Evaluation of depressive symptoms in mid-aged women: report of a multicenter South American study

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Abstract

Objective: To evaluate depressive symptoms and related factors among mid-aged women using the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10).

Methods: This was a cross-sectional multicenter study in which women aged 40 to 65 from various South American countries were surveyed with the CESD-10 and a general questionnaire containing personal and partner data.

Results: In all, 864 women were interviewed from Colombia (Afro-Colombian, n = 215), Ecuador (Mestizo, n = 202), Perú (Quechua at high altitude, n = 231), and Paraguay (Mestizo, n = 216). Mean age of the whole sample was 49.1 ± 6.0 years. Although the rate of postmenopausal status was similar among studied sites, differences were observed in relation to age, parity, hormone therapy use, hot flush rate, sedentary lifestyle, chronic medical conditions, habits, and partner aspects. Median total CESD-10 score for all sites was 7.0, with a 36.0% (n = 311) having scores equal to 10 or more (suggestive of depressed mood). Higher scores were observed for Afro-Colombian and Quechua women, and also for postmenopausal and perimenopausal ones. Multivariate linear regression analysis found that depressed mood (higher CESD-10 total scores) was significantly associated with ethnicity (Afro-Colombian), hot flush severity, hormone therapy use, sedentary lifestyle, postmenopause, perceived unhealthy status, and lower education. Higher monthly coital frequency and having a healthy partner without premature ejaculation was related to lower scores, hence less depressed mood.

Conclusion: In this mid-aged female South American sample, depressive symptoms correlated to menopausal status and related aspects, ethnicity, and personal and partner issues. All these features require further research.

Key Words: CESD – Climacteric – Depressive symptoms – Ethnicity – Menopause – Mid-life.

D epressive disorders are more prevalent in women than in men, most likely due to female endocrine peculiarities, responses to stress, education, and their social position in a male-dominant world. Women's role in the society and ancestry discrimination may have also contributed to the higher frequency of depressive pathology.[1-4] Several

biological and social changes occurring during female mid-life may aggravate the risk of depressive disorders. Indeed, these changes increase the prevalence of menopausal complaints, which in turn lead to higher rates of female depression. Depressive status and mood are negative conditions that impair quality of life, sleep, sexual function, resilience, and life satisfaction of mid-aged women.[5-10] Depression and depressive mood are also associated with a higher risk of stress, the metabolic syndrome and excessive body weight, cardiovascular disease, poor cognitive function, and subclinical inflammation.[1,4,10-12]

Depressive symptoms have not been evaluated in mid-aged Latin American women, residing in their respective countries, using a common standardized instrument, despite the fact that items intended to assess depressive mood and anxiety are included in menopause-related quality-of-life tools.[13,14] Screening for depressive symptoms may require more precise and specific instruments. In this sense, the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10) is a relevant depressive symptom-screening tool. A total CESD-10 score of 10 or more has shown a positive correlation with depression-related health and a high retest correlation.[7,15] Taking into consideration that stress, educational level, ethnicity, place of residency, socioeconomic factors, and

partner aspects may influence female mid-life mood,[1,2,4,7,9] we carried out this research to evaluate depressive symptoms and related factors among mid-aged women from various South American countries using the CESD-10.

METHODS

Study design and participants

This cross-sectional multicenter study was carried out from July 2015 to July 2016. The coordinating center of the investigation was the Institute of Biomedicine of the Medical Faculty of the *Universidad Católica de Santiago de Guayaquil,* Guayaquil, Ecuador. Three other countries participated: Colombia, Perú, and Paraguay. The research aimed at assessing several endpoints among mid-aged women (40-65 years), such as the severity of menopausal symptoms, sexuality, metabolic aspects, and depressive symptoms, in the different participating South American populations to assess the effect of various factors (ie, ethnicity, altitude of residency, partner aspects). This manuscript specifically presents data related to the evaluation of depressive symptoms. Women from Ecuador (Guayaquil city) and Paraguay (Asunción Central) were urban mestizo, also called Hispanic, who are not Afro-descendent or white. They were recruited through newspaper advertising, flyers, and/or among those accompanying relatives seeking health care at these study sites. Participating Colombian women were from the San Cayetano Municipality. This is an isolated village of the Bolivar Department where direct descendants of African slaves (mother and father) have settled since colonial days.[16] Peruvian women were indigenous Quechua living in several communities located peripheral from Cusco (Paucartambo, Vellille, Santo Tomás, Chinchapujio, Huarocondo, and Tinta), all at high altitude (3,000 to 4,000 m above sea level). Women from Colombia and Perú were recruited through direct door to door visits. Surveys in the indigenous communities were performed in Quechua language (E.O). More details of these Colombian and Peruvian populations can be found elsewhere.[16,17]

The research protocol of the study was revised and approved by the Institutional Review Board of the Enrique C. Sotomayor Hospital of Guayaquil, Ecuador. Local approval for each of the other participating countries was also obtained. Eligible women were informed about the study, its purposes, and requested to provide written consent of participation, after which they were surveyed by one of the investigators with a general questionnaire containing personal and partner data and also several validated tools among them the CESD-10. Women declining participation or incapable of understanding the questions or items contained in the general survey or validated tools were excluded. The abdominal circumference (cm) of each participant was measured and recorded.

