Maturitas 62 (2009) 184–189

Contents lists available at ScienceDirect

Maturitas

journal homepage: www.elsevier.com/locate/maturitas

Relations among menopausal symptoms, sleep disturbance and depressive symptoms in midlife

Jessica P. Brown[a,*], Lisa Gallicchio[b], Jodi A. Flaws[c], J. Kathleen Tracy[a]

[a] Department of Epidemiology and Preventive Medicine, University of Maryland School of Medicine, Baltimore, MD, United States
[b] The Weinberg Center for Women's Health and Medicine, Mercy Medical Center, Baltimore, MD, United States
[c] Department of Veterinary Biosciences, University of Illinois, Urbana, IL, United States

ARTICLE INFO

Article history:
Received 11 August 2008
Received in revised form 7 November 2008
Accepted 11 November 2008

Keywords:
Menopausal symptoms
Sleep
Depressive symptoms

ABSTRACT

Objectives: To investigate the relations among hot flashes, other menopausal symptoms, sleep quality and depressive symptoms in midlife women.
Methods: A large population-based cross-sectional study of 639 women (ages 45–54 years) consisting of a questionnaire including the Center for Epidemiologic Studies-Depression (CES-D) Scale, demographics, health behaviors, menstrual history, and menopausal symptoms.
Results: After controlling for menopausal status, physical activity level, smoking status and current self-reported health status elevated CES-D score is associated with frequent nocturnal hot flashes, frequent trouble sleeping, experiencing hot flashes, nausea, headaches, weakness, visual problems, vaginal discharge, irritability, muscle stiffness, and incontinence.
Conclusions: The present study found significant links between depressive symptoms and several menopausal symptoms including hot flashes, sleep disturbance, irritability, muscle stiffness, and incontinence after controlling for covariates. These findings suggest that a potential mechanism in which bothersome menopausal symptoms may influence depressed mood during the midlife is through sleep disturbance.

1. Introduction

Although a majority of women do not experience depressed mood during the menopausal transition, a substantial portion are vulnerable. The experience of depressive symptoms is most often reported by perimenopausal women as compared to those who are either pre or postmenopausal [1–5]. The Study of Women Across the Nation (SWAN), a large multi-race study of midlife women, reported that 40.5% of participants reported feeling depressed within the past 2 weeks [6]. Additionally, 14.3% reported feeling depressed 6 or greater days within the past 2 weeks [2]. Considering that the perimenopause can last up to 6 years [7], the risk of developing depression during the perimenopause can be as high as 14 times that of premenopausal women [8], and that depression is the second leading cause of disability in developed countries [9], the potential burden of illness experienced by depressed perimenopausal women is significant.

The underlying causes of depressive symptoms during the perimenopause remain poorly understood. Risk factors may include a previous depressive episode (including postpartum depression) [10], vasomotor symptoms [10–13], and negative life events [14]. Hormonal fluctuations have been implicated as an underlying mechanism of depression during the perimenopause. However, whether hormones have a direct or indirect impact remains controversial. Reports from SWAN and others [1,6,15–19] suggest no direct effect of hormones on mood. Most recently, Gallicchio et al. [19] found no statistically significant associations between hormones (estradiol, FEI, estrone, androstenedione, testosterone, FTI, DHEA-S, and SHBG) and depressive symptoms among perimenopausal women. However, the number of menopausal symptoms reported was significantly related to depressive symptoms. This suggests an alternative hypothesis such that the experience of depressive symptoms during the perimenopause may be explained by vasomotor and other menopausal symptoms. A report from the Massachusetts Women's Health Study [11] stated that any association seen between menopausal status and depression may be explained by other menopausal symptoms. Schmidt et al. [8] reported that hot flashes were correlated with the development of perimenopausal depression but were not a necessary precursor.

Here we investigated the relations among hot flashes and other menopausal symptoms, sleep quality and depressive symptoms in

* Corresponding author at: Department of Epidemiology and Preventive Medicine, University of Maryland School of Medicine, 660 W. Redwood Street, Howard Hall, Room 220, Baltimore, MD 21201, United States.
E-mail address: jpbrown@epi.umaryland.edu (J.P. Brown).

