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Factors related to increased daytime sleepiness during the menopausal transition as evaluated by the Epworth Sleepiness Scale

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ABSTRACT

Background: Sleep disorders and sleep-apnea/hypopnea syndromes are very frequent in women, being misdiagnosed in many cases. The menopause, regardless of age, is associated to poor sleep quality and daytime sleepiness that can lead to impaired quality of life, and reduced productivity and functioning.
Objective: To assess daytime sleepiness and related risk factors among middle aged Ecuadorian women using the Epworth Sleepiness Scale (ESS).
Methods: In this cross-sectional study 149 women aged 40–59 years were assessed for hot flush presence and intensity using the Menopause Rating Scale (MRS) and requested to fill out the ESS and a questionnaire containing personal and partner data.
Results: Mean age of surveyed women was 47.6 ± 5.5 years, with 67.8% having less than 12 years of schooling, 33.6% being postmenopausal, and 2.7% on hormone therapy. A 10.1% were current smokers and 20.8% were sedentary. According to the MRS (item 1) 51.7% presented hot flushes, which were graded as severe–very severe in 42.8% of cases. Regarding the partner ($n = 132$), erectile dysfunction was present in 10.6%, premature ejaculation 6.1% and 17.4% abused alcohol. Mean total ESS score was 8 ± 4.4 (median 8), with 33.6% considered having some degree of daytime sleepiness (ESS score ≥10). Logistic regression analysis determined that postmenopausal status (OR 6.58, CI 95% [2.51–17.23], $p = 0.001$), sedentarism (OR 3.43, CI 95% [1.14–10.26], $p = 0.02$) and hot flush presence (OR 2.61, CI 95% [1.02–6.65], $p = 0.04$) among women were risk factors for increased daytime sleepiness (ESS total score ≥10) whereas partner faithfulness decreased this risk (OR 0.47, CI 95% [0.24–0.90], $p = 0.02$).
Conclusion: Increased daytime sleepiness in this middle aged series was related to female (hormonal status and sedentarism) and partner factors; several which are susceptible of intervention.

1. Introduction

There are a number of factors that may affect female quality of sleep: neurologic diseases, metabolic alterations, elevated body weight and low degree of exercise, depression, stress, drugs, lifestyle and changes in hormone levels [1–9]. Regarding the latter, pregnancy, menstrual-related fluctuations and the menopause may cause sleeping disturbances such as difficulty of falling asleep, fractioned sleep, night-time awakening, inability of resuming sleep, problems in waking up, fatigue and daytime sleepiness. Sleep disorders are more common during the menopausal transition as compared to premenopausal years [1,10,11]. Many women during the menopause achieve less than 6 h of sleep on a regular basis, becoming at higher risk for short-term (fatigue-related accidents) and long-term problems (hypertension, diabetes and cardiovascular disease) [12–14]. Epidemiological data have consistently shown a higher prevalence of sleep-apnea/hypopnea in men, possibly reflecting the fact that women are being misdiagnosed [15–17]. In addition, women report more fatigue or difficulty in initiating and maintaining sleep [18,19]; those who work reporting more daytime sleepiness even in cases of mild sleep-apnea [20].

Daytime sleepiness imposes difficulty in performing daily tasks and cause irritability, moodiness and memory problems. Hot flush frequency and severity and night sweats have been associated with severe sleep disorders, night-time wakefulness and sleep fragmentation in postmenopausal women [21]. Despite this, many women refer sleep disorders many years before the onset of the menopause

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[22–24] and treating hot flushes has not always solved the problem [8,25].

The Epworth Sleepiness Scale (ESS) is a short and effective instrument developed at the Australian Epworth Hospital to assess excessive daytime sleepiness [26–28] and discriminate when clinical intervention is required. The score is claimed to represent a person's average sleep propensity which is different from fatigue or tiredness which is the focus of other sleep scales (i.e. Stanford Sleepiness Scale). A Spanish version of the ESS has been validated and demonstrated appropriate internal consistency, reliability, and evidenced measuring validity [29,30]. The objective of the present study was to assess daytime sleepiness and related risk factors among middle aged Ecuadorian women with the Spanish version of the ESS.