Instruments

General questionnaire

To assess and record all data (personal and partner), an itemized questionnaire was elaborated and validated in 50 women before its implementation at each participating site.

Participant data included: age (years), married status (yes/no), achieved educational level (years), parity, and current partner status (yes/no). Lifestyle, health, and other personal factors included: sedentary lifestyle (yes/no), self-perceived healthy status (yes/no), hypertension or diabetes (yes/no), and the current consumption of tobacco, alcohol/coffee, or drugs (psychotropics, hormone therapy [HT] or phytoestrogens). Definitions for sedentary lifestyle and self-perceived health status are described elsewhere.[18] Female menopausal status was defined as premenopausal, perimenopausal, and postmenopausal in accordance to criteria of the stages of reproductive aging workshop.[19] Each participant provided information related to their partner including: age (years), achieved educational level (years), healthy status (yes/no), alcohol abuse (yes/no), and the presence or not of sexual dysfunction (erectile dysfunction and/or premature ejaculation). Definitions for alcoholism, erectile dysfunction, and premature ejaculation have previously been described.[8] The presence and severity of hot flushes were assessed with the first question of the 10-item Cervantes Scale (CS-10).[20]

Center for epidemiologic studies short depression scale (CESD-10)

The CESD-10 is a 10-item questionnaire that evaluates how an individual has been feeling during the past week. This is a short version of the 20-item CESD in which each of its items can be graded according to a Likert scale: rarely or none of the time, less than 1 day (0 points); some or a little of the time, 1 to 2 days (1 point); occasionally or a moderate amount of time, 3 to 4 days (2 points); and all the time, 5 to 7 days (3 points). Items 5 and 8 are scored inversely. Total CESD-10 score is the sum of the 10 graded items, with scores 10 or higher defining depressed mood.[7,15] The Spanish language version of the tool was used for this research; which has been previously validated among Spanish postmenopausal women.[7]

Sample size calculation

Prevalence of depressed mood may range from 30% to 40% in mid-aged women.[1,4,8] Hence, assuming that 35% of surveyed women would present depressed mood, with a 7% desired precision and a 95% confidence level (CI), a minimal sample size of 179 participants was calculated for each center. Nquery Advisor statistical package (Statistical Solutions Ltd., 7B Airport East Business Park, Farmers Cross, Cork, Ireland) was used to perform a post hoc power calculation report of the generated regression models.

Statistical analysis

The SPSS version 22.0 (IBM, Armonk, NY) was used to perform statistical analysis. The data are presented as mean ± standard deviations, medians (interquartile ranges [IQRs]), frequencies (%), β coefficients, and 95% CIs. The Kolmogorov-Smirnov test was used to determine the normality of data distribution and the Bartlett test to evaluate the homogeneity of the measured variance. According to this, non-normally

