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Prevalence of insomnia and related factors in a large mid-aged female Colombian sample

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ABSTRACT

Objective: To assess the prevalence of insomnia and related factors in a large cohort of mid-aged Colombian women of different ethnical background.
Methods: This cross-sectional study involved 1325 women aged 40–59 of 3 ethnical groups: Mestizo (70.0%), Black (11.5%) and Zenú indigenous (18.5%), who completed the items of the Athens Insomnia Scale (AIS), the Menopause Rating Scale (MRS) and a general questionnaire containing personal socio-demographic data.
Results: Median [interquartile range] age of the whole sample was 48.0 [10.0] years. A 43.4% were postmenopausal, 51.7% had increased body mass index values, 18.2% had hypertension and 5.1% used hormone therapy. A 27.5% displayed insomnia (AIS total score ≥6). Significant Spearman rho correlations were found between total AIS and MRS scores (total and subscales). Multiple linear regression analysis found that higher total AIS scores (more insomnia) correlated with tobacco consumption and higher MRS psychological and somatic subscale scores (more severe symptoms). Age, ethnicity and partner and menopausal status were excluded from the final regression model.
Conclusions: In this large mid-aged Colombian cohort insomnia was present in nearly one third of cases, related to smoking habit and the severity of somatic and psychological menopausal symptoms and independent of ethnics and menopausal status.

1. Introduction

Low quality of sleep and insomnia are frequent during the menopausal transition [1–5]. Independent of objective sleep assessment [6], insomnia has been defined as a subjective alteration associated to the onset or maintenance of sleep [7–9]. Insomnia may lead to other problems such as daytime sleepiness, work difficulties, memory reduction, risk of accidents, mood changes, increased cardiovascular risk and a state of chronic inflammation [3,10–15].

Prevalence of insomnia may vary considerably in accordance to definition criteria, research study design and methodology [2,3,5,16]. It is more prevalent in women than in men and related to health disorders and demographical, behavioral, and cultural aspects [2,16–18]. Rate may vary from 9 to 56.6% among mid-aged women [2–6,17,19–21]. The influence of ethnics over sleep performance has been studied among mid-aged US Caucasian, Black and immigrant women from different world regions [22,23]. Hispanic immigrant is a heterogeneous denomination for different ethnical backgrounds which have in common the Spanish language. Sleep, ethnics and the menopause have been analyzed among Hispanic immigrant women, with limited information regarding insomnia available from mid-aged Hispanic women living in their original cultural and traditional lifestyle [3,5,19,22,23]. Thus, the aim of the present research was to assess the prevalence of insomnia and related risk factors in a large cohort of mid-aged Colombian women of different ethnical background using the Athens Insomnia Scale (AIS).

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2. Methods

2.1. Study design and participants

A cross-sectional study was carried out from February 2009 to March 2011 among Colombian women aged 40–59 years who were requested to fill out the AIS, the Menopause Rating Scale (MRS) and a questionnaire containing personal data. Women were either mestizo (also called Hispanic), indigenous (direct descendants of native Zenú) or black (direct African descendants). Mestizo women were recruited from urban and surrounding peripheral areas (Barranquilla and Cartagena in the Atlantic coast and Cali in the Pacific coast) and from rural regions of the Colombian departments of Bolivar (North) and Valle del Cauca (South). Afro-descendant participants (mother and father black) are natural residents of the Municipio of San Cayetano and nearby areas (Municipio de San Juan Nepomuceno) in the Department of Bolivar, Cartagena, Colombia. San Cayetano Municipio is a small partially isolated village, which is populated by approximately 4000 low-income black individuals who are direct descendents of African slaves who settled in the area during the colonial days. Indigenous Zenú women were from the San Andrés de Sotavento fortress. This fortress was created by the Spanish crown in 1773 and is located on the North Colombian coast (Department of Córdoba). This low socioeconomic population is an ancestral settlement of native indigenous individuals who have not blended with any other race. They are devoted to basic agriculture chores and the manufacturing of textiles and baskets. Despite the fact that all participants are from various Colombian sites and ethnicities they all share a common language and Hispanic cultural background.

Door-to-door visits were carried out by trained personnel in the cited communities, seeking women meeting the inclusion criteria. Women were informed about the research (purpose and content) and requested to give written consent of participation. Those denying participation, had surgery in the last 6 months, cancer or any other serious illness, did not complete the socio-demographic questionnaire or were incapable of understanding its content were excluded.

The study protocol of this research was approved by the institutional review board of the Cartagena University, Cartagena, Colombia and was carried out in accordance with the principles of the Declaration of Helsinki.

