women's 50-60 referred to health centers in city Arak. Sample size was calculated based on confidence 95%, study power 80% and the results of literatures. Finally, with considering attrition rate 10%, the required sample size was 55 samples for each of the intervention and control groups. The sampling was convenience and after selecting eligible criteria, block random allocation was used to assign subjects to *lemon balm* and control groups. The written informed consent was obtained from all eligible subjects and the ethical committee of Arak University of Medical Sciences approved this study. Moreover, it is registered in the Iranian Clinical Trial code IRCT2015073110076N5.

The inclusion criteria were at least one years the last menstruation, having mild to moderate sleep disorder based on the Pittsburg Sleep Quality Index (PSQI) questionnaire, lack of physical and mental illness affecting sleep (asthma, thyroid disorders, malignancies and other respiratory chronic diseases) no taking drugs that affect sleep (pain killer, diuretics, sedatives, anti-depressants), no smoking and alcohol, lack of allergy to drug or particular substance. The exclusion criteria were affecting to physical and mental illness during study, significant change in sleep conditions due to travel or displacement, take any medications or sleeping drugs during the study and samples not taken our treatment more than seven days during study.

Data collection

Data was collected using a questionnaire including 2 sections. The first section was demographic characteristics including 5 questions (menopause age, number of deliveries, and number of children, education and employment status). The second section of data collection tool was PSQI questionnaire includes 19 questions at seven dimensions of sleep quality (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction). This questionnaire has 9 main questions (question 1 to 4 in open, short and single answer and questions 5 to 9 in four answers). The score of each component is 0 to 3 and therefore the total score of PSQI questionnaire could varied from 0 to 21 [19]. However, lower score shows better sleep quality. However, this questionnaire is standard and validated in Iranian people [20,21].

At the first stage of study, the PSQI questionnaire was completed through interview and women with sleep quality score 5 and higher than 5 were selected. At the second stage of these study subjects randomly divided into two groups. The intervention group received a capsule contain 250mg *lemon balm* juice extract, twice a day for a month and the control group received placebo that was same capsule that contain 250 mg starch, twice a day for a month. The researcher checks the correct use of the medication by phone every week. All subjects followed for one month after taking intervention and baseline and after sleep quality scores compared. The subjects were completed the PSQI questionnaire again one month after intervention. One woman was excluded of intervention group due to travelling CONSORT chart (Figure 1).