TABLE 1. *Baseline characteristics of studied women and their partners*

Participant data	All (n = 864)	Colombia (n = 215)	Ecuador (n = 202)	Perú (n = 231)	Paraguay (n = 216)	P^a
Age, yrs	49.1 ± 6.0	49.2 ± 5.5	50.8 ± 6.3	47.9 ± 5.7	48.7 ± 6.1	<0.0001^b
40-49	480 (55.6)	120 (55.8)	87 (43.1)	148 (64.1)	125 (57.9)	
50-59	334 (38.6)	95 (44.2)	89 (44.0)	77 (33.3)	73 (33.8)	
60-65	50 (5.8)	0 (0)	26 (12.9)	6 (2.6)	18 (8.3)	
Educational level, yrs	7.0 [9.0]	5.0 [6.0]	13.0 [5.0]	3.0 [2.0]	12.0 [5.0]	<0.0001^b
0-6	417 (48.3)	150 (69.8)	31 (15.3)	197 (85.3)	39 (18.0)	
7-12	269 (31.1)	56 (26.0)	67 (33.2)	34 (14.7)	112 (51.9)	
≥13	178 (20.6)	9 (4.2)	104 (51.5)	0 (0)	65 (30.1)	
Currently married	432 (50.0)	42 (19.5)	93 (49.0)	151 (65.4)	146 (67.6)	<0.0001
Parity	3.0 [5.0]	4.0 [2.0]	3.0 [1.0]	6.0 [2.0]	3.0 [1.0]	<0.0001^b
0	40 (4.6)	1 (0.5)	21 (10.4)	3 (1.3)	15 (6.9)	
1-4	573 (66.3)	144 (67.0)	166 (82.2)	80 (34.6)	183 (84.8)	
≥ 5	251 (29.1)	70 (32.5)	15 (7.4)	148 (64.1)	18 (8.3)	
Postmenopausal	476 (55.1)	130 (60.5)	115 (56.9)	127 (55.0)	104 (48.1)	0.07
Smoking habit	75 (8.7)	39 (18.1)	12 (5.9)	0 (0)	24 (11.1)	<0.0001
Hypertension	165 (19.1)	22 (10.2)	45 (22.3)	4 (1.7)	94 (43.5)	<0.0001
Diabetes	36 (4.2)	13 (6.0)	9 (4.5)	0 (0)	14 (6.5)	0.001
Hot flushes present	655 (75.8)	202 (93.9)	109 (53.9)	227 (98.3)	117 (54.2)	<0.0001
Hormone therapy use	92 (10.6)	61 (28.4)	12 (5.9)	0 (0)	19 (8.8)	<0.0001
Phytoestrogen use	93 (10.8)	34 (15.8)	9 (4.5)	0 (0)	50 (23.1)	<0.0001
Psychotropic drug use	100 (11.6)	2 (0.9)	6 (3.0)	7 (3.0)	85 (39.3)	<0.0001
Self-perception of healthiness	755 (87.4)	203 (94.4)	154 (76.2)	227 (98.3)	171 (79.2)	<0.0001
Sedentary lifestyle	102 (11.8)	6 (2.8)	73 (36.1)	1 (0.4)	22 (10.2)	<0.0001
Abdominal circumference, cm	90.0 [13.5]	95.0 [16.0]	89.0 [13.0]	90.0 [6.0]	88.0 [18.0]	<0.0001
Abdominal obesity (waist >88 cm)	506 (58.6)	161 (74.9)	103 (51.0)	145 (62.8)	97 (44.9)	<0.0001
Currently has partner	673 (77.9)	170 (79.0)	136 (67.3)	174 (75.3)	193 (89.3)	<0.0001
Partner data	n = 673	n = 170	n = 136	n = 174	n = 193	
Alcohol abuse	232 (34.5)	24 (14.1)	33 (24.3)	79 (45.4)	96 (49.8)	<0.0001
Erectile dysfunction	129 (19.2)	13 (7.6)	38 (28.0)	50 (28.8)	28 (14.5)	<0.0001
Premature ejaculation	173 (25.7)	6 (3.5)	32 (23.5)	89 (51.1)	46 (23.8)	<0.0001

Data are presented as mean ± standard deviations, medians [interquartile ranges] or frequencies n (%).
^{a}Presented P values were calculated with the appropriate tests according to each case and are the result of comparing the analyzed variable for all studied groups as a trend.
^{b}P value when comparing mean or median values of the analyzed variable for all studied groups.

distributed continuous data were compared with the Mann-Whitney U test or the Kruskal-Wallis test (respectively, for two or more than two independent samples [nonparametric tests]). Normally distributed continuous data were compared with the Student's t test or analysis of variance (ANOVA) (respectively, for two or more than two independent samples [parametric tests]). Reliability of the CESD-10 was determined by calculating Cronbach's alphas.

Multiple linear regression analysis was performed to assess variables related to higher CESD-10 scores and, hence, more depressed mood. Two regression models were generated, the first including data of all surveyed women, and the second using data of women who currently have a partner. Both models were constructed with independent variables achieving $P = 0.10$ during bivariate analysis; then final reduced models were generated with a forward/backward stepwise procedure. The dependent variable was the total CESD-10 score. Among the most important personal independent variables tested during bivariate analysis were age, parity, educational level, ethnicity, altitude of residency, marital status, menopausal status, perceived healthy status, sedentary lifestyle, tobacco, coffee or drug consumption, and hot flush presence and severity. Partner variables included age, educational level, healthy status, alcohol abuse, and the presence of sexual dysfunction. For all calculations, a

P value of less than 0.05 was considered as statistically significant.