2.2. Survey

Personal data of the questionnaire included age, parity, ethnicity, menopausal and marital and partner status, body mass index (BMI), current use of hormone therapy (HT), educational level, habits (current coffee and tobacco consumption) and the presence of hypertension. Menopause status was defined using criteria of the Stages of Reproductive Aging Workshop: premenopausal (women having regular menses), perimenopausal (irregularities >7 days from their normal cycle), and postmenopausal (no menses in the last 12 months) [24]. Those with bilateral oophorectomy were considered postmenopausal.

BMI was calculated as weight in kilograms divided by squared height in meters. BMI values were categorized as low ($<18.50\,kg/m^2$), normal ($18.50–24.99\,kg/m^2$), or increased ($\geq 25.00\,kg/m^2$). Increased BMI values were further used to define women as being overweight ($25.00–29.99\,kg/m^2$) or obese (≥ 30.00) [25]. Women declaring to be on anti-hypertensive medication were considered as hypertense [26].

2.3. The Athens Insomnia Scale (AIS)

The AIS is a self-administered psychometric instrument designed for the quantification of sleep difficulties [27,28] based on the International Classification of Diseases (ICD-10) [7]. It consists of eight items: the first four pertain to sleep quantitative variables, including sleep induction, night awakenings, early morning awakenings, and total sleep duration. The fifth item relates to overall sleep quality, and the last three refer to the impact of insomnia over day time performance. Items can be rated from 0 (no problem) to 3 (very serious problem) with higher scores denoting more impaired sleep or insomnia. Total AIS scores (sum of all rated items) may range from 0 to 24 with totals scores of 6 or more used to define insomnia [27,28]. The present research used the Spanish language validated AIS [29,30].

2.4. The Menopause Rating Scale

The MRS assesses the presence and severity of menopausal symptoms through 11 items grouped into three subscales: somatic (4 items), psychological (4 items) and urogenital (3 items). Women may grade each item from 0 (not present) to 4 (1 = mild; 2 = moderate; 3 = severe; 4 = very severe). Graded items within each subscale are summed up to provide a total subscale score. The sum of each obtained subscale score provides a total MRS score. Total MRS scores equal to or above 17 were defined as severe (severe menopausal symptoms) [31,32].

2.5. Sample size calculation

A minimal sample size of 1037 participants was calculated assuming a 50% prevalence of insomnia [3,5,19] with a 4% desired precision and a 99% confidence level.

2.6. Statistical analysis

Statistical analysis was performed using the SPSS version 19 (IBM, Armonk, NY, USA). Data are presented as medians, interquartile ranges (IQR), percentiles (25–75), means, standard deviations, percentages, β-coefficients and confidence intervals. Internal consistency of the instruments (AIS and MRS) was assessed by computing Cronbach's alpha coefficient values.

The Kolmogorov–Smirnov test was used to determine the normality of data distribution. According to this, non-parametric continuous data were compared using the Mann–Whitney *U* test (two independent samples) or the Kruskal–Wallis test (various independent samples). ANOVA was used to compare parametric data (various independent samples) and the chi-square test used to compare percentages. Spearman Rho coefficients were calculated to determine correlations between total AIS scores and various numeric variables (bivariate analysis).

Multiple linear regression analysis was performed to assess variables related to higher total AIS scores and, therefore, insomnia. The dependent variable was the total AIS score. The model was constructed from independent variables achieving $p \leq 0.10$ during bivariate analysis. Independent variables tested during bivariate analysis included: age, parity, menopause status, race/ethnicity, MRS subscale values, BMI, smoking habit, coffee consumption, educational level, HT use, and partner status (no/yes). Entry of variables into the model was performed using a backward/forward stepwise procedure. A p value less than 0.05 was considered statistically significant.

3. Results

During the study period, a total of 1412 women were asked to participate, 0.06% provided incomplete data, leaving 1325 surveys for final analysis. For the whole sample median [IQR] age and educational level was 48 [10] and 11 [6] years, respectively. The majority of women were mestizo (70.0%), 67.4% consumed coffee,

Table 1
General demographic data of studied women ($n = 1325$).

