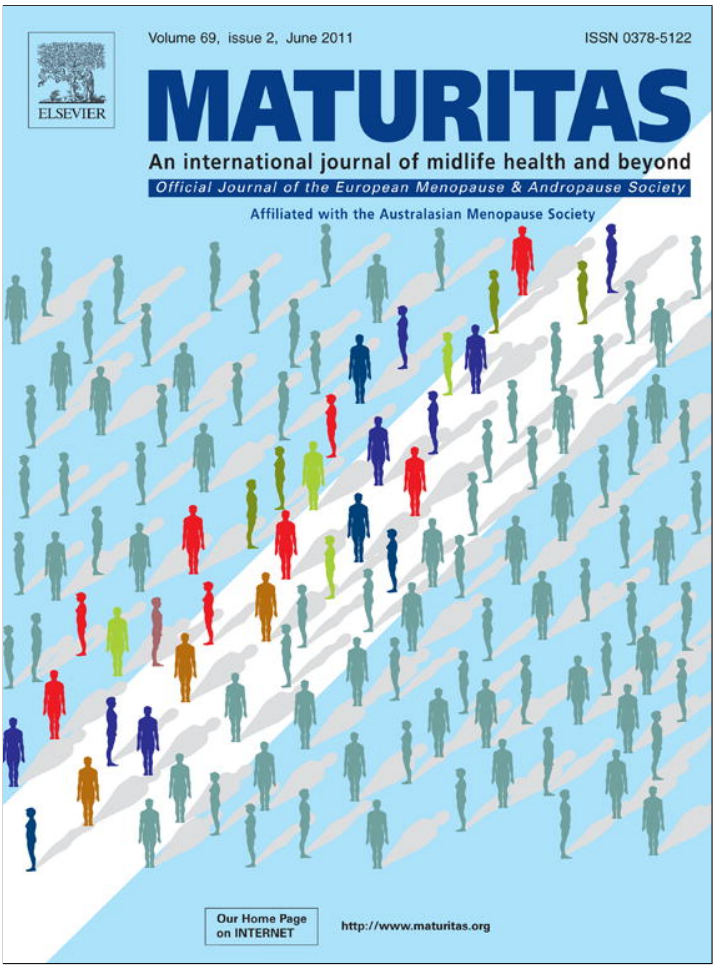

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Factors relating to insomnia during the menopausal transition as evaluated by the Insomnia Severity Index

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ABSTRACT

Background: Although the menopause associates to poor sleep quality, insomnia severity data in the menopausal transition is scarce or lacking.
Objective: To assess insomnia prevalence, severity and related factors in mid-aged women.
Methods: In this cross-sectional study 340 women (40 to 59 years) completed the Insomnia Severity Index (ISI) and a general questionnaire containing personal/partner data. Hot flush presence and intensity was also assessed with the Menopause Rating Scale (MRS).
Results: Median age of the sample was 48.0 years, with 63.5% having lower education and 52.9% being postmenopausal. At the moment of the survey 7.1% were on hormone therapy, 8.2% on phytoestrogens and 2.1% on psychotropic drugs. A 63.8% were abdominally obese (waist circumference > 88 cm) and 65.5% sedentary. According to item 1 of the MRS, 60.9% presented hot flushes, graded in 17.4% as severe-very severe. Regarding the partner (n = 255), erectile dysfunction was present in 23.9%, premature ejaculation 37.6%, 35.3% abused alcohol and 42.4% were faithful. The ISI tool displayed a high internal consistency (alpha Cronbach coefficient = 0.87), identifying 41.5% of women with some degree of insomnia (Total ISI score ≥8) further categorized as sub-threshold or mild (32.0%), moderate (7.4%) and severe (2.1%). Multiple linear regression analysis obtained two best fit models predicting total ISI scores, one not including and one including partner data. In the first model, hot flush severity, psychotropic use and sedentarism displayed significant positive correlations with total ISI scores. In the second, hot flush intensity, psychotropic drug use and male erectile dysfunction positively correlated whereas partner faithfulness inversely with ISI scores.
Conclusion: In this mid-aged series insomnia severity was related to female and partner factors; several of which are susceptible of intervention.

