

Acupuncture improves sleep in postmenopause in a randomized, double-blind, placebo-controlled study

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ABSTRACT

Background Insomnia increases in frequency as women approach and pass through menopause. Studies have not shown acupuncture efficacy for insomnia in postmenopausal women.

Objectives The aim of this study was to evaluate the effectiveness of acupuncture therapy on sleep parameters, depression symptoms and quality of life in postmenopausal women with insomnia.

Methods This study included 18 postmenopausal women aged 50–67 years old. Participants had a body mass index ≤ 30 kg/m², presented a diagnosis of insomnia according to the DSM-IV criteria, had experienced at least 1 year of amenorrhea and had a follicle stimulating hormone level ≥ 30 mIU/ml. Participants were not using antidepressants, hypnotics or hormonal therapy. This study was randomized, double-blind and placebo-controlled. The sample was divided into two groups: acupuncture and ‘sham’ acupuncture. We performed ten sessions of acupuncture and ‘sham’ acupuncture during a period of 5 weeks. A polysomnography exam (PSG) and questionnaires (WHOQOL-BREF, Beck Depression Inventory and Pittsburgh Sleep Quality Index) were completed by all patients before and after the treatment period.

Results Anthropometric, polysomnographic, and questionnaire data were similar among the groups at baseline. Comparison of baseline and post-treatment data of the acupuncture group showed that treatment resulted in significantly lower scores on the Pittsburgh Questionnaire and an improvement in psychological WHOQOL. The acupuncture group had a higher percentage of the N3 + 4 stage than the sham group in PSG findings.

Conclusion Acupuncture was effective in improving reported sleep quality and quality of life in postmenopausal women with insomnia.

INTRODUCTION

Sleep disturbances increase in frequency as women approach and pass through menopause. These sleep disturbances include complaints of insomnia, poor sleep efficiency¹ and breathing irregularity^{2,3}. Sleep complaints increase with age and are more common in women than in men. A number of studies highlight an incidence of insomnia of 28–63% in postmenopausal women^{4,5}. The incidence of sleep disturbance has been found to be higher in postmenopause, and over 60% of postmenopausal women suffer from insomnia. Insomnia is defined

as problems in sleep onset, sleep maintenance and early awakening in the presence of adequate opportunity and circumstance for sleep, lasting for at least 1 month with daytime repercussions^{6–8}. Consequences reported in the cognitive sphere include irritability, attention deficit, memory deficit and others⁹. Insomnia has been treated with pharmacological interventions such as hypnotics and non-pharmacological interventions such as relation-based treatment, stimulus control therapy, sleep restriction and a variety of cognitive and educational strategies¹⁰. The close relationship between sleep problems and decreased levels of reproductive hormones in

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menopausal women suggests hormone therapy (HT) for relief, with good results, especially in reducing hot flushes¹¹.

We have previously observed the effects of HT on sleep patterns¹². To avoid the possible collateral effects of HT, alternatives for treatment are sought. Isoflavones have been investigated and found to improve both sleep quality and memory^{13,14}. We have good preliminary results using massage to treat insomnia in postmenopause¹⁵.

Due to limitations and concerns with currently available insomnia treatments, a sizeable proportion of the population, especially in Europe and China, has turned to complementary alternative medicine, including acupuncture, in the search for a treatment with potential efficacy and few side-effects¹⁶. Acupuncture is a clinical treatment modality in an independent medical system of Traditional Chinese Medicine, which was developed over 2000 years ago under the influence of Oriental philosophical theories, such as Yin-Yang, Five Elements and Dialectical Unity. The basic acupuncture technique is to insert acupuncture needles into select acupoints along meridians, which are the channels believed to guide the flow of bio-energy in human bodies¹⁷. Acupuncture has been used as a complement to estrogen therapy, placebos and relaxation therapies to treat hot flushes in postmenopausal women¹⁸. Electro-acupuncture has also been considered an efficient and safe therapy to treat perimenopausal syndrome¹⁶.