RESULTS

During the study period, in all, 872 women were invited to participate. Two women from each city declined participation and were excluded. Therefore, final statistical analysis was performed on 864 complete surveys: Colombia (Afro-Colombian, n = 215), Ecuador (Mestizo, n = 202), Perú (Quechua at high altitude, n = 231), and Paraguay (Mestizo, n = 216). Baseline features of studied women and their partners are presented in Table 1. Mean age of the whole sample was 49.1 ± 6.0 years. Although women from Ecuador were older, the rate of postmenopausal status was similar among studied sites. Significant differences were observed between study sites. For instance, indigenous Peruvian women living at high altitude displayed lower educational level, higher parity, and the highest rate of hot flush presence and self-perceived healthy status, in addition to partners with a higher rate of premature ejaculation and alcohol abuse. On the contrary, they displayed lower rates of HT and phytoestrogen use, tobacco consumption, sedentary lifestyle, diabetes, and hypertension as compared with the other sites. Afro-Colombian women displayed a high hot flush rate (93.9%). They also presented the highest rate of abdominal obesity and tobacco

consumption, while having the lowest rates of psychotropic drug use, married status, and partners with sexual dysfunction. Women from Paraguay displayed the highest rate of hypertension and diabetes, being married, and currently having a partner with a high alcohol abuse rate.

Regarding the reliability of the CESD-10, internal consistency was high as Cronbach's alpha was calculated at 0.83. Total CESD-10 scores in relation to various female and partner aspects are presented in Table 2. Median total CESD-10 score was 7.0 for the whole sample (n = 864). Overall, a 36.0% (n = 311) of surveyed women presented total CESD-10 scores equal to 10 or more (suggestive of depressed mood); with the highest prevalences observed among Afro-Colombian and Quechua and postmenopausal and perimenopausal women (62.8% and 37.6%; 44.5% and 34.7%, respectively) (data not shown in Table 2). With a similar trend, Afro-Colombian and indigenous women living in the highlands of the Peruvian Andes displayed the highest CESD-10 total scores. Higher scores were also observed in women who were older and postmenopausal, with higher parity, with hot flushes, and those currently using HT or phytoestrogens. Neither altitude nor any other female aspect correlated with higher CESD-10 scores. Median age and educational level of the partner was 50.0 and 8.0 years, respectively. Higher CESD-10 total scores were observed in women who currently had no partner and among those with an older and unhealthy partner.

Final multivariate regression models for factors related to higher total CESD-10 scores (more depressed mood) are presented in Table 3. In relation to model 1 (that includes the data of all studied women) a positive correlation (higher scores) was found in association to ethnicity (Afro-Colombian), hot flush severity, HT use, sedentary life style, and postmenopausal status. In addition, women with lower education, perceived unhealthy status, or currently without a partner displayed higher CESD-10 total scores. These factors explained 55% of the variance. A similar model was determined when analysis was confined to the data of women that had a partner (model 2), which explained 50% of the variance. Additional findings for this second model were that women with a higher monthly coital frequency, a healthy partner without premature ejaculation displayed lower CESD-10 total scores, and hence less depressed mood. Post hoc calculated power of the first generated model was 99%, considering a 5% significance level, seven covariates, a sample size of n = 864, and an obtained r^2 of 0.55. For the second model, calculated power was also 99%, considering a 5% significance level, six covariates, a sample size of n = 673, and an obtained r^2 of 0.50.

DISCUSSION

Emotional health and menopausal-related changes may increase the prevalence and severity of psychosomatic complaints. Several studies indicate that the prevalence of depressive symptoms, anxiety, bipolar disorders, sleep problems, and sexual dysfunction are significantly increased in women who are symptomatic during the menopausal transition as compared with those who have mild or no symptoms.[1,21-23] In addition, the degree of (chronic) anxiety, stress, and female physical health problems are significant

TABLE 2. *Total CESD-10 scores in relation to various participant and partner data*

Participant parameters	Total CESD-10 scores
Countries	
Colombia	12.0 [9.0]
Ecuador	6.0 [10.5]
Perú	8.0 [3.5]
Paraguay	4.0 [8.5]
	$P < 0.001^a$
Age, yrs	
40-49	7.9 ± 5.4
50-59	8.6 ± 5.2
60-65	9.0 ± 5.8
	$P = 0.01$
Afro-Colombian	
No	7.0 [6.5]
Yes	12.0 [9.0]
	$P < 0.001$
Educational level, yrs	
0-6	8.0 [6.0]
7-12	7.0 [7.5]
≥13	4.0 [3.5]
	$P < 0.001$
Parity	
0	4.0 [6.5]
1-4	7.0 [7.5]
≥5	8.0 [4.5]
	$P = 0.001$
Menopausal status	
Premenopausal	6.0 [5.0]
Perimenopausal	7.0 [7.0]
Postmenopausal	8.0 [7.0]
	$P < 0.001$
Hot flushes present	
No	3.0 [7.0]
Yes	8.0 [6.0]
	$P < 0.001$
Hormone therapy use	
No	7.8 ± 5.1
Yes	12.4 ± 5.3
	$P < 0.001$
Phytoestrogen use	
No	12.0 [11.0]
Yes	7.0 [7.0]
	$P < 0.001$
Partner parameters	
Currently has a partner	
No	8.0 [6.5]
Yes	7.0 [7.5]
	$P = 0.003$
Partner age ≥50 yrs (median)	
No	7.0 ± 5.2
Yes	8.5 ± 5.0
	$P = 0.0001$
Partner has erectile dysfunction	
No	7.7 ± 5.2
Yes	9.0 ± 5.1
	$P = 0.008$
Partner healthy status	
No	8.0 [10.0]
Yes	7.0 [6.0]
	$P = 0.01$