1. Introduction

The menopause is associated with different physiological, behavioral and socio-demographical changes. Progressive decline in estrogen levels are frequently related to vasomotor symptoms, urogenital discomfort, muscle-skeletal limitations, mood alterations and sleep disorders [1–4]. Menopausal women have more sleep disturbances when compared to premenopausal ones [5,6], frequently displaying less than six hours of sleep and reporting more fatigue or difficulty in initiating and maintaining sleep [7]. Under this scenario, there is an increase for short-term (fatigue-related accidents) and long-term problems (hypertension, diabetes and cardiovascular disease) [8]. Despite the aforementioned, caution has been recommended not to impute the menopause a causative role for sleeping disorders [9]. In fact, many psychological menopausal symptoms are similar to those related with insomnia (i.e. fatigue, irritability and sleep disruptions) [10]. It has been proposed that menopausal mood changes are due to sleep disruptions caused by hot flushes [11].

Research related to sleep has used different approaches: population based sampling, assessment of sleep disorders in morbid conditions and the use of sophisticated sleep laboratory techniques. Many questionnaires and tools have been designed to assess sleep duration and disorders [12]. However, while some tools lack insomnia severity assessment, others do not meet DSM-IV diagnostic criteria [13]. In this sense, the Insomnia Severity Index (ISI) is a simple, easy to use instrument designed to assess insomnia intensity and concomitantly fulfill DSM-IV sleep disor-

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der criteria [14]. The objective of the present study was to assess insomnia prevalence, severity and related factors in mid-aged women.

2. Materials and methods

2.1. Participants

A cross sectional study was performed during December 2010 at the Enrique C. Sotomayor Obstetrics and Gynecology Hospital, an associated teaching facility of the Medical Faculty of the Universidad Católica de Santiago de Guayaquil, Ecuador. Research aimed at assessing insomnia severity and related factors. Hence, healthy women aged 40–59 years visiting inpatients at the different wards of the Hospital (daily visiting hours: noon to 2 pm) were requested to complete the ISI [14] and a questionnaire containing personal and partner data. Subjects were additionally assessed for hot flush presence and severity using item 1 of the Menopause Rating Scale (MRS) [15]. Sotomayor Hospital is a major referral center providing reproductive healthcare basically to low income women of Guayaquil and surrounding peripheral areas. Women excluded from the study were those refusing participation or were incapable of understanding the items included in the questionnaire.

Research protocol of the study was reviewed and approved by the Scientific and Research Committee of the Enrique C. Sotomayor Hospital. All participants were informed about the research (its purpose and used tools) and written consent obtained.

2.2. Sample size calculation

This was based on the fact that 59.9% of mid-aged women present sleeping problems [16]. Hence a minimal sample of 251 subjects was calculated considering that the hospital covers for an estimated population of 5000 women aged 40–59 and assuming a 55% insomnia prevalence with a 6% desired precision and a 95% confidence interval.

2.3. General data questionnaire

2.3.1. Female data

Female data included: age (years), parity, menopausal status (pre, peri or postmenopausal), marital status, educational level (years), accessed healthcare system (free-minimal cost or paid), smoking habit (current, sometime, non-smoker), partner status (yes/no), church attendance, history of sexual abuse, psychiatric consultation and the use of drugs: psychotropics or hormone therapy [HT]/phytoestrogens for the menopause. Women were asked about how they perceived their health status and that of their partner. Those (men or women) capable of performing daily routine activities were defined as healthy. Sedentarism was defined if subjects carried out less than 15 min of physical activity twice a week [17]. Waist circumference was measured with subjects in standing position at the end of a normal breath expiration using a Gulick measuring tape placed horizontally around the abdomen at level of iliac crest. Abdominal obesity was defined as a waist circumference >88 cm [18].