Considering the efficacy of acupuncture in many areas and the lack of research on this therapy in postmenopausal women, the objective of this study was to verify the effects of acupuncture on subjective and objective sleep parameters and on quality of life in postmenopausal women with insomnia.

METHODS

The inclusion criteria were as follows: age from 50 to 67 years old, postmenopausal status (at least 1 year of amenorrhea before enrollment and a follicle stimulating hormone level equal to or greater than 30 mIU/ml), body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters) less than 30 kg/m², no previous exposure to exogenous hormones and a diagnosis of insomnia according to the DSM-IV¹⁷. The volunteers underwent a routine climacteric check-up. Patients with severe and/or uncontrolled clinical disease, a reported history or suspicion of carcinoma of the endometrium and/or breast cancer, antidepressant or hypnotic drug use, apnea/hypopnea index (AHI) > 15 events/h, or illiteracy were excluded. This study was approved by the institutional ethics committee (Approval n° 0229/08).

In the first phase of the study, patients received instructions about the survey and signed the consent form. Patients answered the brief form of the World Health Organization Quality of Life (WHOQOL-BREF)^{19,20}, Beck Depression Inventory²¹ and Pittsburgh Sleep Quality Index (PSQI) questionnaires²². The patients then underwent a basal polysomnography (PSG) recording.

Sleep stages were determined according to Rechtschaffen and Kales criteria²³. Respiratory events²⁴, periodic leg

movements²⁵ and arousals²⁶ were scored using standardized criteria. The sleep parameters analyzed were: sleep latency, rapid eye movement (REM) sleep latency, sleep efficiency, stages 3 and 4, REM sleep, AHI (number/h); periodic leg movements (PLM, number/h).

The patients were randomly assigned to one of two groups: an acupuncture group and a sham acupuncture group (placebo). The acupuncture group underwent two applications per week for 5 weeks for a total of ten sessions. The sessions consisted of the insertion of very fine metal needles into the skin at specific points on the body (acupoints). A similar technique was used for the acupuncture sham group, but at different acupoints¹⁸. Patients remained in a comfortable position for 30 min with disposable 0.25 mm × 40 mm acupuncture needles in place, following basic hygiene standards. Five weeks after beginning the sessions, the patients were re-evaluated. At this time, they underwent a second PSG recording at Instituto do Sono/AFIP. On the next day, they again answered the questionnaires described above. Neither the researchers nor the participants knew which patients had received the sham acupuncture and which had received the actual acupuncture, to prevent bias on the part of the researchers and the volunteers.

Statistical analysis

Statistical analysis was performed using SPSS (version 13). Descriptive analysis (means ± standard errors) was used to characterize the groups. A Mann-Whitney test was used to compare the variables between the two groups (acupuncture and sham), and a Wilcoxon test was performed for repeated measures between both groups for PSG parameters and questionnaires. Statistical significance was set at 5% ($p < 0.05$).

RESULTS

This double-blind, placebo-controlled study interviewed 102 postmenopausal women. Eighteen patients met the initial criteria of insomnia (DSM-IV) and were included in the study. All patients gave written informed consent and completed the study protocol.

At baseline, the two groups were not significantly different in anthropometric characteristics such as BMI and age. There were no differences between the variables of age and BMI when comparing the two groups, showing comparative viability between the acupuncture (age 58 ± 4.85 years; BMI 25.78 ± 3.62 kg/m²) and sham (age 59.8 ± 5.86 years; BMI 25.43 ± 2.9 kg/m²) groups ($p = 0.82$, $p = 0.45$ for BMI and age, respectively).