Data are presented as mean ± standard deviations or medians [interquartile ranges].
CESD-10, 10-item Center for Epidemiologic Studies Depression Scale.
^{a}Presented P values were determined with the appropriate tests according to each case and are the result of comparing calculated total CESD-10 scores for each studied parameter displayed as a trend (more than two categories) or dichotomous answer (yes/no). Table only displays variables that achieved statistical significance.

TABLE 3. *Final multivariate linear regression models for factors related to higher total CESD-10 scores*

Model including data of all studied women (N = 864)					
Factors	β coefficient	Standard error	95% CI	t	P
Afro-Colombian	2.90	0.42	2.07-3.73	6.87	<0.001
Hormone therapy use	3.18	0.57	2.04-4.31	5.51	<0.001
Sedentary lifestyle	2.82	0.53	1.78-3.86	5.32	<0.001
Postmenopausal status	1.09	0.23	0.63-1.55	4.68	<0.001
Hot flush intensity	0.99	0.17	0.66-1.32	5.85	<0.001
Female educational level	−0.07	0.31	−0.14 to −0.01	−2.53	<0.001
Female perceived healthy status	−1.18	0.49	−2.16 to −0.20	−2.16	0.01
Currently has a partner	−1.36	0.39	−2.14 to −0.58	−3.43	0.001
$r^2 = 0.57$; adjusted $r^2 = 0.55$, $P < 0.0001$					
Model including the data of those with a partner (N = 673)					
Factors	β coefficient	Standard error	95% CI	t	P
Afro-Colombian	4.73	0.45	3.84-5.62	10.44	<0.001
Hormone therapy use	3.65	0.58	2.49-4.80	6.20	<0.001
Sedentary lifestyle	1.78	0.55	0.68-2.87	3.20	0.001
Postmenopausal status	0.82	0.24	0.34-1.30	3.39	0.001
Hot flush intensity	0.91	0.17	0.57-1.25	5.26	<0.001
Female perceived healthy status	−1.60	0.51	−2.61 to −0.59	−3.12	0.002
Coital frequency, mo	−1.62	0.03	−0.22 to −0.10	−5.39	<0.001
Partner healthy status	−0.81	0.42	−1.64 to −0.01	−1.92	0.01
Partner premature ejaculation	1.28	0.41	0.47-2.09	3.10	0.002
$r^2 = 0.51$; adjusted $r^2 = 0.50$, $P < 0.0001$					

CESD-10, 10-item Center for Epidemiologic Studies Depression Scale; CI, confidence interval.

predictors of low satisfaction with life, depression, and severe menopausal symptoms.[24-27] In one study,[23] age and hormonal status did not significantly correlate with severe depression. Lifelong difficult conditions seem to have a close relationship with stress, anxiety, and depression.[28] Other factors may correlate to depressed mood that are not necessarily linked to the endocrine changes of the menopause. To highlight this situation, one study showed that depressive mood in postmenopausal women (assessed with the CESD-10) was inversely related to individual resilience.[7] Resilience is a psychological construct related to the capacity of overcoming all types of life difficulties.

The present study used the short 10-item version of the original CESD-20, created to screen for depressive symptoms, yet not perform a definitive diagnosis.[15] In our study, the CESD-10 presented a Cronbach's alpha of 0.83, which is consistent with good reliability. Reports indicate that total CESD-10 scores of 10 or more suggest the presence of depressed mood.[7,15] In accordance with this, our research found that more than a third of surveyed women had depressed mood, with a higher prevalence related to ethnicity (Afro-Colombian) and postmenopausal status. Although altitude has been related to the severity of menopausal symptoms in Latin America,[29] the current study showed that depressed mood (higher total CESD-10 scores) did not correlate to high altitude residency (Indigenous Quechua population). The prevalence of depressed mood ranged from 45% to 48.7% when the CESD-10 was applied to postmenopausal Spanish women[7,21]; that is consistent with our findings using the same tool. Multiethnic mid-aged women with depressed mood were described in the Seattle Midlife Women's Health Study using a multidimensional model. Three factors correlated with

depressive mood: the menopausal transition, health status, and stressful life, the latter being the most important. Health status had a direct effect on depressed mood and an indirect effect through stress. According to the authors, menopausal changes had little explanatory power and, therefore, depressed mood should not be directly related to menopausal endocrine changes.[30,31] However, negative mood and depressive symptoms (as measured with the CESD) are highest during the menopausal transition when compared with the postmenopausal years. When controlling for age, CESD scores do not differ when comparing early and late postmenopausal stages.[4]