Menopausal status was defined as: premenopausal (regular menses), perimenopausal (menstrual irregularities >7 days from their normal cycle) and postmenopausal (no more menses in the last 12 months) [19]. Those with bilateral oophorectomy were defined as postmenopausal. For statistical purposes hysterectomized women were considered as a separate group.

2.3.2. Partner data

Information regarding the partner was obtained from women and included: age, educational level, health status, faithfulness and the presence of alcoholism and sexual dysfunction (erectile dysfunction or premature ejaculation). Definitions for insufficient education (men and women), alcoholism, erectile dysfunction and premature ejaculation have previously been described [20].

2.4. Instruments

2.4.1. Menopause Rating Scale (MRS)

The Menopause Rating Scale (MRS) was used to assess hot flush presence and severity. This scale is a menopause specific health related quality of life instrument composed of 11 items grouped into three subscales: somatic, psychological and urogenital [15]. Item one of the somatic subscale was used to assess hot flushes and grade them from 0 (not present) to 4 (1 = mild; 2 = moderate; 3 = severe; 4 = very severe).

2.4.2. The Insomnia Severity Index (ISI)

The ISI is a brief, reliable, validated self-reporting instrument that yields a quantitative index of perceived insomnia severity [14]. The tool comprises 7 items targeting sleep disturbance severity, sleep related satisfaction and the degree of daytime functional impairment, impairment perception and distress and concern related to the sleeping problem. Each item is rated on a 5-point Likert scale (0–4) and summed up to provide a total score ranging from 0 to 28. Higher scores reveal more severe insomnia. Scores may be categorized as: 0–7 (no clinically significant insomnia) or 8–28 (some degree of insomnia). The latter was further divided into: 8–14 (sub-threshold insomnia or mild); 15–21 (moderate insomnia) and 22–28 (severe insomnia) [14].

2.5. Statistical analysis

Analysis was performed using statistical software: EPI-INFO 6.04 (Centers for Disease Control, Atlanta, Ga., USA; WHO, Basel, Switzerland) and SPSS 10.0 (Version for Windows, SPSS, Chicago IL, USA). Data are expressed as medians, interquartile ranges, percentages, beta coefficients and confidence intervals. The Kolmogorov Smirnov test was used to determine normality of data distribution. According to this, continuous non parametric data were compared using the Mann Whitney test (two independent samples) or the Kruskal Wallis test (various independent samples). Chi-square and Fisher's exact tests were used to compare percentages with Yate's correction performed when applicable. Internal consistency of the ISI tool was assessed computing alpha Cronbach coefficients.

Multiple linear regression analysis was performed to obtain two best models predicting total ISI scores (insomnia severity), one with and one without partner data. Independent variables were entered into each model using a stepwise procedure. Potential interaction variables were also entered during model construction. Both final best fit models were validated with a scatter graph model using studentized residues and predictive values obtained within each model. For all calculations a p value of <0.05 was considered as statistically significant.

3. Results

During the study period a total of 355 women were invited to participate. Refusal rate was 4.2% (15/355) which left 340 complete surveys for analysis. Characteristics of surveyed women and their partners are shown in Table 1 (binomial data only). Median [interquartile range = IQR] age, educational level and parity was 48.0 [9] years, 8 [6] years and 3 [2], respectively. A 63.5% had less

Table 1
Characteristics of surveyed women ($n = 340$) and their partners ($n = 255$).