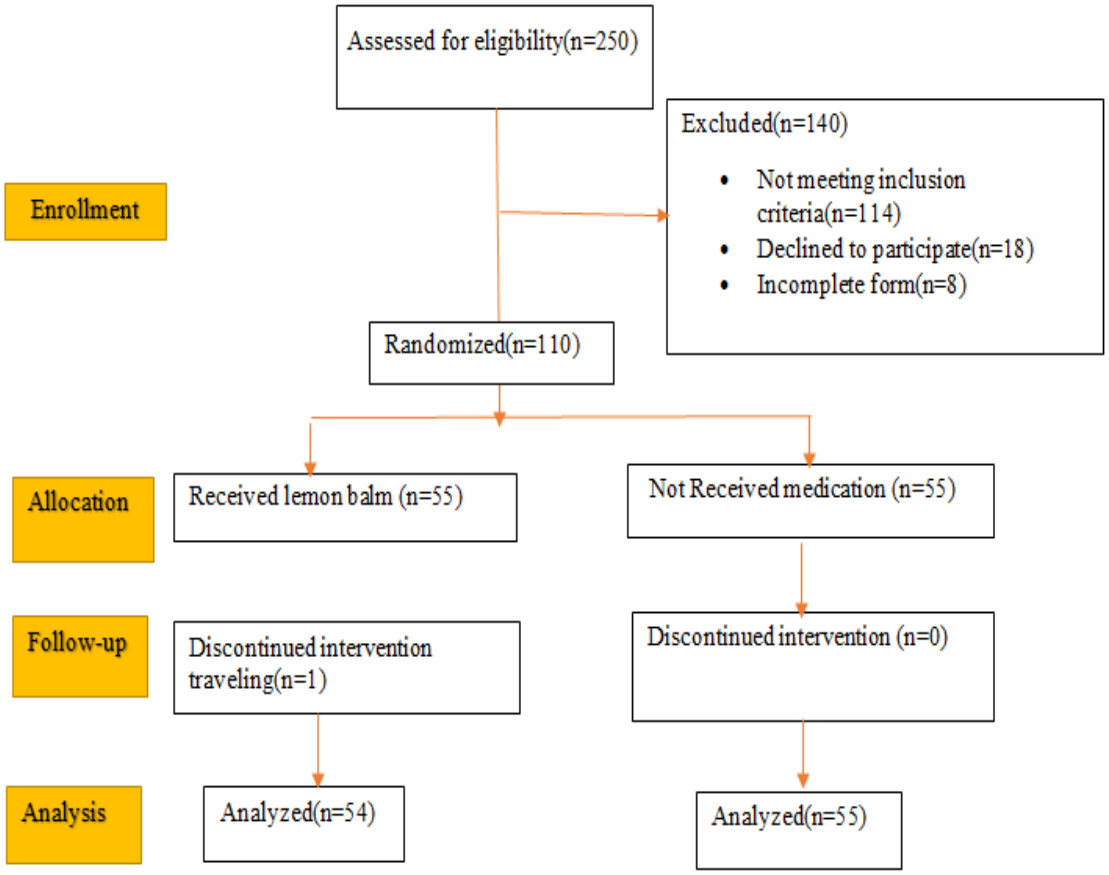

Figure 1: CONSORT chart- Flow chart of subjects in RCT.

Statistical analysis

After data collection the sleep quality score was calculated based on standard protocol of PSQI questionnaire. The comparing of two groups for marital status and literacy level assessed by chi square test. Independent t-test was used to evaluate two groups regarding to mean of menopause age, number of deliveries and number of children. The Kolmogorov Smirnoff test was used to check normality of sleep quality. Paired t-test was used to compare the mean scores before and after intervention in each group. Moreover, the independent t-test applied to compare two groups at baseline and after intervention. All analysis was performed using software SPSS (version 20). P value less than 0.05 considered as significant.

RESULTS

According to Table 1, there was no significant difference in marital status (p=0.120) and literacy rate (0.146) between two groups in the *lemon balm* and control groups. Based on our results (Table 2) two groups were same regarding to menopause age, number of deliveries and children (p>0.05). The mean age of menopause was 53.17 ± 4.88 years in treatment group and 52.4 ± 9.17 years in control group and two groups was not statistically significant (p=0.085). Moreover, two study groups were not statistically different in number of deliveries (p=0.627) and children (p=0.857).

Table 1: Distribution of the participants according to demographic variables slightly in both experimental and control groups.

Variables		Treatment n (%)	Control n(%)	P value
Marital	Single	8(15.4)	1(1.9)	0.12
	Married	44(84.6)	54(98.1)	
Literacy rate	Illiterate	20(38.5)	15(27.2)	0.146
	Diploma	21(40.4)	30(54.5)	
	Diploma and higher	11(21.2)	55(18.1)	

Table 2: Distribution of the participants according to individual variables of quality in both experimental and control groups.

Variables	Treatment, n=54 Mean ± SD	Control, n=55 Mean ± SD	P value
Menopause Age (years)	53.17 ± 4.88	52.4 ± 9.17	0.085
Number of deliveries	3.1 ± 1.29	3.21 ± 1.45	0.627
Number of children	4.20 ± 2.38	4.2 ± 2.35	0.857

The main outcome in our study was the changes in mean of sleep quality score between *lemon balm* and control groups after treatment. As showed in Table 3, the baseline score of quality of life was not statistically significant between two groups based on independent t-test (p=0.876). But after intervention, there was a significant difference among two groups regarding the sleep quality score (p=0.012). In addition, our results showed that the mean of sleep quality score decreased from 12.69 ± 3.98 before intervention to 8.58 ± 1.97 after intervention in treatment group. This change was statistically significant by paired t-test (P<0.001). Nevertheless, the mean of sleep quality score in control group received to 11.21 ± 2.74 from 13.48 ± 1.60 initial score (p=0.155).

Table 3: Comparison of mean of sleep quality score between two treatment and control groups before and after the intervention.

Variables	Before intervention n=54, Mean ± SD	After the intervention n=54, Mean ± SD	Change	P Value‡
Treatment	12.69 ± 3.98	8.58 ± 1.97	4.11	<0.001
Control	13.48 ± 2.60	11.21 ± 2.74	2.27	0.155
P Value†	0.876	0.012		---
† Based on independent t-test; ‡ Based on paired t-test				

Figure 2 depicted the mean score of quality of life between two groups and showed that the decrease in treatment group was higher than control group. Therefore, lemon balm caused more increase in sleep quality of postmenopausal women.