Women ($n = 1325$)	
Age (years)	48.0 [10.0]
≤45	345 (26.0)
46–50	449 (33.9)
51–55	300 (22.6)
≥56	231 (17.4)
Ethnicity	
Mestizo	927 (70.0)
Black	153 (11.5)
Zenú indigenous	245 (18.5)
Parity	3.0 [2.0]
0	73 (5.5)
1–2	547 (41.3)
≥3	705 (53.2)
Marital status	
Married	586 (44.2)
Single	137 (10.3)
Widowed	92 (6.9)
Divorced	178 (13.4)
Co-habiting	332 (25.1)
Educational (years)	11.0 [6.0]
0 to 6	255 (19.2)
7 to 12	651 (49.1)
≥13	419 (31.6)
Menopausal status	
Premenopausal	481 (36.3)
Perimenopausal	269 (20.3)
Postmenopausal	575 (43.4)
Time since menopause onset (years)	5.0 [5.0]
≤5 years	325 (56.5)
>5 years	250 (43.5)
Body mass index	
Baseline BMI kg/m^2	25.3 [4.7]
Low	45 (3.4)
Normal	594 (44.8)
Overweight	549 (41.4)
Obese	137 (10.3)
Current smoking	135 (10.2)
Coffee consumption	893 (67.4)
Hypertension	241 (18.2)
Hormone therapy use	67 (5.1)
MRS ≥17	109 (8.2)
AIS ≥6	365 (27.5)
Mestizo	277 (29.9)
Black	38 (24.8)
Zenú indigenous	50 (20.4)
p value	0.29*

Data are presented as medians [interquartile ranges] or percentages n (%); MRS, Menopause Rating Scale; AIS, Athens Insomnia Scale.
* p value for the trend using the chi square test.

10.2% were current smokers, 43.4% were postmenopausal and only 5.1% were on HT for the menopause (Table 1). A 27.5% displayed insomnia (AIS of ≥6.0) and 8.2% severe menopausal symptoms as determined by a total MRS score equal or above 17.

Descriptive analysis of the AIS and MRS scores are presented on Table 2. For the entire sample, median [IQR] total AIS and MRS scores were 3.0 [5.0] and 6.0 [8.0], respectively. Computed Cronbach's alphas for the AIS and MRS were 0.93 and 0.86, respectively. Bivariate analysis (data not presented) found that higher total AIS scores were related to older age, higher parity, having a partner, tobacco consumption, higher BMI values, and the presence of hypertension. No differences were observed for menopausal stage or ethnics. Scores for the AIS (per item and total) according to each menopausal stage are depicted of Table 3. Except for item 8 (sleepiness), significant differences were specifically found for items 1 to 7 in relation to menopausal stages.

Correlations (Spearman's rho) between total AIS scores, MRS scores (total and sub-scales) and selected numeric socio-demographic variables are presented in Table 4. Total AIS scores displayed positive and significant correlations with age, parity, BMI values and total and subscale MRS scores. Significant correlations were also found between analyzed socio-demographic variables and total and sub-scale MRS scores.

Multiple linear regression analysis was performed in order to assess variables related to higher total AIS scores (Table 5). Higher AIS scores (worse insomnia) positively correlated with higher MRS somatic and psychological subscale scores, and smoking habit. Age, ethnicity and partner and menopausal status were excluded from the final regression model.

4. Discussion

The present investigation assessed insomnia and menopausal symptoms in a large sample of mid-aged Colombian women. Nearly one fourth of women displayed insomnia with less than 10% presenting severe menopausal symptoms and receiving HT. Prevalence of insomnia was somewhat lower than that reported among mid-aged women living in Latin America [19] and the US [22,33,34].

Cross-ethnical differences in relation to depth of sleep and REM characteristics have been reported [35]. Reports indicate that among women living in the US insomnia prevalence may vary in relation to ethnics [22,23,33,34,36,37]. Contrary to this, there are few studies performed among Hispanics other than those living in the US [22,23,38]. Kravitz et al. [38] have shown that self-reported sleep problems prevailed in a higher rate among Caucasian women especially in terms of difficulty of staying asleep, whereas Hispanics displayed lower rates of both difficulty of staying asleep and early-morning awakenings, with no ethnical differences reported for trouble in falling asleep. No ethnical differences in the prevalence of insomnia (as assessed with the AIS) was observed in the present study (Zenú indigenous: 20.4%; Mestizo: 29.9%; and Black: 24.8%, $p = 0.29$). Our study could not analyze differences with Caucasian women as the rate of this ethnical group is very low in Colombia.

Previous studies have also reported a small increase in insomnia severity related to age and the menopause [19,39,40]; with ethnical differences found for difficulties for staying asleep and early morning awakenings [38]. In the Women's Health Across the Nation Sleep Study, electroencephalography (EEG) findings were cross-sectionally compared among women according to the different stages of the menopause. It was found that Beta EEG power in non-rapid eye movement (REM) and REM sleep in late peri- and postmenopausal women exceeded that of pre- and early pre-menopausal ones [40]. In our studied population, although scores for seven of eight items included in the AIS increased along the

Table 2
Scores for the AIS and the MRS among studied women ($n = 1325$).