The PSG features showed differences between the two groups in the final evaluation. The acupuncture group had a higher percentage of the N3+4 stage than the sham group (16 ± 1.4 vs. 8.64 ± 2.6, respectively; $p = 0.02$; effect size = 0.51), and the sham group had a higher PLM index than the acupuncture group (11.68 ± 6 vs. 1.47 ± 1.5, respectively;

Table 1 Polysomnographic results before and after 5 weeks of treatment in the Acupuncture and Sham groups. Data are given as mean \pm standard error

	Acupuncture		Sham	
	Baseline	Final	Baseline	Final
Sleep latency	17.79 \pm 3.6	13.37 \pm 3.1	18.28 \pm 4.5	16.3 \pm 3.2
Sleep efficiency	77.37 \pm 2.9	80.44 \pm 2.3	82.06 \pm 2.4	81.56 \pm 2.2
N3 + 4 stage (%)	20.14 \pm 2.9	16 \pm 1.4 [†]	17.07 \pm 2.1*	8.64 \pm 2.6
Rapid eye movement stage (%)	17.41 \pm 1.7	18.26 \pm 1.1	21.75 \pm 2.1	20.45 \pm 1.7
Apnea-hypopnea index/h	4.92 \pm 0.7	6.93 \pm 1.8	9.51 \pm 2.1	12.03 \pm 3.6
Blood oxygen saturation < 90% O ₂ (%)	0.61 \pm 0.2	0.76 \pm 0.4	4.43 \pm 4.1	2.03 \pm 1.5
Arousal/h	14.1 \pm 1.7	13.58 \pm 2.3	19.43 \pm 4.4	21.8 \pm 4.5
Periodic leg movements/h	1.23 \pm 1.2	1.47 \pm 1.5 [†]	4.61 \pm 2.4	11.68 \pm 6

*, Comparison between the pre- and post-treatment moments of each group; [†], comparison of the groups in the post-intervention moment, $p < 0.05$

$p = 0.046$; effect size = 0.47). The comparison between the baseline and final evaluations of the sham group showed a decrease in the N3 + 4 stage (17.07 \pm 2.1 vs. 8.64 \pm 2, respectively; $p = 0.02$; effect size = 0.82). The acupuncture group showed a significant improvement in the PSQI questionnaire when baseline and final evaluation were compared (12.77 \pm 0.7 vs. 9.77 \pm 0.8, respectively; $p < 0.01$; effect size = 0.8) and an enhancement of the psychological WHOQOL (57.07 \pm 4.1 vs. 66.67 \pm 3.1, respectively; $p = 0.03$; effect size = 0.66), as shown in the Table 2.

The comparison between groups after treatment showed no differences among questionnaires, but the comparison did show a trend toward improvement in PSQI in the acupuncture group (9.77 \pm 0.8 vs. 12 \pm 0.9; $p = 0.058$; effect size = 0.45).

DISCUSSION

Acupuncture intervention produced a significant improvement in subjective sleep quality, as evaluated by the psychological WHOQOL and sleep quality indicated by the PSQI at the final evaluation. This finding suggests that the acupuncture treatment was effective for treating insomnia, as suggested in other studies that showed an improvement in sleep quality through acupuncture by different types of

evaluations, such as melatonin secretion and nocturnal hot flashes²⁷⁻²⁹.

The improvements detected in the scores of the PSQI questionnaire regarding baseline and final evaluations of the acupuncture group were similar to the findings of Zhou and colleagues³⁰, who studied the effect of scalp point penetration needling on the sleep quality of insomnia patients. However, the target population in their study was not only women of a specific age range, as in our study. A systematic review of randomized, controlled trials using meta-analyses to study acupuncture for the treatment of insomnia³¹ showed a beneficial effect of acupuncture compared to no treatment and of real acupressure compared with sham acupressure on total PSQI scores. However, these results were also not specific to menopausal women.

Lunny and Fraser showed that more than 50% of women use complementary and alternative medicine (CAM) during menopause³². Our previous studies showed improvements in sleep quality³³⁻³⁵ in postmenopausal women with insomnia under physical therapy³⁶ and isoflavone¹⁴.

