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Severe menopausal symptoms in mid-aged Latin American women can be related to their indigenous ethnic component

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ABSTRACT

Background Latin American women present more severe menopausal symptoms when compared to those from other regions of the world. Since this population is an ethnic blend of Caucasian and indigenous people, we sought to test the hypothesis that severe menopausal symptoms in Latin American women are associated with an indigenous origin.

Objective To assess menopausal symptoms among two specific indigenous Latin American populations.

Method A total of 573 natural postmenopausal indigenous women aged 45–59 years (288 Quechua (Peru) and 285 Zenú (Colombia)) living in isolated communities were surveyed with a general questionnaire and the Menopause Rating Scale (MRS).

Results The total MRS score was significantly higher among Quechua women as compared to Zenú ones (22.7 ± 5.7 vs. 14.7 ± 2.5, $p < 0.0001$); both figures were higher than those described for Hispanic or European populations. Quechua women presented more intense somatic and psychological symptoms as compared to Zenú (8.8 ± 2.3 vs. 5.3 ± 1.8; and 7.8 ± 2.4 vs. 3.2 ± 1.7, $p < 0.0001$); however, both indigenous groups presented similar intense urogenital symptoms (6.1 ± 1.6 vs. 6.2 ± 1.4, not significant). These differences persisted after adjusting for age, years since menopause onset and parity. The percentage of women presenting severe somatic and psychological symptoms significantly increased with aging among Quechua. This was not the case for Zenú women. More than 90% of indigenous women (Quechua and Zenú) at all age intervals presented severe urogenital scores, a percentage that is much higher than that described in the world literature.

Conclusion Severe menopausal symptoms found among Latin American women could be the result of their indigenous ethnic origin; the urogenital domain is the most affected.

INTRODUCTION

A recent, multicenter Latin American study[1], using the Menopause Rating Scale (MRS) in more than 8000 mid-aged women of 12 countries, suggested that menopausal symptoms were more severe than those reported for other populations. This scale assesses menopausal symptoms grouped within three sub-scales: somatic, psychological and urogenital; the mean scores for all subscales in the mentioned study were found to be higher than those described for the USA, Europe and Asia[2]. Schnatz and colleagues[3] have determined that, in the USA, Hispanic women present several symptoms at a higher rate than Caucasian women; these differences remained even when socioeconomic factors were considered, suggesting that ethnicity may be an independent variable predicting menopausal symptom intensity.

Urogenital complaints, as assessed with the MRS, are also more intense in Latin American mid-aged women when compared to other regions of the world[4]. Aiming to assess

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sexuality in mid-aged Latin American women with the Female Sexual Function Index, another recent study found decreased vaginal lubrication as the main related risk factor for sexual dysfunction[5]. It was determined that women with the least vaginal lubrication were those with higher rates of indigenous background, such as Quito (Ecuador), Santa Cruz (Bolivia) and Cochabamba (Bolivia), suggesting that indigenous women presented more urogenital atrophy.

Several studies performed in different populations have identified ethnicity as a factor influencing menopausal symptoms[6–9]. Latin America presents a mix of ethnicities resulting from the blending of Spanish conquerors with local indigenous populations. This situation originated in a high degree of blended ethnic populations; however, due to the geographical complexity of Latin America, some isolated indigenous groups still persist all over the continent. In some countries, such as Bolivia, on average two out of three inhabitants are indigenous; in other countries, such as Brazil, in contrast, only 0.4% of the population is indigenous[10].

Bearing in mind the hypothesis that the increased severity of menopausal symptoms observed among Latin American women is associated with their indigenous ethnic origin, we carried out the following study to assess menopausal symptoms among two specific indigenous Latin American populations.

METHODS

Study design

A cross-sectional study was carried out among healthy natural postmenopausal women aged 45–59 years from two specific indigenous populations. Women were surveyed with a general sociodemographic questionnaire and the MRS. Postmenopausal state was defined as at least 1 year of amenorrhea[11] and healthy status according to the National Center for Health Statistics as that allowing individuals to perform daily routine activitites[12]. Subjects excluded from the study were those refusing participation or who were incapable of understanding the items included in the questionnaire.

Surveys were performed by trained health-care providers well known among the indigenous populations. For this, door-to-door visits were carried out seeking women satisfying the inclusion criteria and an appointment was made for a future visit for the purpose of the survey. The surveys were performed on Sundays, a day in which women do not perform their agriculture chores. The research protocol of the CAVIMEC (Quality of life during the menopause and Colombian Ethnics) project as a whole and its Peruvian branch was approved by the Scientific Committee of the Vice-Rectorado de Investigación de la Universidad de Cartagena, Colombia. In accordance with the Declaration of Helsinski[13], all participants were informed about the research and its purposes and oral consent was obtained.