2. Materials and methods

2.1. Participants

From February 2009 to March 2009 a cross-sectional study aimed to assess beliefs and risk factors for the presence and severity of hot flushes (Primary Research Branch) among middle aged women was carried out at one of the associated teaching facilities of the Medical Faculty of the Universidad Católica de Guayaquil, Ecuador (The Enrique C. Sotomayor Obstetrics and Gynecology Hospital). During the study period, healthy non-black Hispanic women aged 40–59 years visiting inpatients at the different wards of the Hospital (visiting hours: 12 pm to 14 pm/day) were requested to fill out a questionnaire containing personal and partner data. Subjects were additionally assessed for hot flush presence and severity using the Menopause Rating Scale (MRS, item 1). Sotomayor Hospital is a major referral center providing reproductive healthcare basically to low income women of Guayaquil and surrounding peripheral areas [31]. Women excluded from the study were those refusing participation or were incapable of understanding the items included in the questionnaire.

The study had two secondary branches *the first* aimed to assess self-esteem and *the second* daytime sleepiness. In order to fulfill the second secondary aim women were additionally requested to fill out the ESS. This document presents data exclusively related to daytime sleepiness. Research protocol of the primary (The National Ecuadorian Study regarding hot flushes) and secondary branches of the study was reviewed and approved by the Bioethics Committee of the Medical Faculty of the Universidad Católica. All participants were informed about the research and its purposes and written consent obtained.

Sample size calculation was focused on the aim of the primary branch of the study, determining risk factors for hot flush presence and severity. Hence, using EPI-INFO statistical software, a minimal sample of 94 subjects was calculated considering that the hospital covers for an estimated population of 5000 women aged 40–59 and assuming that, as we have previously reported [32,33], at least 50% of surveyed women would present hot flushes with an estimated 10% error and a 95% confidence interval.

2.2. General data questionnaire

2.2.1. Female data

Age (years), parity, menopausal status (pre-, peri- or postmenopausal), marital status, educational level (expressed in years), accessed healthcare system (free-minimal cost or paid), smoking habit (current, sometime, and non-smoker), partner status, church attendance, history of sexual abuse, psychiatric consultation, and the use of drugs (psychotropic, hormone therapy [HT], and 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 considered if subjects carried out less than 15 min of physical activity twice a week [34].

2.2.2. Partner data

Data related to partner was obtained from women and included: age (years), educational level (total years), health status, faithfulness, presence of alcoholism and sexual dysfunction (erectile dysfunction or premature ejaculation). Alcoholism was defined as a chronic conduct disorder manifested by repeated and excessive alcohol consumption which interferes with health, economic or social relationships. For surveyed women and their partners less than 12 years of schooling was considered as low [35].

2.3. Hot flush assessment

The Menopause Rating Scale (MRS) was used to assess hot flush presence and severity. The MRS is a menopause specific health related quality of life instrument composed of 11 items divided into three subscales: somatic, psychological and urogenital. For the purpose of this research item one of the somatic subscale was used, which was graded by the subject from 0 (not present) to 4 (1 = mild; 2 = moderate; 3 = severe; 4 = very severe) [36].

2.4. Menopausal status definitions

The following definitions were used: premenopausal, women having regular menses; perimenopausal, those presenting irregularities >7 days from their normal cycle and postmenopausal, no more menses in the last 12 months [37]. Those with bilateral oophorectomy were considered as postmenopausal. For statistical purposes hysterectomized women were considered as a separate group.

2.5. The Epworth Sleepiness Scale (ESS)

The ESS is a patient rated 8-item instrument which quantifies on a 3-point scale the perceived severity of daytime sleepiness and insomnia-related interference with daytime functioning. A global score is obtained by summing the graded 8 items. A score of 10 or more is considered sleepy whereas 18 or more as very sleepy [28]. For the purpose of this research the validated Spanish version of the ESS was used which has shown appropriate internal consistency, reliability, and evidenced measuring validity [29,30].

2.6. Statistical analysis

Analysis was performed using EPI-INFO 2000 statistical software (Centers for Disease Control, Atlanta, GA, USA; WHO, Basel, Switzerland). Data are expressed as mean ± standard deviations, medians, percentages, odds ratios and confidence intervals. Continuous data were compared using ANOVA (parametric) and Mann–Whitney's *U*-test (non-parametric) whereas chi-square and Fisher's exact tests were used for categorical data. ESS total scores were re-grouped according to cut-off values 10 and 16 and presented as frequencies.

Risk factors for increased sleepiness (ESS ≥ 10) were analysed using logistic regression. For this, total ESS scores, as continuous variables, were transformed into a categorical one, now considered as cases those exhibiting scores equal or above 10. Independent variables to be entered in the regression model related to surveyed women included: older age (≥47, median), higher parity (≥3, median), marital status (married or not), low schooling (<12 years), postmenopausal status, hot flush presence, smoking status, sedentarism, perceived health status, drug use (HT, phytoestrogens

Table 1
Characteristics of surveyed women ($n = 149$) and their partners ($n = 132$).