Llanas and colleagues used treatment consisting of segmental and global stretching exercises, strengthening exercises, massotherapy and relaxation techniques³⁶. They found an increase in REM sleep and in total sleep efficiency in patient 1 and a reduction in sleep latency and an increase in

Table 2 Results of the brief form of the World Health Organization Quality of Life (WHOQOL-BREF), Beck Depression Inventory and Pittsburgh Sleep Quality Index questionnaires before and after 5 weeks of treatment in the Acupuncture and Sham groups. Data are given as mean \pm standard error

	Acupuncture		Sham	
	Baseline	Final	Baseline	Final
Physical WHOQOL	59.64 \pm 1.7	59.93 \pm 3.8	59.93 \pm 3.8	59.37 \pm 5.3
Psychological WHOQOL	57.07 \pm 4.1*	66.67 \pm 3.1	66.67 \pm 3.1	58.91 \pm 3.8
Social WHOQOL	52.49 \pm 4.6	60.17 \pm 5.1	60.17 \pm 5.1	65.62 \pm 4.5
Environmental WHOQOL	47.2 \pm 4.1	50.01 \pm 5.7	50.01 \pm 5.7	59.01 \pm 2.8
Pittsburg	12.77 \pm 0.7*	9.77 \pm 0.8	9.77 \pm 0.8	12 \pm 0.9
Beck	32.88 \pm 1.7	33.28 \pm 1.3	33.28 \pm 1.3	32.5 \pm 1.1

*, Comparison between the pre- and post-treatment moments of each group, $p < 0.05$

the percentage of slow wave sleep in patient 2. The use of isoflavone led to an increase in sleep efficiency compared to the placebo group¹⁴.

In previous studies, we used a combination of relaxation training, physiotherapy, yoga, massage, postures, and cognitive-behavioral therapy to improve sleep quality and to reduce menopausal symptoms, with good results³⁷.

Most studies on acupuncture in the literature have focused on menopausal symptoms, especially hot flashes, with positive outcomes. However, these studies have not established conclusions about the efficacy of acupuncture^{38,39}.

Previous studies have presented data on the association between insomnia, and acupuncture may be an effective intervention for the relief of insomnia²⁹. Ruan and colleagues demonstrated that electro-acupuncture improved sleep quality by increasing the percentage of slow wave sleep and REM sleep in chronic insomniacs⁴⁰. However, Zhou and colleagues found that scalp point penetration needling produced a more significant improvement in the sleep quality and sleep structure of insomnia patients than routine needling³⁰.

The diagnostic criteria for insomnia are essentially clinical and based on subjective evaluation¹⁷. The acupuncture group reported an improvement in sleep quality (Table 2). These data suggest an improvement in subjective insomnia, a self-reported complaint of non-restorative sleep, difficulty falling asleep, frequent awakenings or waking too early in the morning⁴¹. The same results were demonstrated by Zhou and colleagues³⁰, who found an improvement in sleep latency, total sleep time and the percentage of slow wave sleep after acupuncture treatment in insomnia patients. As shown in previous studies, an improvement in subjective sleep quality is commonly observed in postmenopausal women even when PSG is not altered¹⁵ or is altered only slightly¹².

The sham group showed a decrease of NREM 3 + 4 between the baseline and final evaluations but it was not

clinically relevant. Additionally, this study found an augmentation of the Periodic Leg Movements index, which could be related to the high prevalence of night-to-night variability in periodic leg movements⁴².

CONCLUSION

Despite the large number of women suffering from climacteric syndrome and the high frequency of sleep disturbances in postmenopausal women, there is a lack of studies addressing the treatment of sleep difficulties, especially concerning complementary and/or alternative therapies. This scarcity of information led our group to use polysomnographic examinations to investigate sleep disorders in postmenopausal women with complaints of insomnia and to examine the effects of acupuncture in this population.

Based on the results of this randomized, controlled-trial study, we conclude that acupuncture is effective in improving the quality of sleep and the psychological domain of quality of life in postmenopausal women with insomnia. Furthermore, we observed an important decrease in subjective insomnia supported by a high effect size.