0378-5122/$ – see front matter © 2008 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.maturitas.2008.11.019

Table 1
Sample characteristics.

	CES-D score < 16 (n = 477)		CES-D score ≥ 16 (n = 157)		p-Value*
	N	%	*N*	%	
Demographics					
Age (years)					.15
45–49	301	63.1	109	69.4	
50–54	176	36.9	48	30.6	
Race					.40
White	396	83.0	133	84.7	
Black	73	15.3	19	12.1	
Other	7	1.5	4	2.5	
Marital status					.07
Single	64	13.4	18	11.5	
Married/living with partner	328	68.9	98	62.4	
Divorced/widowed/separated	84	17.6	41	26.1	
Education					.09
High school or less	71	14.9	28	17.8	
Some college	119	24.9	49	31.2	
Graduated college	118	24.7	41	26.1	
Graduate school	169	35.4	39	24.8	
Employment					.539
Unemployed	20	4.2	10	3.4	
Retired/disability[a]	67	14.1	22	14.0	
Employed	389	81.7	125	79.6	
Health behaviors/status					
Menopausal status					.04
Premenopausal	189	40.7	49	31.4	
Perimenopausal	275	59.3	107	68.6	
Physical activity					.002
Inactive/light	263	55.1	109	69.4	
Moderate/heavy	214	44.9	48	30.6	
Cigarette use					.001
Current	32	6.7	26	16.6	
Former	188	39.5	58	36.9	
Never	256	53.8	73	46.5	
Alcohol use within past year					.158
Yes	324	77.0	97	23.0	
No	153	71.8	60	28.2	
Self-rated health status					<.001
Excellent	114	23.9	15	9.6	
Very good/good	336	70.6	121	77.1	
Fair/poor	26	5.5	21	13.4	
Body mass index (kg/m^2)					.4
24.9 or less	208	43.6	63	40.1	
25.0–29.9	133	27.9	40	25.5	
30.0 or greater	136	28.5	53	33.8	
Menopausal symptoms					
Hot flashes (ever)					.1
Yes	268	56.2	100	63.7	
No	209	43.8	57	36.3	
Hot flashes (past 30 days)[b]					.02
Yes	172	64.9	78	78.0	
No	93	35.1	22	22.0	
Hot flash severity					.45
Mild	101	37.8	33	33.0	
Moderate	144	53.9	55	55.0	
Severe	22	8.24	12	12.0	
Wake up with hot flashes (# of times/night)					<.001
None	102	28.7	30	22.6	
One	100	28.2	32	24.1	
Two	96	27.0	25	18.8	
Three	41	11.6	23	17.3	
Four or more	16	4.5	23	17.3	
Change bed sheets					.01
Yes	61	17.23	36	27.3	
No	293	82.8	96	72.7	

Table 1 (*Continued*).

Frequency of changing bed sheets[c]					.21
<once/week	43	70.5	27	73.0	
1–2 times/week	9	14.8	9	24.3	
3–4 times/week	8	13.1	1	2.7	
>5 times/week	1	1.6	0	.0	
Trouble sleeping (#/week)					.001
None	147	49.2	43	38.7	
1–2 times	110	36.8	33	29.7	
3–4 times	32	10.7	24	21.6	
5 or more	10	3.3	11	9.9	
Insomnia[d]					<.001
Yes	181	38.1	103	67.3	
No	293	61.8	50	32.7	
Nausea					<.001
Yes	30	6.3	32	20.4	
No	446	93.7	125	79.6	
Headache					<.001
Yes	168	35.2	82	52.2	
No	309	64.8	75	47.8	
Aches and pains					<.001
Yes	244	51.3	113	72.0	
No	232	48.7	44	28.0	
Weakness					<.001
Yes	52	11.0	47	30.3	
No	420	89.0	108	69.7	
Visual changes					.001
Yes	76	16.1	43	28.1	
No	395	83.9	110	71.9	
Vaginal discharge					.003
Yes	115	24.3	56	36.4	
No	359	75.7	98	63.6	
Vaginal dryness					.30
Yes	100	21.3	39	25.3	
No	369	78.7	115	74.7	
Irritability					<.001
Yes	212	45.1	123	79.4	
No	258	54.9	32	20.7	
Muscle stiffness					<.001
Yes	183	38.9	85	55.2	
No	287	61.1	69	44.8	
Incontinence					<.001
Yes	88	18.8	54	35.3	
No	380	81.2	99	64.7	