Female	n (%)
Married[a]	91 (61.1)
Premenopausal	47 (31.5)
Perimenopausal	52 (34.9)
Postmenopausal	50 (33.6)
Bilateral oophorectomy	2 (1.3)
Hysterectomized	10 (6.7)
Hot flush (present)	77 (51.7)
Severe to very severe hot flushes	33/77 (42.8)
Low schooling (<12 years)	101 (67.8)
Currently smoking	15 (10.1)
Sedentary	31 (20.8)
Access to free healthcare	137 (91.9)
Hormone therapy use	4 (2.7)
Phytoestrogen use	1 (0.7)
Psychotropic drug use	3 (2.0)
Currently on psychiatric care	9 (6.0)
History of sexual abuse	1 (0.7)
Currently has a partner	132 (88.6)
Healthy (perceived by women)	133 (89.3)
Church assistance	124 (83.2)
Partner	$n = 132$
Low schooling (<12 years)	74 (56.0)
Alcoholism	23 (17.4)
Healthiness	109 (82.6)
Erectile dysfunction	14 (10.6)
Premature ejaculation	8 (6.1)
Faithfulness	69 (52.3)

[a] Those not married were either single (5.4%), divorced (4.7%), widowed (6.0%) or cohabited with partner (22.8%).

and psychotropic), partner status, free healthcare access, church assistance and if currently attending a psychiatrist. Those related to partner were age, low schooling, alcoholism, healthiness, faithfulness and sexual dysfunction (premature ejaculation or erectile dysfunction). Entry of variables (female and partner) into the model was considered with a 20% significance level and the back stepwise procedure performed. A p value of <0.05 was considered as statistically significant.

3. Results

A total of 22 women requested to participate were excluded due to refusal (13%, 22/169), leaving 149 who completely filled out the survey. Characteristics of surveyed women and their partners are shown in Table 1. Women had a mean age and educational level of 47.6 ± 5.5 (median 47) and 8.3 ± 3.7 years (median 8) respectively, with a median parity of 3; 67.8% had less than 12 years of schooling and 33.6% were postmenopausal. At the moment of the survey 2.7% were on HT, and 2% were taking psychotropic drugs. A low percentage of women (8.1%) accessed the private healthcare system. Regarding habits 10.1% were current smokers and 20.8% were sedentary. According to item 1 of the MRS 51.7% presented hot flushes, which were graded in 42.8% of cases as severe to very severe. Regarding the partner ($n = 132$), mean age was 51.0 ± 6.7 years (median 50.5) with an average schooling of 9.3 ± 4.0 years (median 10). Erectile dysfunction was present in 10.6%, premature ejaculation in 6.1%, 17.4% abused alcohol and 47.7% were unfaithful (Table 1).

Table 3
Factors related to increased daytime sleepiness (ESS score ≥10): logistic regression analysis ($n = 149$).

	Odds ratio (CI 95%)	p value
Female		
Postmenopausal status	6.58 (2.51–17.23)	0.001
Sedentarism	3.43 (1.14–10.26)	0.02
Hot flush presence	2.61 (1.02–6.65)	0.04
Male		
Faithfulness	0.47 (0.24–0.90)	0.02

Mean total EES score was 8.0 ± 4.4 (median 8). A total of 33.6% presented an ESS score equal or above 10, considered to have some degree of daytime sleepiness. ESS scores for all women and according to menopausal status and years after the menopause onset are depicted in Table 2. ESS total scores, expressed as means and percentages of those with scores ≥10, significantly increased from one menopausal stage to the other. No differences were found when comparing early and late menopausal women.

Logistic regression analysis determined that postmenopausal status (OR 6.58, CI 95% [2.51–17.23], $p = 0.001$); sedentarism (OR 3.43, CI 95% [1.14–10.26], $p = 0.02$); and the presence of hot flushes (OR 2.61, CI 95% [1.02–6.65], $p = 0.04$) among women were risk factors for increased daytime sleepiness (ESS score 10 or more) whereas male faithfulness decreased this risk (OR 0.47, CI 95% [0.24–0.90], $p = 0.02$) (Table 3).