	n (%)
Female	
Married[a]	154 (45.3)
Premenopausal	88 (25.9)
Perimenopausal	72 (21.2)
Postmenopausal	180 (52.9)
Bilateral oophorectomy	27 (7.9)
Hysterectomized	68 (20.0)
Hot flush (present)	207 (60.9)
Severe to very severe hot flushes	36/207 (17.4)
Low schooling (<12 years)	216 (63.5)
Currently smoking	5 (1.5)
Sedentary	223 (65.6)
Abdominal obesity (waist >88 cm)	196 (57.6)
Access to free healthcare	116 (34.1)
Hormone therapy use	24 (7.1)
Phytoestrogen use	28 (8.2)
Psychotropic drug use	7 (2.1)
Currently on psychiatric care	32 (9.4)
History of sexual abuse	21 (6.2)
Currently has a partner	255 (75.0)
Healthy (perceived by women)	232 (68.2)
Church assistance	254 (74.4)
Partner ($n = 255$)	
Low schooling (<12 years)	141 (56.0)
Alcoholism	90 (35.3)
Healthiness	181 (71.0)
Erectile dysfunction	61 (23.9)
Premature ejaculation	96 (37.6)
Faithfulness	108 (42.4)

[a] Those not married were either single (8.8%), divorced (13.8%), widowed (4.1%) or cohabited with partner (27.9%).

than 12 years of schooling, 34.1% accessed a free healthcare system and 52.9% were postmenopausal. At the moment of the survey 7.1% were on HT, 8.2% on phytoestrogens and 2.1% were taking psychotropic drugs. Regarding habits only 1.5% were current smokers, 63.8% abdominally obese and 65.5% sedentary. According to item 1 of the MRS 60.9% presented hot flushes, which were graded in 17.4% as severe to very severe. As for the partner ($n = 255$), median [IQR] age and educational level was 51 [11] years and 9 [6] years, respectively. Erectile dysfunction was present in 23.9%, premature ejaculation in 37.6%, 35.3% abused alcohol and 42.4% were faithful (Table 1).

The ISI tool displayed a high internal consistency as computed alpha Cronbach coefficient was determined to be 0.87. ISI scores for all women and according to menopausal status and years after the menopause onset are depicted in Table 2. A 41.5% of women had some degree of insomnia (ISI score ≥ 8) categorized as: subthreshold or mild (32.0%), moderate (7.4%) and severe (2.1%). ISI total scores and severity of insomnia (%) did not differ in relation to menopausal stage or time since menopause onset.

Multiple linear regression analysis was used to obtain two best fit models predicting total ISI scores, one without and one with partner data (Table 3). In the first model, hot flush severity, psychotropic use and sedentarism displayed significant positive correlations with total ISI scores. In the second, hot flush intensity, psychotropic drug use and male erectile dysfunction positively correlated whereas faithfulness inversely with ISI scores. Assumption of data linearity was met in both models and no interaction variables were found to be significant during the process of each model construction.

4. Discussion

Sleep aids the human body to physically recuperate and allow the brain to reorganize and store more efficiently daily gathered information, and hence consolidate memory knowledge and emotions [8]. Sleep disruptions and daytime sleepiness negatively impact quality of life, and seem to increase co-morbid conditions and mortality risk [2,8,21]. Although many population-based surveys report that sleep disorders increase with age [22] others have not confirmed this association [23]. In any case, the exact role of concomitant morbid conditions is still unclear [5,8]. Insomnia is very frequent in the peri/postmenopausal period (30–60%) in which HT use has been proposed as a control measure [5,24]. Polysomnographic findings indicate that menopausal women display longer total wake time and lower sleep efficiency than premenopausal ones [24]. It remains controversial, however, whether gonadal hormonal changes are in fact directly related to insomnia, sleep-breathing disorders and sleepiness. In fact, sleep complaints and sleepiness during the peri/postmenopausal period relate to factors such as psychological distress, headaches, dizziness, palpitations, depression and weight gain [24]. A 52.9% of surveyed women of the present study were postmenopausal, with a high abdominal obesity rate. Despite this, our linear regression model explaining more than 70% of total variance failed to demonstrate a correlation between ISI total scores (insomnia severity) and female age, menopausal status and waist circumference.