A recent secondary analysis showed that postmenopausal Latin American women with anxiety display more physical symptoms, and thus impaired quality of life, as compared with those without anxiety.[27] To the best of our knowledge, the current investigation is the first Hispanic multicenter study reporting data related to the evaluation of depressive symptoms in mid-aged women from four South American countries using a simple and common standardized screening tool: the CESD-10. Although women from the four countries seem to share many common cultural background features, significant sociodemographic differences were observed among studied sites, which may be related to ethnicity, geographical, educational, and other cultural aspects. Both depressive symptoms and mood are very common during the menopausal transition; in fact, they are much more prevalent in women than in men.[1,13] This sex difference has been imputed to the various biological changes that occur during the menopausal transition and also to partner issues.[1] Previous studies have reported that Afro-American women display more vasomotor symptoms than other ethnic groups (ie, white women), which

has been related in this population to lower educational level, higher perceived stress, more depressive symptoms, a lifetime history of depression, trait anxiety, chronic medical conditions, and daily stress.[32] Despite this, not all comparative ethnic studies have adjusted analysis for confounding factors such as educational level, family size, work conditions, economic situation, comorbidity (excessive weight, obesity, metabolic syndrome, etc), and lifestyle. Longitudinal data analysis of the North American Study of Women's Health Across the Nation cohort (SWAN) indicate that higher scores using the 20 item CESD (more intense depressive symptoms) were related to stressful life events occurring in the past year, lower education, vasomotor symptom severity, menopausal status (perimenopausal or postmenopausal as compared with premenopausal) and current tobacco consumption.[33] Therefore, ethnicity may not be the only or most important factor related to depressive symptoms. Multivariant models are needed in prospective designs to assess the weight of each component in the regression model using depressive symptoms as an outcome/endpoint variable.

In agreement with the Seattle Midlife Women's Health Study and the SWAN study,[30-33] our multivariate linear analysis (data of all women) found that higher CESD-10 total scores were directly related to ethnicity (Afro-Colombian), HT use, sedentary life-style, postmenopausal status, and hot flush intensity. An inverse correlation was observed with female educational level, unhealthy perceived status, and the fact of not having a current partner. When analysis was confined to data of women with partners, monthly coital frequency and male issues also contributed to female depressed mood.

The present study found that HT users displayed more depressive symptoms. Interestingly, we have previously reported that HT users display more intense vasomotor symptoms than nonusers,[34] possibly due to the logical fact that they are the ones most likely to use treatment. In parallel to this, our first regression model also found a positive correlation between hot flush intensity and depressive symptoms, suggesting that vasomotor symptoms aggravate depressed mood and may also produce sleep disturbance.[1,35] Hence, the correlation between HT use and more severe depressive symptoms seems feasible and perhaps related to the presence of more intense hot flushes.

Finally, regarding the partner, our study found a correlation between higher CESD-10 scores and of having no current partner or having one with sexual dysfunction. As previously reported from small local mid-aged female Ecuadorian samples, male issues seem to be important risk factors for female sexual dysfunction, more severe menopausal symptoms,[13] and also, in light of our current findings, to more depressed mood. Male factor may indeed be a burden for women in traditional societies in which the role of men and women are quite separate. As others have reported in multi-ethnic studies from the United States,[31,33] our results seem to support the fact that depressed mood is not only related to menopausal endocrine changes, there seems to be a trend toward a more important role of social conditions such as

ethnicity, parity, the quality of male-to-female relationship, sedentary lifestyle, and excessive weight.

Regarding the limitations of the present research, one can mention its design (cross-sectional that does not allow determining causality and sample size calculation is not based on power calculation required for the regression model construction) and methodology (nonrandom sampling subject to referral bias). In addition, the diversity of the characteristics of the studied populations does not allow extrapolating results to the rest of the South American or the entire Latin American population. Despite the fact that women provided partner data, this was recall and did not include all sociodemographic partner features or information regarding the quality of the couple relationship, for instance, the presence of intimate partner violence, very common in Hispanic populations, and a correlate of female depression.[36,37] Indigenous ethnicity has been correlated to severe menopausal symptoms[17]; despite this, the present study found no association with depressed mood, perhaps due to sample size of this group. Anxiety is a highly prevalent issue in postmenopausal women of Latin America[27]; unfortunately, the CESD-10 does not assess anxiety.