Conflict of interest This was not an industry-supported study. The authors have indicated no financial conflicts of interest.

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References

1. Baker A, Simpson S, Dawson D. Sleep disruption and mood changes associated with menopause. *J Psychosom Res* 1997;43:359-69
2. Saaresranta T, Polo-Kantola P, Rauhala E, et al. Medroxyprogesterone in postmenopausal females with partial upper airway obstruction during sleep. *Eur Respir J* 2001;18:989-95
3. Young T, Rabago D, Zgierska A, et al. Objective and subjective sleep quality in premenopausal, perimenopausal, and postmenopausal women in the Wisconsin Sleep Cohort Study. *Sleep* 2003;26:667-72
4. Kuh DL, Wadsworth M, Hardy R. Women's health in midlife: the influence of the menopause, social factors and health in earlier life. *Br J Obstet Gynaecol* 1997;104:923-33
5. Hachul H, Bittencourt LR, Soares JM, Jr, et al. Sleep in postmenopausal women: differences between early and late postmenopausal. *Eur J Obstet Gynecol Reprod Biol* 2009;145:81-4
6. Andersen ML, Bittencourt LRA, Antunes IB, et al. Effects of progesterone on sleep: a possible pharmacological treatment for sleep-breathing disorders? *Curr Med Chem* 2006;13:3575-82
7. Ohayon MM. Prevalence of DSM-IV diagnostic criteria of insomnia: distinguishing insomnia related to mental disorders from sleep disorders. *J Psychiatr Res* 1997;31:333-46
8. Ohayon MM, Reynolds CF 3rd. Epidemiological and clinical relevance of insomnia diagnosis algorithms according to the DSM-IV and the International Classification of Sleep Disorders (ICSD). *Sleep Med* 2009;10:952-60
9. Piaulino DC, Bueno OF, Tufik S, et al. The Prospective and Retrospective Memory Questionnaire: a population-based random sampling study. *Memory* 2010;18:413-26
10. Morin CM, Mimeault V, Gagne A. Nonpharmacological treatment of late-life insomnia. *J Psychosom Res* 1999;46:103-16
11. Sarti CD, Chiantera A, Graziottin A, et al. Hormone therapy and sleep quality in women around menopause. *Menopause* 2005;12:545-51
12. Hachul H, Bittencourt LR, Andersen ML, et al. Effects of hormone therapy with estrogen and/or progesterone on sleep pattern in postmenopausal women. *Int J Gynaecol Obstet* 2008;103:207-12