Insomnia rates found in the present study seem to be similar to those reported in women from other latitudes with a more favorable social context and better economical status [1,6]. However, as mentioned, our data seem not to support the menopause or age as factors influencing the presence and severity of insomnia. It is likely that external factors (non hormonal) be involved. Surveyed women have a similar socio-demographical profile (i.e. low income and educational level) as inpatients attended at Sotomayor Hospital. Using several tools we have previously described within this population increased menopausal and depressive symptoms related to female and partner factors in a higher degree than with age and menopausal status [4,16,20], with sleeping problems ranging from 45.6 to 68.4% [25,26]. Indeed, social difficulties, economical disad-

Table 2
ISI scores for all women and according to menopausal status and years after menopause onset.

Parameter	Total ISI score[a]	ISI score 8–28 Insomnia n (%)	ISI score 8–14 mild Insomnia n (%)	ISI score 15–21 moderate insomnia n (%)	ISI score 22–28 severe insomnia n (%)
All ($n = 340$)	6.5 [7.0]	141/340 (41.5)	109/340 (32.0)	25/340 (7.4)	7/340 (2.1)
Menopausal phase					
Premenopausal ($n = 88$)	6.0 [7.0]	34/88 (38.6)	28/88 (31.8)	5/88 (5.7)	1/88 (1.1)
Perimenopausal ($n = 72$)	6.0 [7.8]	23/72 (31.9)	17/72 (23.6)	6/72 (8.3)	0/72 (0.0)
Postmenopausal ($n = 180$)	7.0 [6.0]	84/180 (46.7)	64/180 (35.6)	14/180 (7.8)	6/180 (3.3)
	$p = 0.08$[**]	$p = 0.08$	$p = 0.12$	$p = 0.77$	$p = 0.60$
Postmenopausal stage					
Early (<5 years) ($n = 91$)	7.0 [7.0]	44/91 (48.4)	35/91 (38.5)	6/91 (6.6)	3/91 (3.3)
Late (≥ 5 years) ($n = 89$)	7.0 [7.0]	40/89 (44.9)	29/89 (32.6)	8/89 (8.9)	3/89 (3.4)
	$p = 0.43$	$p = 0.64$	$p = 0.41$	$p = 0.54$	$p = 0.69$

[a] Median [interquartile range].
[**] p values for the trend.

Table 3
Final best model predicting total ISI score: multiple linear regression analysis.

	Beta coefficient	CI 95%	Standard error	t	*p*-Value
Model complete data ($n = 340$)					
Hot flush intensity	1.55	1.05–2.05	0.25	6.10	<0.001
Psychotropic use	6.44	2.65–10.24	1.92	3.34	0.001
Sedentarism	1.43	0.30–2.56	0.57	2.49	0.01
Model with partner data ($n = 255$)					
Hot flush intensity	1.39	0.78–1.92	0.29	4.65	<0.001
Psychotropic use	7.12	3.42–11.49	2.04	3.64	<0.001
Male erectile dysfunction	1.70	0.38–3.23	0.72	2.50	0.01
Faithfulness	−1.11	−2.00 to -0.35	0.42	−2.81	0.005

Model 1: $r^2 = 0.77$; adjusted $r^2 = 0.75$, $p < 0.001$; model 2: $r^2 = 0.70$; adjusted $r^2 = 0.68$, $p = 0.01$; CI: confidence intervals.

vantages and stress may cause preoccupation and anxiety that may favor insomnia among our population, overriding the influence of age and hormonal status.

The relationship between hot flushes and disturbed sleep has long been described. A strong association between sleep and hot flushes has been reported in mid-aged women of the Women's Health Across the Nation (SWAN) study [27] and other similar studies [28]. Premenopausal women aged 45–49 reported poor sleep in relation to hot flushes, depression, caffeine consumption and lower estradiol levels [29]. The present study supports the findings of others. Indeed, our two linear regression models determined that the presence and severity of hot flushes positively correlated with ISI scores. Despite this, other studies have failed to do so [9,30].