[a] Contains individuals who reported either being retired, full-time homemaking, being a student, on temporary medical leave or permanently disabled.
[b] Among those who had ever had hot flashes.
[c] Among those who had to ever had to change sheets.
[d] For insomnia, nausea, headache, weakness, visual changes, vaginal discharge, irritability, muscle stiffness, and incontinence: yes = at least once/week.
[*] *p*-Values from Chi-square analyses.

midlife women not taking hormone replacement therapy or oral contraceptives.

2. Methods

2.1. Study sample

As part of a large population-based cross-sectional study, 639 women (ages 45–54 years) were asked to complete a questionnaire that included the Center for Epidemiologic Studies-Depression (CES-D) Scale, demographics, health behaviors, menstrual history, menopausal symptoms including history and severity of hot flashes, and sleep quality. Participants were eligible if they were between 45 and 54 years old, had at least 3 but not more than 9 menstrual periods within the past 12 months, were not pregnant or on hormones, had an intact uterus and at least one ovary, and had no history of ovarian or endometrial cancer. A full description of the sample and data collection methods have been presented elsewhere [20]. Women were considered to have depressive symptoms if their CES-D score was $\geq$16. All participants gave written informed consent according to the procedures approved by the University of Maryland and the Johns Hopkins University Institutional Review Boards.

2.2. Statistical analysis

Chi-square analyses were performed to assess the distribution of demographic variables, health behaviors, menopausal symptoms and sleep quality between women with depressive symptoms (CES-D $\geq$ 16) and women without depressive symptoms (CES-D < 16). Logistic regression analyses were conducted to examine the associations between variables found to be significantly associated with depressive symptoms in the univariate analyses. Adjusted models were conducted correcting for the demographic and health

behavior variables significantly associated with depressive symptoms to provide adjusted odds ratios (OR) for relations between menopausal symptoms and depressive symptoms.

3. Results

Sample characteristics divided by presence or absence of depressive symptoms are shown in Table 1. Women experiencing depressive symptoms were more likely to be perimenopausal, report little physical activity, be a current smoker, and less likely to rate their current health as excellent. There were no observed differences in age, race, marital status, education level, employment status or BMI.

Unadjusted and adjusted OR and 95% confidence intervals (95% CI) of depressive symptoms by menopausal symptoms are shown in Table 2. After controlling for covariates (i.e., menopausal status, physical activity level, smoking status and current self-reported health status), waking up 5 or more times/night with a hot flash (OR 4.51, 95% CI 2.01, 10.11), having trouble sleeping more than 5 times/week (OR 4.22, 95% CI 1.53, 11.64), experiencing insomnia once/week or more (OR 3.01, 95% CI 2.02, 4.49), experiencing hot flashes within the past 30 days (OR 1.48, 95% CI 1.00, 2.19), experiencing nausea once/week or more (OR 3.66, 95% CI 2.06, 6.50), experiencing headaches once/week or more (OR 2.01, 95% CI 1.37, 2.94), experiencing aches and pains once/week or more (OR 1.87, 95% CI 1.23, 2.84), experiencing weakness once/week or more (OR 2.94, 95% CI 1.83, 4.72), experiencing visual problems once/week or more (OR 1.71, 95% CI 1.08, 2.70), experiencing vaginal discharge once/week or more (OR 1.77, 95% CI 1.18, 2.66), experiencing irritability once/week or more (OR 4.23, 95% CI 2.71, 6.58), experiencing muscle stiffness once/week or more (OR 1.60, 95% CI 1.09, 2.36), experiencing incontinence once/week or more (OR 2.14, 95% CI 1.40, 3.27) were significantly associated with elevated CES-D score. After controlling for covariates, ever having to change bed sheets due to hot flashes (OR 1.63, 95% CI .99, 2.68) and having trouble sleeping 3–4 times/week (OR 1.92, 95% CI .99, 3.75) were marginally significantly ($p < .057$ and $p < .056$ respectively) related to elevated CES-D score. No significant associations were found between number of times/week bed sheets had to be changed, ever experiencing hot flashes, or experiencing vaginal dryness once/week or more and elevated CES-D score in this sample.