The authors recognize that the above mentioned aspects are potential study limitations; however, it is important to highlight the fact that data related to depressed mood obtained from Hispanic populations are scarce. Our study may indeed be the first to provide this information from mid-aged women of four South American countries using a standardized validated instrument such as the CESD-10, and thus providing insights regarding the association between depressed mood and menopausal status, ethnicity, altitude of residency, and, most important of all, partner aspects. This indeed seems to be an important strength of our research. There is a need for prospective longitudinal data that assess cultural aspects, geographical conditions, and partner issues in greater depth in combination with the use of instruments that provide definitive diagnosis. Indeed, emotional and mental health requires a broader evaluation with specific instruments and procedures. In this sense, the CESD-10 is only a screening tool.

CONCLUSIONS

In this mid-aged female South American sample, depressive symptoms correlated to menopausal status and related aspects, ethnicity, and personal and partner issues. All these features require further investigation.

REFERENCES

1. Llaneza P, García-Portilla MP, Llaneza-Suárez D, Armott B, Pérez-López FR. Depressive disorders and the menopause transition. *Maturitas* 2012; 71:120-130.
2. Dulón-Pérez A, Depiano E, Chedraui P, Monterrosa-Castro A. The menopause in Latin America. *Maturitas* 2013;74:291-292.

3. Lambrinoudaki I, Bouziou G, Armeni E, et al. Circulating androgens are associated with mood disturbances in young postmenopausal women. *Climacteric* 2015;18:205-213.

4. Campbell KE, Dennerstein L, Tacey M, Szoeke CE. The trajectory of negative mood and depressive symptoms over two decades. *Maturitas* 2017;95:36-41.

5. Fernández-Alonso AM, Cuadros JL, Chedraui P, Mendoza M, Cuadros AM, Pérez-López FR. Obesity is related to increased menopausal symptoms among Spanish women. *Menopause Int* 2010;16:105-110.

6. Chedraui P, Pérez-López FR, Mendoza M, et al. Factors related to increased daytime sleepiness during the menopausal transition as evaluated by the Epworth sleepiness scale. *Maturitas* 2010;65:75-80.

7. Pérez-López FR, Pérez-Roncero G, Fernández-Iñarrea J, Fernández-Alonso AM, Chedraui P, Llaneza P; MARIA (MenopAuse RIsk Assessment) Research Group. Resilience, depressed mood, and menopausal symptoms in postmenopausal women. *Menopause* 2014;21:159-164.

8. Chedraui P, Pérez-López FR, San Miguel G, Avila C. Assessment of sexuality among middle aged women using the Female Sexual Function Index. *Climacteric* 2009;12:213-221.

9. Blümel JE, Chedraui P, Baron G, et al; for the Collaborative Group for Research of the Climacteric in Latin America (REDLINC). Menopausal symptoms appear before the menopause and persist 5 years beyond: a detailed analysis of a multinational study. *Climacteric* 2012;15:542-551.

10. Cuadros JL, Fernández-Alonso AM, Cuadros-Celorrio AM, et al; for The MenopAuse RIsk Assessment (MARIA) Research Group. Perceived stress, insomnia and related factors in women around the menopause. *Maturitas* 2012;72:367-372.

11. Pérez-Lopez FR, Chedraui P, Gilbert JJ, Pérez-Roncero G. Cardiovascular risk in menopausal women and prevalent related co-morbid conditions: facing the post-Women's Health Initiative era. *Fertil Steril* 2009;64:1171-1186.

12. Pérez-López FR, Chedraui P. Metabolic syndrome. In: Menopause: A Comprehensive Approach. Springer Verlag, Heidelberg (in press).

13. Chedraui P, Pérez-López FR, Morales B, Hidalgo L. Depressive symptoms in climacteric women are related to menopausal symptom intensity and partner factors. *Climacteric* 2009;12:395-403.

14. Monterrosa-Castro A, Romero-Pérez I, Marrugo-Flórez M, Fernández-Alonso AM, Chedraui P, Pérez-López FR. Quality of life in a large cohort of mid-aged Colombian women assessed using the Cervantes Scale. *Menopause* 2012;19:924-930.

15. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med* 1994;10:77-84.

16. Monterrosa-Castro A, Marrugo-Flórez M, Romero-Pérez I, Chedraui P, Fernández-Alonso AM, Pérez-López FR. Prevalence of insomnia and related factors in a large mid-aged female Colombian sample. *Maturitas* 2013;74:346-351.