Participants

Quechua

Surveyed Quechua women were those from the indigenous communities of Ancahuasi, Pitumarca, Espinar, Yaurisqui, Mollepata and Tinta. These are isolated villages located in the Peruvian Andes at 3000–4000 m above sea level, with several thousands of inhabitants living in extreme conditions of poverty and devoted to agriculture and cattle raising as a way of life. A total of 291 women were invited to participate of which three refused participation (1%), leaving 288 subjects who completed the survey. All surveys were performed in the Quechua language (J.E).

Zenú

Indigenous Zenú women from the San Andrés de Sotavento fortress were surveyed. This fortress was created by the Spanish crown in 1773 and is located on the North Colombian coast (Department of Cordoba). 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. A total of 296 women were requested to participate of which 11 (3.9%) refused, leaving 285 for analysis.

Instruments

The Menopause Rating Scale (MRS)

The Menopause Rating Scale[14] was used in this research. It is composed of 11 items assessing menopausal symptoms and grouped into three subscales: (1) somatic: hot flushes, heart discomfort, sleeping problems and muscle and joint problems (items 1–3 and 11, respectively); (2) psychological: depressive mood, irritability, anxiety and physical and mental exhaustion (items 4–7, respectively); and (3) urogenital: sexual problems, bladder problems and dryness of the vagina (items 8–10, respectively). Each item can be graded by the subject from 0 (not present) to 4 (1 = mild; 2 = moderate; 3 = severe; 4 = very severe), and the mean ± standard deviation were obtained for each item. For a particular individual, a total subscale score can be obtained by summing each graded item contained in the subscale. The total MRS score is the sum of the scores obtained for each subscale. Higher scores indicate more impaired quality of life. Values above 8 (somatic), 6 (psychological), 3 (urogenital) and 16 (total) were used to define severe scorings[4]. This instrument has been validated in Spanish and used in several countries of Latin America[1,15–19].

General questionnaire

Regarding the general characteristics of the studied populations, the following variables were assessed: age, parity, years of schooling, spoken language, marital status, years since menopause onset, hormone therapy (HT) use and smoking habit.

Statistical analysis

Data analysis was performed using EPI-INFO 3.5.1 statistical software (Centers for Disease Control, Atlanta, USA; World Health Organization, Basel, Switzerland). Data are expressed as means ± standard deviations and percentages and their corresponding confidence intervals. Continuous data were analyzed with ANOVA and Student's t or Mann–Whitney test, according to the homogeneity of the variance. Differences in percentages were evaluated using the χ^2 test. Logistic regression was used to assess race as a risk factor for severe MRS scores (total and sub-scale) after adjusting for several confounding variables. The MRS score was considered as the dependent variable and ethnicity, age, years since menopause and parity as independent variables. Continuous variables were converted into dichotomic values using medians as cut-off points. Entry of variables into the regression model was considered at a 20% significance level and the stepwise procedure applied. For all statistical calculations, a p value of <0.05 was considered as significant.

RESULTS

A total of 573 postmenopausal women participated in this study, 288 Quechua and 285 Zenú. The general epidemiological data of surveyed women is depicted in Table 1. Although the ages of participants were similar (51.8 ± 3.3 vs. 52.0 ± 3.5 years), years since menopause onset were significantly higher for Quechua women (6.3 ± 3.0 vs. 5.1 ± 2.8, $p < 0.0001$). Compared to Zenú women, Quechuas had a higher parity (5.5 ± 1.9 vs. 4.2 ± 2.0, $p < 0.0001$), a higher rate of having a sexual partner (83.3% vs. 55.7%, $p < 0.001$) and more years of schooling (3.4 ± 1.8 vs. 2.4 ± 2.0 years, $p < 0.001$). HT use and the number of smokers were low in both indigenous groups. Only one Quechua woman (0.3%) spoke Spanish, whereas only two (0.7%) Zenú women did not.

MRS scores (total and subscales) among postmenopausal indigenous women (Quechua and Zenú) are shown in Table 2. As one can observe, quality of life is more impaired among Quechua women due to more severe menopausal symptoms. Indeed, the total MRS score was found to be significantly higher when compared to Zenú women (22.7 ± 5.7 vs. 14.7 ± 2.5, $p < 0.0001$). Upon analyzing each item composing the MRS, one can observe that only hot flushes and sexual problems display similar scorings; the rest are more severe for Quechua women. Quechua women displayed significantly higher somatic and psychological subscale scorings (8.8 ± 2.3 vs. 5.3 ± 1.8 and 7.8 ± 2.4 vs. 3.2 ± 1.7, respectively, $p < 0.001$). Quechua women presented a depressive mood scoring almost five times higher than Zenú women (1.9 ± 0.8 vs. 0.4 ± 0.7, $p <$ 0.001). No significant difference was found among studied groups for the total urogenital subscale score (6.1 ± 1.6 vs. 6.2 ± 1.4, not significant).