	AIS ($\alpha = 0.93$)[a]	MRS ($\alpha = 0.86$)[a]			
		Total	Somatic	Psychological	Urogenital
Mean	4.4	6.9	3.1	2.5	1.3
Median	3.0	6.0	3.0	2.0	0.0
p25–p75	1.0–6.0	2.0–10.0	1.0–5.0	0.0–4.0	0.0–2.0
IQR	5.0	8.0	4.0	4.0	2.0

[a] Computed Cronbach's alphas for each used scales are presented in parenthesis. AIS: Athens Insomnia Scale; MRS: Menopause Rating Scale; IQR: interquartile range.

Table 3
Scores for the Athens Insomnia Scale (per item and total) according to the menopausal stages.

Items of the AIS	Premenopause, 40–44 years, $n = 230$	Premenopause, ≥45 years, $n = 251$	Perimenopause, $n = 269$	Early (<5 years) postmenopause, $n = 266$	Late (≥5 years) postmenopause, $n = 309$	p value*
Difficulty with sleep induction (item 1)	0.45 ± 0.67	0.59 ± 0.78	0.48 ± 0.71	0.63 ± 0.85	0.67 ± 0.88	0.046
Awakening during the night (item 2)	0.63 ± 0.75	0.72 ± 0.80	0.60 ± 0.74	0.85 ± 0.90	0.89 ± 0.92	<0.0001
Early morning awakening (item 3)	0.45 ± 0.62	0.47 ± 0.78	0.52 ± 0.73	0.69 ± 0.90	0.68 ± 0.85	0.001
Total sleep time (sufficiency) (item 4)	0.43 ± 0.69	0.55 ± 0.76	0.46 ± 0.77	0.62 ± 0.90	0.61 ± 0.87	0.040
Overall quality of sleep (item 5)	0.33 ± 0.64	0.43 ± 0.78	0.42 ± 0.73	0.56 ± 0.87	0.61 ± 0.88	<0.0001
Well-being during the day (item 6)	0.29 ± 0.58	0.35 ± 0.70	0.37 ± 0.68	0.55 ± 0.86	0.56 ± 0.86	<0.0001
Functioning during the day (item 7)	0.31 ± 0.54	0.49 ± 0.71	0.36 ± 0.60	0.48 ± 0.80	0.50 ± 0.80	0.044
Sleepiness during the day (item 8)	0.58 ± 0.49	0.63 ± 0.80	0.58 ± 0.68	0.70 ± 0.93	0.72 ± 0.90	0.73
Total AIS score	3.47 ± 3.83	4.23 ± 4.92	3.79 ± 4.31	5.06 ± 6.05	5.25 ± 5.94	0.17

Data are presented as mean ± standard deviations.
* p value as determined with ANOVA or the Kruskal–Wallis test; AIS: Athens Insomnia Scale.

Table 4
Rho Spearman coefficients between tool scores and various numeric variables.

	AIS	MRS			
		Total MRS score	Somatic MRS score	Psychological MRS score	Urogenital MRS score
Socio-demographic variables					
Age (years)	0.08	0.11	0.14	0.05	0.11
p value	0.03	<0.0001	<0.0001	0.05	<0.0001
Parity	0.06	0.09	0.13	0.05	0.05
p value	0.02	<0.0001	<0.0001	0.05	0.04
Educational level (years)	−0.011	−0.09	−0.09	−0.09	−0.04
p value	0.67	0.001	0.002	0.001	0.14
Body mass index	0.07	0.16	0.12	0.13	0.19
p value	0.01	<0.0001	<0.0001	<0.001	<0.0001
Tools					
Total MRS score	0.57	–	–	–	–
p value	<0.0001				
Somatic MRS score	0.56	0.90	–	–	–
p value	<0.0001	<0.0001			
Psychological MRS score	0.49	0.88	0.69	–	–
p value	<0.0001	<0.0001	<0.0001		
Urogenital MRS score	0.38	0.71	0.49	0.52	–
p value	<0.0001	<0.0001	<0.0001	<0.0001	

different phases of the menopause, multiple linear regression analysis could not find menopausal status or age as risk factors for higher total AIS scores. A strength of the AIS is that it allows classifying subjective sleep with reliability according to the (ICD-10) and DSM IV-TR criteria. Indeed, computed Cronbach's alphas for the AIS and MRS were consistent with values of 0.93 and 0.86, respectively.