Table 2
Unadjusted and adjusted associations between sample characteristics and depressed mood.

Symptom	Unadjusted OR (95% CI)	Adjusted OR (95% CI)[a]
Hot flashes (past 30 days)		
No	1.00 (referent)	1.00 (referent)
Yes	1.73 (1.20, 2.50)	1.48 (1.0, 2.19)
Wake up with hot flashes (# of times/night)		
None	1.00 (referent)	1.00 (referent)
One	1.09 (.62, 1.92)	.99 (.55, 1.80)
Two	.89 (.49, 1.61)	.71 (.38, 1.33)
Three	1.01 (.99, 3.67)	1.56 (.78, 3.09)
Four or more	4.89 (2.29, 10.42)	4.51 (2.01, 10.11)
Change bed sheets		
No	1.00 (referent)	1.00 (referent)
Yes	1.80 (1.12, 2.89)	1.63 (.99, 2.68)[#]
Trouble sleeping (#/week)		
None	1.00 (referent)	1.00 (referent)
1–2 times	1.03 (.61, 1.72)	.91 (.53, 1.55)
3–4 times	2.56 (1.37, 4.81)	1.92 (.99, 3.75)[†]
5 or more	3.76 (1.50, 9.45)	4.22 (1.53, 11.64)
Insomnia		
No	1.00 (referent)	1.00 (referent)
Yes	3.34 (2.27, 4.90)	3.01 (2.02, 4.49)
Nausea		
No	1.00 (referent)	1.00 (referent)
Yes	3.81 (2.23, 6.51)	3.66 (2.06, 6.50)
Headache		
No	1.00 (referent)	1.00 (referent)
Yes	2.01 (1.40, 2.90)	2.01 (1.37, 2.94)
Aches and pains		
No	1.00 (referent)	1.00 (referent)
Yes	2.44 (1.65, 3.61)	1.87 (1.23, 2.84)
Weakness		
No	1.00 (referent)	1.00 (referent)
Yes	3.52 (2.25, 5.50)	2.94 (1.83, 4.72)
Visual changes		
No	1.00 (referent)	1.00 (referent)
Yes	2.03 (1.32, 3.12)	1.71 (1.08, 2.70)
Vaginal discharge		
No	1.00 (referent)	1.00 (referent)
Yes	1.78 (1.21, 2.63)	1.77 (1.18, 2.66)
Irritability		
No	1.00 (referent)	1.00 (referent)
Yes	4.68 (3.05, 7.19)	4.23 (2.71, 6.58)
Muscle stiffness		
No	1.00 (referent)	1.00 (referent)
Yes	1.93 (1.34, 2.79)	1.60 (1.09, 2.36)
Incontinence		
No	1.00 (referent)	1.00 (referent)
Yes	2.36 (1.57, 3.53)	2.14 (1.40, 3.27)

[a] Adjusted for menopausal status, physical activity level, smoking status and current self-reported health status.
[#] $p = .057$.
[†] $p = .056$.

4. Discussion

This study revealed that among midlife women elevated CES-D score is associated with a number of menopausal symptoms even after controlling for menopausal status, physical activity level, smoking status and current self-reported health status. Frequent nocturnal hot flashes, frequent trouble sleeping, experiencing hot flashes, nausea, headaches, aches and pains, weakness, visual problems, vaginal discharge, irritability, muscle stiffness, and/or incontinence were related to depressed mood. Furthermore, ever having to change the bed sheets and moderate sleep disturbance (3–4 times/week) were marginally significantly related to depressive symptoms.