In the present study the ISI tool displayed a high internal consistency (alpha Cronbach coefficient = 0.87). As reported by others [14] the tool allowed the identification of women with several degrees of insomnia. Only 9.5% of our women displayed ISI scores compatible with moderate to severe insomnia (7.4% moderate and 2.1% severe). This rate is lower than the 33% found by Ensrud et al. [31] using the same ISI tool in postmenopausal women. Although same tool was used, differences in study population make comparisons difficult. Nonetheless, both studies do evidence the role of hot flushes (presence and severity) as a predictor of higher ISI total scores (insomnia severity). To the best of our knowledge the present study is the first to use the ISI tool among climacteric women (pre, peri- and postmenopausal). More research is warranted in this regard.

Although the present study failed to correlate abdominal obesity with insomnia severity, it did find a positive correlation with sedentarism. We have previously reported that sedentarism increased the risk for daytime sleepiness, an indirect measure of insomnia and sleep disturbance [2], fact that supports our present data.

Various reports point out to the fact that HT use improves menopausal related sleep disturbances [5,32]. This was not the case in the present study; however, a positive correlation was found between psychotropic use and higher ISI scores in both proposed models, supporting the findings of others [33], that depression and insomnia may be related. Unfortunately the present study did not assess depressive symptoms. Future research design should include the assessment of depressive symptoms.

Another aspect worth mentioning is the male component. Health status, sexual function and social aspects of the partner may also influence the severity of female insomnia. The present series found male erectile dysfunction in 23.9%, alcohol abuse in 35.3% and partner faithfulness in 42.4%. As we have previously reported in low income mid-aged women, male sexual dysfunction, alcoholism and sexual behaviour correlate with female sexual dysfunction and increased menopausal/depressive symptoms, and hence impaired quality of life [16,20,26]. Results of the present series well correlate with our previous findings. Indeed, women with faithful partners displayed lower ISI scores whereas higher scores in those with a partner with erectile dysfunction. Exact mechanisms by which the male component negatively impacts mid-aged women's life are complex and perhaps uncertain; however, these surely must involve problems in the couple relation in a high rate.

Finally, as for the limitations of the present study one can mention its cross-sectional design. Although factors related to higher ISI scores (insomnia severity) have been delineated in our regression model we still cannot identify the precise causes of insomnia. Moreover if the ISI is not *per se* a diagnostic insomnia tool. It would have been interesting to assess hot flush daily frequency and depressive symptoms. As an additional limitation one can mention the study population which may be subject to certain degree of stress or anxiety. Hence, our results cannot be extrapolated to the general population. As a strength, that this series adds to the few assessing insomnia severity among mid-aged women (pre, peri and postmenopausal).

Despite the outlined limitations it can be concluded that in this mid-aged series insomnia severity was related to female (hot flushes, psychotropic use and sedentarism) and partner factors. Our results highlight the fact that these risk factors should be screened during daily clinical practice and appropriate intervention be provided as a reasonable cost-effective measure. In any case, more research in this regard is required to define links between comorbid conditions and risk factors. Biological as well as emotional and socio-demographical variables may influence insomnia prevalence in the menopause transition, hence we encourage that sleep habits, snoring, insomnia, daytime sleepiness and fatigue information be routinely included in menopausal healthcare protocols.

Contributors

Masumi Arakene, María F. Rosero, Cindy Castillo, Ricardo Peñafiel declare to have participated in the manuscript entitled "Factors relating to insomnia during the menopausal transition as evaluated by the Insomnia Severity Index" contributing in study design, literature review, data collection and providing intellectual input to final manuscript.

Peter Chedraui, declares to have participated in the manuscript entitled "Factors relating to insomnia during the menopausal transition as evaluated by the Insomnia Severity Index" contributing in the study design, performed statistics (analysis and interpretation) and formatting and editing the final version of the paper.

Faustino Pérez-López, declares to have participated in the manuscript entitled "Factors relating to insomnia during the menopausal transition as evaluated by the Insomnia Severity Index" contributing in its design, performing literature review, providing intellectual input and formatting of the final document.

Competing interests

The authors declare no conflict of interest.

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