17. Ojeda E, Monterrosa A, Blümel JE, Escobar-López J, Chedraui P. Severe menopausal symptoms in mid-aged Latin American women can be related to their indigenous ethnic component. *Climacteric* 2011;14:157-163.

18. Castelo-Branco C, Blumel JE, Roncagliolo ME, et al. Age, menopause and hormone replacement therapy influences on cardiovascular risk factors in a cohort of middle-aged Chilean women. *Maturitas* 2003;45:205-212.

19. Harlow SD, Gass M, Hall JE, et al; STRAW 10 Collaborative Group. Executive summary of the Stages of Reproductive Aging Workshop + 10 addressing the unfinished agenda of staging reproductive aging. *Menopause* 2012;19:387-395.

20. Pérez-López FR, Fernández-Alonso AM, Pérez-Roncero G, Chedraui P, Monterrosa-Castro A, Llaneza P. Assessment of menopause-related symptoms in mid-aged women with the 10-item Cervantes Scale. *Maturitas* 2013;76:151-154.

21. Cuadros JL, Pérez-Roncero GR, López-Baena MT, Cuadros-Celorrio AM, Fernández-Alonso AM. [Life satisfaction and related socio-demographic factors during female midlife]. *Enferm Clin* 2014;24:315-322.

22. Chedraui P, Pérez-López FR. Assessing sexual problems in women at midlife using the short version of the female sexual function index. *Maturitas* 2015;82:299-303.

23. Hu LY, Shen CC, Hung JH, et al. Risk of psychiatric disorders following symptomatic menopausal transition: a nationwide population-based retrospective cohort study. *Medicine (Baltimore)* 2016;95:e2800.

24. Fernández-Alonso AM, Trabalón-Pastor M, Vara C, Chedraui P, Pérez-López FR; MenopAuse RIsk Assessment (MARIA) Research Group. Life satisfaction, loneliness and related factors during female midlife. *Maturitas* 2012;72:88-92.

25. Ornat L, Martínez-Dearth R, Muñoz A, et al. Sexual function, satisfaction with life and menopausal symptoms in middle-aged women. *Maturitas* 2013;75:261-269.

26. Weiss SJ, Simeonova DI, Kimmel MC, Battle CL, Maki PM, Flynn HA. Anxiety and physical health problems increase the odds of women having more severe symptoms of depression. *Arch Womens Ment Health* 2016;19:491-499.

27. Nuñez-Pizarro JL, González-Luna A, Mezones-Holguín E, et al. Association between anxiety and severe quality-of-life impairment in postmenopausal women: analysis of a multicenter Latin American cross-sectional study. *Menopause* 2017;24:645-652.

28. Place PJ, Ling S, Patihis L. Full statistical mediation of the relationship between trauma and depressive symptoms [published online ahead of print May 12, 2016]. *Int J Psychol*.

29. Chedraui P, Blümel JE, Baron G, et al. Impaired quality of life among middle aged women: a multicentre Latin American study. *Maturitas* 2008;61:323-329.

30. Woods NF, Mitchell ES. Pathways to depressed mood for midlife women: observations from the Seattle Midlife Women's Health Study. *Res Nurs Health* 1997;20:119-129.

31. Woods NF, Mariella A, Mitchell ES. Depressed mood symptoms during the menopausal transition: observations from the Seattle Midlife Women's Health Study. *Climacteric* 2006;9:195-203.

32. Avis NE, Crawford SL, Greendale G, et al; Study of Women's Health Across the Nation. Duration of menopausal vasomotor symptoms over the menopause transition. *JAMA Intern Med* 2015;175:531-539.

33. Bromberger JT, Schott LL, Kravitz HM, et al. Longitudinal change in reproductive hormones and depressive symptoms across the menopausal transition: results from the Study of Women's Health Across the Nation (SWAN). *Arch Gen Psychiatry* 2010;67:598-607.

34. Blümel JE, Chedraui P, Baron G, et al; Collaborative Group for Research of the Climacteric in Latin America (REDLINC). A large multinational study of vasomotor symptom prevalence, duration, and impact on quality of life in middle-aged women. *Menopause* 2011;18:778-785.

35. Ornat L, Martínez-Dearth R, Chedraui P, Pérez-López FR. Assessment of subjective sleep disturbance and related factors during female mid-life with the Jenkins Sleep Scale. *Maturitas* 2014;77:344-350.

36. Godoy-Ruiz P, Toner B, Mason R, Vidal C, McKenzie K. Intimate Partner violence and depression among Latin American women in Toronto. *J Immigr Minor Health* 2015;17:1771-1780.

37. PAHO. Violence Against Women in Latin America and the Caribbean: A Comparative Analysis of Population-Based Data from 12 Countries. Available at: http://www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=19825&Itemid=270&lang=pt. Accessed February 3, 2017.