Our findings are consistent with those of prior investigations that have found an association between depressed mood and hot flashes [10,12,14], noctural hot flashes [13], sleep disturbance [10,12,21], smoking status [10,12], physical activity [12], and poor self-rated health status [22]. The Melbourne Women's Midlife Health Project found that elevated scores on an abbreviated version of the CES-D were related to number of bothersome menopausal symptoms including lack of energy, trouble sleeping and urinary incontinence [22]. Reports from SWAN have found that psychologic distress (i.e., the presence of feeling tense or nervous, feeling blue or depressed, and feeling irritable or grouchy within the past 2 weeks) was related to sleep disturbance, hot flashes or night sweats, and poor self-rated health [1].

In contrast, findings from the Seattle Midlife Women's Health Study have found an association between hot flashes and poor sleep and poor sleep and feeling depressed/sad, but not between hot flashes and depressed mood [22]. In the same study, however, when depressed mood was measured with the CES-D, experiencing hot flashes was related to elevated CES-D score, but only when looked at individually [14]. When looked at in aggregate, having hot flashes was no longer significantly associated with depressive symptoms,

but negative life event stress, BMI, nulliparity, and history of postpartum blues remaining significant predictors. A similar pattern of results was found in a subset of SWAN participants experiencing their first episode of major depression during the perimenopause [23]. Additionally, Ozturk et al. [24] found no significant relation between severity of vasomotor symptom subscale scores of the Greene Climacteric scale and scores on the Hamilton Depression scale scores in perimenopausal women.

Prospectively, the Harvard Study of Moods and Cycles found a two-fold increase in the risk of developing depressive symptoms during the perimenopause among women who nocturnal hot flashes without a history of depression [13]. The experience of hot flashes at baseline was marginally significantly more frequent among women who reported an elevated CES-D score during an 8-year follow up as compared to women who did not exhibit depressive symptoms during the follow up period. Participants with elevated CES-D scores during follow up were 2.16 times more likely to report hot flashes at the same visit. These associations were not maintained when comparing women who went on to develop major depression with women who remained free from depressive symptoms (i.e. CES-D < 16 at all time points) [25].

These studies suggest that the experience of vasomotor symptoms serve as a trigger for depressive symptoms but not frank clinical depression. This association seems more potent in women who have a compromised health status and/or have recently experienced 1 or more negative life events. The present findings support this domino theory [26] of perimenopausal depressed mood as well. Here, women with depressive symptoms also report an aggregate of bothersome menopausal symptoms most notably frequent nocturnal hot flashes, trouble sleeping and irritability and we have previously reported no association between hormone levels and depressive symptoms in this sample [19].

While the cross-sectional design of the present study precludes examining directional associations between vasomotor and depressive symptoms, one plausible path is that the experience of vasomotor symptoms leads to sleep disturbance which, in turn, promotes depressive symptoms in perimenopausal women. The prevalence of sleep disturbance is higher during the perimenopause than the premenopausal years and ranges from 33% to 51% [27]. An AHRQ evidence-based report of the management of menopausal symptoms [28] revealed that women have more difficulty sleeping as they progress through the menopause. Peri- and postmenopausal women have a slightly increased prevalence of sleep problems than premenopausal women, suggesting a link between vasomotor symptoms and poor sleep [28]. The frequency of hot flashes has been associated with self-reported sleep quality, such that women with a high frequency of hot flashes report poorer sleep [29,34]. Women who experience hot flashes and night sweats have significantly lower sleep efficiencies based on polysomnography [27].