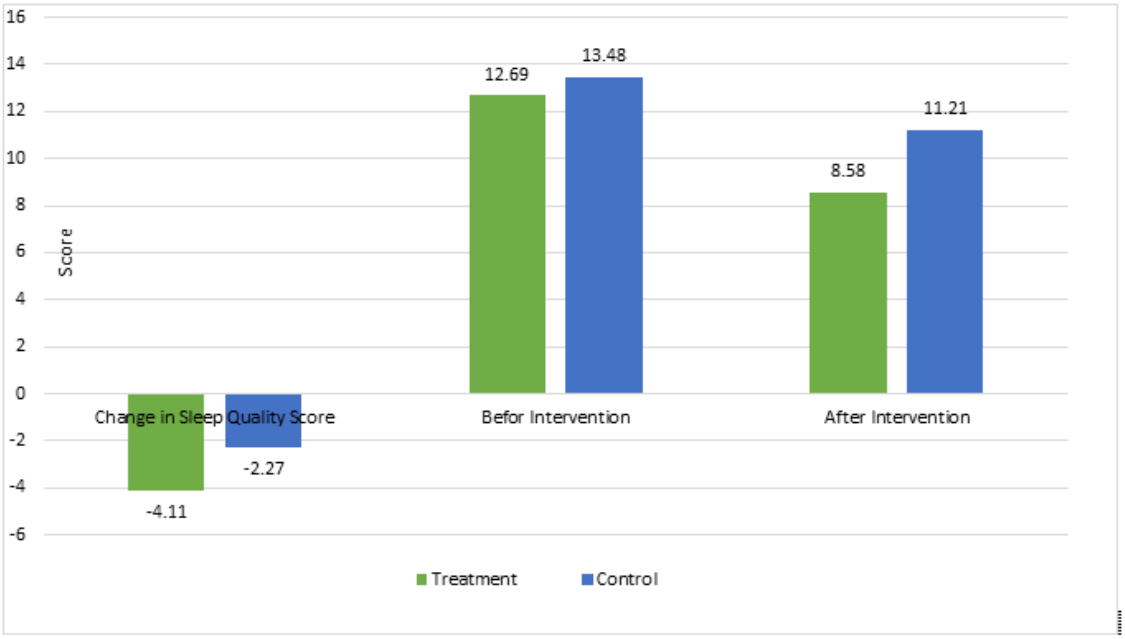

Figure 2: The change mean of sleep quality score between two treatment and control groups and mean score before and after the intervention.

DISCUSSION

Menopause is one of the most critical periods of life for some women [1]. One of the most common problems of women in this period is sleep disorder. Therefore, the current study aimed to determine the effect of consumption of lemon balm extract on improving the sleep quality of postmenopausal women. Based on the above results, it can be said that the lemon balm extract reduced the disorder and the mean disorder score in the case group. Some studies assessed the effect of lemon balm extract on sleep disorder implies the *lemon balm* effect on sleeping [22,23]. The results of Taavoni et al. that examined the effect of lemon palm on the improvement of sleep disorder in postmenopausal women were consistent with the present results [3,23]. The results of Haybar et al. were also in line with the results of the present study [18]. These researchers studied the effects of lemon balm on the treatment of sleep disorders in chronic heart patients and found that it was sedative and helped to sleeping [18]. The results of Cases et al. also indicated the effect of lemon balm on improving sleep disorder [15]. Heydari et al. studied the effect of lemon balm on juvenile girls with premenstrual syndrome and confirmed the effects of this herbal medicine on reducing sleep disorder and anxiety [24]. The experimental studies have also shown the sedative and sleeping effects of lemon balm. In the study of Gorgi et al. the lemon balm significantly increased the sleep duration in lab rats compared to the control group [25]. According to the results of this study, it can be concluded that lemon juice can be used to improve sleep quality in postmenopausal women. One of the limitations of this study was the probability of the influence of confounding variables on sleep quality score. To eliminate this limitation, random sampling was used to select the research samples and the mean sleep quality score of the samples was compared before and after the intervention.

CONCLUSION

According to results, the extracts *lemon balm* is effective treatment for improving the sleep quality in post-menopausal women as well as in reducing symptoms of sleep disorders. Our study showed that the sleep quality increased by consumption of 250mg of *lemon balm* extracts after one month. Therefore, usage of complementary medicine beside improvement of psychological health could decrease the sleep disorders in postmenopausal women.

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CONFLICTING INTEREST

There is no conflict of interest.

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