4. Discussion

Sleep is a protective mechanism early developed during man's evolution. In the primitive era sleep protected men during darkness from being selected by nocturnal predators. Many learning processes are largely inactivated during sleep allowing the brain to reorganize and store more efficiently the daily gathered information. Moreover, sleep obviously aids the body to recuperate physically and consolidate memory knowledge and emotions [38,39]. Daytime sleepiness and fatigue are consequences of sleep disorders and breath-related sleep disturbances. Although sleep difficulties are very frequent in the peri-/postmenopausal period (30–60%) [4,10,40], controversy exists whether gonadal hormonal changes are in fact directly related with insomnia, sleep-breathing disorders and sleepiness. It would seem that daytime sleepiness occurs in an age-related fashion rather than on a hormone-related basis. In fact, sleep complaints and sleepiness during the peri-/postmenopausal period are highly correlated with factors such as psychological distress, headaches, dizziness, palpitations, depression, and weight gain than with the hormonal status *per se* [40].

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

Parameter	Total EES score (mean)	Score 0–9 n (%)	Score ≥10 n (%)	Score ≥16 n (%)
All ($n = 149$)	8.0 ± 4.4	99/149 (66.4)	50/149 (33.6)	8/149 (5.4)
Menopausal phase				
Premenopausal ($n = 47$)	6.7 ± 4.0	37/47 (78.7)	10/47 (21.3)	2/47 (4.3)
Perimenopausal ($n = 52$)	7.8 ± 3.9	36/52 (69.2)	16/52 (30.8)	0/52 (0.0)
Postmenopausal ($n = 50$)	9.4 ± 4.8*	26/50 (52.0)*	24/50 (48.0)*	6/50 (12.0)
Postmenopausal stage				
Early (<5 years) ($n = 29$)	8.7 ± 4.1	15/29 (51.7)	14/29 (48.3)	2/29 (6.9)
Late (≥5 years) ($n = 21$)	10.1 ± 5.6	11/21 (52.4)	10/21 (47.6)	4/21 (19.0)

* $p < 0.05$ for the whole trend.

There are many tools (prospective/retrospective) available to characterize the patterns, frequency, and severity of daytime sleepiness, many capable of determining the current status of the problem and monitoring spontaneous changes and treatment-related evolution. Sleep diaries are the gold standard for research, although difficult to carry out in the daily clinical setting [41]. In this sense, the ESS is a brief sleepiness screening tool, which can render an outcome measure, has adequate internal consistency and is reliable in detecting changes in sleepiness [26–28]. The ESS is a very popular tool in the study of sleepiness and although not exempt of limitations, as described by the original author and others [27,28,42,43], it is much more a discriminating daytime sleepiness test when compared to other popular tools such as the Multiple Sleep Latency Test and the Maintenance of Wakefulness Test [44]. In fact, versions in other languages (i.e. Spanish) have been validated [29,30]. In one study, Jansson et al. [45] included the ESS as an additional test during the assessment of climacteric symptoms in Swedish pre- and postmenopausal women. In this study, the prevalence of sleepiness in pre- and postmenopausal women (HT users and non-users) was lower when compared to our studied Ecuadorian population. In addition, in Jansson's study total ESS scores were divided into three categories (0–7, 8–15, and 16–24), the polarities corresponding to true absence or presence of obstructive sleep-apnea syndrome. The authors reported that the prevalence of this syndrome (EES scores $\geq$16) was similar in all studied groups. Same trend has been observed in the present series despite small number of participating women. Recently, assessment with the ESS and polysomnography, in a small number of Brazilian postmenopausal women, determined that several sleep symptoms were more frequent in late postmenopausal ones [46]. In the present series the absence of a specific questionnaire regarding nocturnal sleep disorders, somnographic assessment and anthropometric data does not allow performing any strong hypothesis on the causes of sleepiness and its changes with the menopausal state. Prospective studies are needed to overcome the limitations of the present study.

Since racial, cultural, and ethnical differences have been reported for daytime sleepiness and early morning awakening [47], the present study was undertaken in a homogeneous low income mid-aged Ecuadorian female income population. Sotomayor Hospital provides healthcare for low income women of Guayaquil and surrounding peripheral areas [31], hence women surveyed in this study are of equal background. Using several tools we have previously described within this population increased menopausal and depressive symptoms related not only to female yet also partner factors [48–51], with sleep problems ranging from 45.6% to 68.4% [32,51]. Social difficulties, economical disadvantages, and stress can cause preoccupation and anxiety that may favor sleepiness among our population and hence explain higher encountered rates as compared to populations with a much more favored social and economical background [24,45,52].