Sleep disturbance during the perimenopause is well recognized both subjectively by women [10,12,21,30–34] and has been physiologically measured [27]. However, both the direction of the relation between poor sleep and depressive symptoms, as well as potential underlying mechanisms remains unknown. Studies on the influence of hormone replacement therapy, while its use is controversial, on sleep quality are mixed but suggest a beneficial effect perhaps by alleviating vasomotor symptoms [27]. Moreover, existing studies are fraught with methodological differences hampering the utility of the available data [29]. Aside from vasomotor symptoms leading to sleep disturbance, sleep disordered breathing may also play a role [33] Sleep disordered breathing ranges from snoring to apnea (airflow cessation) [27] and is more prevalent during the menopausal years due to the loss of progesterone which stimulates breathing, the redistribution of fat as measured by waist/hip circumference ratio changes and higher prevalence of obesity [27,29,30]. However, research findings regarding sleep disordered breathing among peri- and postmenopausal women are mixed and require further study.

As mentioned above, one limitation of our study is its cross-sectional design. In order to better characterize the temporal relations linking menopausal symptoms, poor sleep and depressive symptoms, longitudinal studies are needed. Ideally, these studies would employ physiological measurements of both hot flashes and sleep quality versus relying on subjective, self-report data alone. Additionally, we did not assess prior episodes of depression or concurrent negative life events in our sample.

In review, the present study found significant links between depressive symptoms in perimenopausal women and several menopausal symptoms including hot flashes, sleep disturbance, irritability, muscle stiffness, and incontinence after controlling for covariates. One potential mechanism in which bothersome menopausal symptoms may influence depressed mood is through sleep disturbance. However, how poor sleep affects mood during the midlife requires more study [28]. In the meantime, midlife women should be encouraged to engage in health promoting and preserving behaviors such as regular physical activity, quitting smoking and maintaining a healthy weight. Leading a healthful lifestyle and seeking appropriate treatment for bothersome menopausal symptoms may improve mood and quality of life.

References

[1] Bromberger JT, Meyer PM, Kravitz HM, et al. Psychologic distress and natural menopause: a multiethnic community study. Am J Public Health 2001;91:1435–42.
[2] Bromberger JT, Assmann SF, Avis NE, Schocken M, Kravitz HM, Cordal A. Persistent mood symptoms in a multiethnic community cohort of pre- and perimenopausal women. Am J Epidemiol 2003;15:347–56.
[3] Schmidt PJ. Mood, depression, and reproductive hormones in the menopausal transition. Am J Med 2005;118:54S–8S.
[4] Rasgon N, Shelton S, Halbreich U. Perimenopausal mental disorders: epidemiology and phenomenology. CNS Spectr 2005;10:471–8.
[5] Vesco KK, Haney EM, Humphrey L, Fu R, Nelson HD. Influence of menopause on mood: a systematic review of cohort studies. Climateric 2007;10:448–65.
[6] Avis NE, Stellato R, Crawford S, et al. Is there a menopausal syndrome? Menopausal status and symptoms across racial/ethnic groups. Soc Sci Med 2001;52:345–56.
[7] North American Menopause Society. Menopause Guidebook. 6th ed. Cleveland, OH: North American Menopause Society; 2006.
[8] Schmidt PJ, Haq N, Rubinow DR. A longitudinal evaluation of the relationship between reproductive status and mood in perimenopausal women. Am J Psychiatry 2004;161:2238–44.
[9] Murray CJL, Lopez AD, editors. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Cambridge, MA: Harvard School of Public Health; 1996.
[10] Freeman EW, Sammel MD, Liu L, Gracia CR, Nelson DB, Hollander L. Hormones and menopausal status as predictors of depression in women in transition to menopause. Arch Gen Psychiatry 2004;61:62–70.
[11] Avis NE, Crawford S, Stellato R, Longcope C. Longitudinal study of hormone levels and depression among women transitioning through menopause. Climacteric 2001;4:243–9.
[12] Bosworth HB, Bastian LA, Kuchibhatla MN, et al. Depressive symptoms, menopausal status, and climacteric symptoms in women at midlife. Psychosom Med 2001;63:603–8.
[13] Cohen LS, Soares CN, Vitonis AF, Otto MW, Harlow BL. Risk for new onset depression during the menopausal transition. Arch Gen Psychiatry 2006;63:385–90.
[14] Woods NF, Smith-DiJulio K, Percival DB, Tao EY, Mariella A, Mitchell ES. Depressed mood during the menopausal transition and early postmenopause and their relation to endocrine levels over time: observations from the Seattle Midlife Women's Health Study. Menopause 2008;15:223–32.
[15] Avis NE, Brambilla D, McKinlay SM, Vass K. A longitudinal analysis of the association between menopause and depression: results from the Massachusetts Women's Health Study. Ann Epidemiol 1994;4:214–20.
[16] Kaufert PA, Gilbert P, Tate R. The Manitoba Project: a re-examination of the link between menopause and depression. Maturitas 1992;14:143–55.
[17] McKinley JB, McKinley SM, Brambilla D. The relative contributions of endocrine changes and social circumstances to depression in mid-aged women. J Health Soc Behav 1987;28:345–63.
[18] Mitchell ES, Woods NF. Symptom experiences of midlife women: observations from the Seattle Midlife Women's Health Study. Maturitas 1996;25:1–10.
[19] Gallicchio L, Schilling C, Miller SR, Zacur H, Flaws JF. Correlates of depressive symptoms among women undergoing the menopausal transition. J Psychosom Res 2007;63:263–8.