13. Santos-Galduroz RF, Galduroz JC, Facco RL, et al. Effects of isoflavone on the learning and memory of women in menopause: a double-blind placebo-controlled study. *Braz J Med Biol Res* 2010;43:1123–6
14. Hachul H, Brandao LC, D'Almeida V, et al. Isoflavones decrease insomnia in postmenopause. *Menopause* 2011;18:178–84
15. Hachul H, Oliveira D, Tufik S, et al. Effect of massage in postmenopausal women with insomnia: a pilot study. *Clinics* 2011; 66:343–6
16. Zhou J, Qin ZY, Li WL, et al. [Clinical observation on therapeutic effect of electroacupuncture at Sanyinjiao (SP 6) on perimenopausal syndrome]. *Zhongguo Zhen Jiu* 2006;26:617–20
17. American Psychiatric Association. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders. Washington, DC: American Psychiatric Association, 1994
18. Zaborowska E, Brynhildsen J, Damberg S, et al. Effects of acupuncture, applied relaxation, estrogens and placebo on hot flashes in postmenopausal women: an analysis of two prospective, parallel, randomized studies. *Climacteric* 2007;10:38–45
19. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial – A report from the WHOQOL group. *Qual Life Res* 2004;13:299–310
20. Noerholm V, Groenvold M, Watt T, et al. Quality of life in the Danish general population – normative data and validity of WHOQOL-BREF using Rasch and item response theory models. *Qual Life Res* 2004;13:531–40
21. Beck AT, Ward CH, Mendelson M, et al. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4:561–71
22. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh Sleep Quality Index – a new instrument for psychiatric practice and research. *Psychiatry Res* 1989;28:193–213
23. Rechtschaffen A, Kales A. A Manual of Standardized Terminology, Techniques and Scoring System for Sleep Stages of Human Subjects. NIH publication No. 204. Washington, DC: Public Health Service, US Government Printing Office, 1968
24. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force. *Sleep* 1999;22:667–89
25. Chesson AL Jr, Wise M, Davila D, et al. Practice parameters for the treatment of restless legs syndrome and periodic limb movement disorder. An American Academy of Sleep Medicine Report. Standards of Practice Committee of the American Academy of Sleep Medicine. *Sleep* 1999;22:961–8
26. Bonnet M, Carley D, Carskadon M, et al. ASDA report: EEG arousals: scoring rules and examples. *Sleep* 1992;15:173–84
27. Spence DW, Kayumov L, Chen A, et al. Acupuncture increases nocturnal melatonin secretion and reduces insomnia and anxiety: a preliminary report. *J Neuropsychiatry Clin Neurosci* 2004; 16:19–28
28. Huang MI, Nir Y, Chen B, et al. A randomized controlled pilot study of acupuncture for postmenopausal hot flashes: effect on nocturnal hot flashes and sleep quality. *Fertil Steril* 2006;86: 700–10
29. Sok SR, Erlen JA, Kim KB. Effects of acupuncture therapy on insomnia. *J Adv Nurs* 2003;44:375–84
30. Zhou ZL, Shi X, Li SD, et al. [Effect of scalp point penetration needling on sleep quality and sleep structure of insomnia patients]. *Zhongguo Zhen Jiu* 2010;30:721–4
31. Cao H, Pan X, Li H, et al. Acupuncture for treatment of insomnia: a systematic review of randomized controlled trials. *J Altern Complement Med* 2009;15:1171–86
32. Lunny CA, Fraser SN. The use of complementary and alternative medicines among a sample of Canadian menopausal-aged women. *J Midwifery Womens Health* 2010;55:335–43
33. Hill-Sakurai LE, Muller J, Thom DH. Complementary and alternative medicine for menopause: a qualitative analysis of women's decision making. *J Gen Intern Med* 2008;23:619–22
34. Brett KM, Keenan NL. Complementary and alternative medicine use among midlife women for reasons including menopause in the United States: 2002. *Menopause* 2007;14:300–7
35. van der Sluijs CP, Bensoussan A, Liyanage L, et al. Women's health during mid-life survey: the use of complementary and alternative medicine by symptomatic women transitioning through menopause in Sydney. *Menopause* 2007;14:397–403
36. Llanas AC, Hachul H, Bittencourt LR, et al. Physical therapy reduces insomnia symptoms in postmenopausal women. *Maturitas* 2008;61:281–4
37. Hachul H. Clinical roundup – How do you treat insomnia in your practice? Part 2. *Altern Complement Ther* 2010;16: 299–305
38. Borud E, Grimsgaard S, White A. Menopausal problems and acupuncture. *Auton Neurosci* 2010;157:57–62
39. Borrelli F, Ernst E. Alternative and complementary therapies for the menopause. *Maturitas* 2010;66:333–43
40. Ruan JW, Wang CH, Liao XX, et al. Electroacupuncture treatment of chronic insomniacs. *Chin Med J* 2009;122:2869–73
41. Polo-Kantola P, Saaresranta T, Polo O. Aetiology and treatment of sleep disturbances during perimenopause and postmenopause. *CNS Drugs* 2001;15:445–52
42. Sforza E, Haba-Rubio J. Night-to-night variability in periodic leg movements in patients with restless legs syndrome. *Sleep Med* 2005;6:259–67