The logistic regression model of the present research showed that among surveyed women postmenopausal status, sedentarism and hot flushes were risk factors for increased daytime sleepiness (ESS score 10 or more). Although sleep difficulties and sleepiness may either coexist with other conditions, they are more prevalent in mid-aged women. The relationship between hot flushes/night sweats and disturbed sleep has been described [53]. However, the hormonal changes associated with poor sleep during the menopause may be affecting women earlier than previously thought. To highlight this one study found that 17% of premenopausal women aged 45–49 reported poor sleep in association to a higher rate of hot flushes, higher depression level, greater caffeine consumption and lower estradiol level [22]. Our study was not designed to address sleep characteristics but rather one of the consequences of sleep disturbances: sleepiness. Our data showed a very important, and significant, increment of sleepiness in postmenopausal women, although no differences were found in terms of the postmenopausal stage (early or late). Despite this, we cannot ascertain if this finding is related to the chronic and accumulative evolution of sleepiness or to other factors. It is reasonable to assume that both hormonal and behavioral factors would augment sleepiness moreover if the problem is not neutralized.

Treating severe hot flushes with hormones could improve sleep quality and minimize the consequences of sleep disorders [24]. Although HT may benefit mild degree sleep disorders [2,3,54,55], controlling every co-morbid condition by means of HT is not usually possible. In addition, HT use has been limited due to several potential adverse effects [14,56]. The Women's Health Initiative study [57] reported that HT produced modest improvement in sleep. In the SWAN, women with high levels of sleep impairment had more improvement in bodily pain after initiating HT and tended toward improving emotional functioning and vitality [58]. Despite this, the negative effects of HT on other health outcomes have reduced its routine use among peri- and postmenopausal women. In our population, few women were on HT hence no specific conclusion can be drawn in this regard.

We have previously reported among postmenopausal women screened for the metabolic syndrome that obesity (a risk factor for sedentarism) [59] increased the risk for hot flushes and depression [60]. Although body mass index was not determined in the present series, sedentarism was found to increase the risk for daytime sleepiness situation that correlates with the findings of others [7,61,62].

Another aspect worth mentioning is the male component. As we have previously reported in low income mid-aged women, male sexual dysfunction, alcoholism and sexual behavior have correlated with female sexual dysfunction and increased menopausal/depressive symptoms, and hence impaired quality of life [48–51]. Results of the present series well correlate with our previous findings, as women with a faithful partner were at decreased risk for daytime sleepiness. Although the exact mechanisms by which the male component negatively impacts mid-aged women's life are complex and perhaps uncertain, however most surely these must be linked to problems in the relation as a couple.

Prevalence of sleep-disordered breathing, restless legs syndrome and periodic limb movement disorder, fibromyalgia, and narcolepsy increases among mid-aged women [17,63,64]. The ESS has often been used to assess sleep disorders such as sleep-apnea/hypopnea syndromes [26,65] with scores 16–24 being highly indicative. In the general population the prevalence of such syndromes is 2.5% [45,66]. In patients with sleep-apnea/hypopnea syndromes the sensitivity of the ESS is associated with an elevated ESS index. When the cut-off is 10 there is a low sensitivity (66%) as compared to a cut-off of 8 which increases sensitivity to 76% [65]. In the present series, mean total ESS score significantly increased from one menopausal stage to the next.

Finally, as for the limitations of the present study one can mention its cross-sectional nature and small sample size, which always imposes certain degree of selection bias; we are aware of this fact. Although risk factors for daytime sleepiness have been delineated in our regression model we still cannot rule out the precise causes of sleepiness (i.e. apnea, hypopnea, obesity, metabolic alterations, etc.). As an explanation, one can mention that assessing daytime sleepiness was a secondary aim of the whole primary research and sample size was calculated on the basis of the primary objective (determining hot flush prevalence). Hence, determining the precise causes of sleep disorders was not contemplated in the original methodological design; moreover if it has a cross-sectional nature. Not determining body mass index may be seen as another potential limitation, even more if one considers increased weight as a risk factor for increased menopausal symptoms and sleeping disorders

[60,67–69]. Despite this, one can presume that increased weight be involved, as sedentarism (a delineated risk factor for sleepiness in this series) is usually linked to obesity in the majority of cases [61,62]. As a strength one can mention that this series adds to the few assessing daytime sleepiness among mid-aged women.

Despite the outlined limitations we conclude that increased daytime sleepiness in this middle aged series was related to female (hormonal status and sedentarism) and partner factors; several which are susceptible of intervention. More research in this regard is required to define links between co-morbid conditions and risk factors. In light of our findings we encourage that sleep habits, snoring, daytime sleepiness, and fatigue information be routinely included in menopausal healthcare protocols.

Conflict of interest

None.

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