[20] Schilling C, Gallicchio L, Miller SR, et al. Current alcohol use is associated with a reduced risk of hot flashes in midlife women. Alcohol Alcohol 2005;40:563–8.
[21] Woods NF, Smith-DiJulio K, Percival DB, Tao EY, Taylor HJ, Mitchell ES. Symptoms during the menopausal transition and early postmenopause and their relation to endocrine levels over time: observations from the Seattle Midlife Women's Health Study. J Womens Health 2007;16:667–77.
[22] Dennerstein L, Guthrie JR, Clark M, Lehert P, Henderson VW. A population-based study of depressed mood in middle-aged, Australian-born women. Menopause 2004;11:563–8.
[23] Bromberger JT, Kravitz HM, Matthews K, Youk A, Brown C, Feng W. Predictors of first lifetime episodes of major depression in midlife women. Psychol Med 2008 [Accessed April 17, 2008 (published online ahead of print April 1, 2008)].
[24] Ozturk O, Erasian D, Mete HE, Ozsener S. The risk factors and symptomatology of perimenopausal depression. Maturitas 2006;55:180–6.
[25] Freeman EW, Sammel MD, Lin H, Nelson DB. Associations of hormones and menopausal status with depressed mood in women with no history of depression. Arch Gen Psychiatry 2006;63:375–82.
[26] Robinson GE. Psychotic and mood disorders associated with the perimenopausal period. CNS Drugs 2001;15:175–84.
[27] Shaver JLF, Zenk SN. Sleep disturbance in menopause. J Womens Health Gend Based Med 2000;9:109–18.
[28] Nelson, HD, Haney E, Humphrey L, et al. Management of menopause-related symptoms. summary, evidence report/technology assessment no. 120. (Prepared by the Oregon Evidence-based Practice Center, under Contract No. 290.02-0024.) AHRQ Publication No. 05-E016-1. Rockville, MD: Agency for Healthcare Research and Quality; March 2005.
[29] Moline ML, Broch L, Zak RZ. Sleep in women across the life cycle from adulthood through menopause. Med Clin N Am 2004;88:705–36.
[30] Owens JF, Matthews KA. Sleep disturbances in healthy middle-aged women. Maturitas 1998;30:41–50.
[31] Kloss JD, Tweedy K, Gilrain K. Psychological factors associated with sleep disturbance among perimenopausal women. Behav Sleep Med 2004;2:177–90.
[32] Thurston RC, Blumenthal JA, Babyak MA, Sherwood A. Association between hot flashes, sleep complaints, and psychological functioning among healthy menopausal women. Int J Behav Med 2006;13:163–72.
[33] Young T, Finn L, Austin D, Peterson A. Menopausal status and sleep-disordered breathing in the Wisconsin Sleep Cohort Study. Am J Respir Crit Care Med 2003;167:1181–6.
[34] Kravitz HM, Zhao X, Bromberger JT, et al. Sleep disturbance during the menopausal transition in a multi-ethnic community sample of women. Sleep 2008;31:979–90.