Urogenital symptoms (vaginal dryness) and insomnia are among the most disturbing menopausal complaints related to impaired quality of life [41,42]. Indeed, insomnia is highly prevalent during the menopausal transition [1,3–6,19]. Cessation of the ovarian function is associated with reduced endogenous estrogen and progesterone secretion which are linked to several other physical, physiological, and psychological changes that may affect sleep [43,44]. Causes for menopause-related insomnia include hot flashes, mood disturbances, and primary sleep disorders [14,41,43]; although vasomotor symptoms during the night have largely been unrelated to sleep characteristics [44,45]. Additional causes of insomnia include psychosocial, behavioral, and stress-related factors [4,5,14,46,47].

We have recently reported a significant correlation between menopausal symptom severity, tobacco use and sleep quality among mid-aged Colombian women as measured with the Pittsburgh Sleep Quality Index [5], situation that is in agreement with the findings of the present study. Indeed, higher total AIS scores significantly correlated with higher MRS scores (especially somatic

Table 5
Factors related to total AIS scores: multiple linear regression analysis.

AIS for all studied women ($n = 1325$)					
Factors	β coefficient	Standard error	95% CI	t	p value
Smoking	2.473	0.144	1.679–3.267	1.679	<0.0001
MRS somatic	0.766	0.398	0.643–0.888	12.265	<0.0001
MRS psychological	0.229	0.120	0.107–0.351	3.697	<0.0001

$r^2 = 0.265$; adjusted $r^2 = 0.264$, $p < 0.0001$.
CI, confidence interval; MRS, Menopause Rating Scale; AIS, Athens Insomnia Scale.

and psychological scores), suggesting that women with severe symptoms had a worse degree of insomnia. Although there were significant rho Spearman correlations between total AIS scores and age, educational level and BMI values, these factors were excluded from the final regression model. Thus, these factors seem to have little or no effect on insomnia during female mid-life, which has been confirmed in previous reports [5,19,36,48].

Data regarding sleep and smoking habit is controversial. Indeed, some studies suggest that smokers are more prone than non smokers to have problems with sleep induction, staying asleep, daytime sleepiness, depression, and high daily caffeine consumption [49,50] whereas others not [51]. In one study, higher intensity of smoking, and thus more nicotine dependence, was related to shorter sleep duration [52]. In addition, smokers have longer sleep latency, higher REM density, more apneas and leg movements than non-smokers [53]. Our results suggest that smoking among mid-aged women is associated with sleep problems as previously reported using other approaches [50,52]. It seems that insomnia symptoms and smoking and coffee consumption are mutually and negatively influenced [54]. Reports indicate that as with tobacco, coffee consumption may affect sleep–wake cycle [55,56]. Our study is the first and largest in determining the prevalence of insomnia among different Colombian female ethnical groups living in their original environment. Since smoking and coffee consumption are modifiable behavioral risk factors for insomnia, programs oriented towards quitting these habits may indeed improve sleep and life quality.

Finally, as for the limitations of the present study one can mention its cross-sectional design which does not allow the detection of causality and the fact that results cannot be extrapolated to other Hispanic Spanish speaking populations. In addition, the study was based on self-reported recall data and did not include polysomnographic assessment. This objective sleep assessment was not feasible due to the large studied population and there is no guarantee of correlation with clinical findings; in addition, subjective assessment is more close to clinical complaint than the architectural profile of sleep rhythm [57]. We also did not have the opportunity of assessing other factors that may interfere with normal sleep such as depression, anxiety or stress [4,14,58,59]. More research is required to determine if women smoke because they cannot sleep, do not sleep because they need to smoke or if smoking *per se* causes insomnia. Another limitation of the study is the lack of assessment of sleep-related breathing disorders such as sleep-apnea syndrome [8,9,60]. Finally, sleep in mid-aged women has been related to marital dissatisfaction [4,61] one aspect that was not explored. Despite the latter, an important strength of our study is that it analyzes insomnia in a large multi-ethnical Hispanic Colombian sample of women living in their original environment. Such data is scarce or lacking in the literature.

In conclusion, in this large mid-aged Colombian cohort insomnia was present in almost a third of cases and related to smoking habit and the severity of somatic and psychological menopausal symptoms. Interestingly, menopausal status and ethnics were not related risk factors.

Contributors

AMC and FRPL were involved in conception and design of the analysis. AMC, YRP and MMF were responsible of data acquisition. AMFA and PC performed the statistical analysis. FRPL and PC did the drafting of the manuscript. All authors were involved in critically revising the manuscript for its intellectual content; and the final approval of the manuscript was done by all authors.

Competing Interest

Authors declare to have no financial or personal relationships with other people or organizations that could inappropriately influence (bias) the results presented in this manuscript. This study was not supported by the industry.

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