The distribution of women presenting severe MRS scores (%) according to the indigenous group is depicted in Table 3. Quechua women presented a higher rate of total MRS scores defined as severe compared to Zenú women (84.0% vs. 21.4%, $p < 0.0001$). This was due to the higher rate of Quechua women presenting severe scores for the psychological (64.6% vs. 6.0%, $p < 0.0001$) and somatic (55.3% vs. 2.8%, $p < 0.0001$) subscales. Rates for severe scores for the urogenital subscale were similar in both studied groups (95.1% vs. 92.3%, not significant). After adjusting for age, years since menopause onset and parity, Quechua women presented a higher risk of presenting severe total MRS scores as compared to Zenú women (odds ratio 17.28, 95% confidence interval (CI) 10.82–27.61, $p < 0.001$); equally, the odds ratios for severe somatic and psychological MRS scores among Quechua and Zenú women were 28.62 (95% CI 15.54–52.71) and 29.78 (95% CI 13.82–64.15), respectively.

Table 4 shows the severe MRS scores for the total and subscales, presented as percentages stratified by age and ethnic

Table 1 Epidemiological characteristics of postmenopausal indigenous women: Quechua (Peru) and Zenú (Colombia)

	Quechua ($n = 288$)	*Zenú* ($n = 285$)	*p Value*
Age (mean ± SD) (years)	51.8 ± 3.3	52.0 ± 3.5	NS
Years of education (mean ± SD)	3.4 ± 1.8	2.4 ± 2.0	0.0001
Spanish speaking, *n* (%)	1 (0.3)	283 (99.3)	0.0001
Women with partner, *n* (%)	240 (83.3)	278 (97.5)	0.0001
Parity (mean ± SD)	5.5 ± 1.9	4.2 ± 2.0	0.0001
Years since menopause onset (mean ± SD)	6.3 ± 3.0	5.1 ± 2.8	0.0001
Hormone therapy users, *n* (%)	4 (1.4)	6 (2.1)	NS
Current smokers, *n* (%)	12 (4.2)	13 (4.6)	NS

NS, non-significant; SD, standard deviation

Table 2 MRS scores (total and subscales) among postmenopausal indigenous women (Quechua and Zenú). Data are given as mean ± standard deviation

Subscale and symptoms	*Quechua* ($n = 288$)	*Zenú* ($n = 285$)	*p Value**
Somatic			
Hot flushes, sweating	2.0 ± 0.7	1.9 ± 0.4	NS
Heart discomfort	1.7 ± 0.7	0.6 ± 0.7	0.0001
Sleeping problems	2.3 ± 0.7	0.5 ± 0.7	0.0001
Muscle and joint problems	2.8 ± 0.6	2.3 ± 1.4	0.0001
Total somatic subscale	8.8 ± 2.3	5.3 ± 1.8	0.0001
Psychological			
Depressive mood	1.9 ± 0.8	0.4 ± 0.7	0.0001
Irritability	1.7 ± 0.7	1.0 ± 0.6	0.0001
Anxiety	1.7 ± 0.7	0.6 ± 0.8	0.0001
Physical and mental exhaustion	2.5 ± 0.6	1.3 ± 0.8	0.0001
Total psychological subscale	7.8 ± 2.4	3.2 ± 1.7	0.0001
Urogenital			
Sexual problems	1.8 ± 0.6	1.8 ± 0.6	NS
Bladder problems	2.4 ± 0.7	2.7 ± 0.7	0.0001
Vaginal dryness	1.9 ± 0.7	1.7 ± 0.7	0.0001
Total urogenital subscale	6.1 ± 1.6	6.2 ± 1.4	NS
Total score	22.7 ± 5.7	14.7 ± 2.5	0.0001

*As determined by Student *t* or Mann–Whitney test according to case; NS, non-significant

Table 3 Severe MRS scores for total and subscales (%) according to indigenous group. Data are given as percentage (95% confidence interval)

	Percentage with severe MRS scores		
Subscale	*Quechua* ($n = 288$)	*Zenú* ($n = 285$)	*p Value**
Somatic	55.3 (47.5–59.3)	2.8 (1.2–5.5)	0.0001
Psychological	64.6 (58.8–70.1)	6.0 (3.5–9.4)	0.0001
Urogenital	95.1 (92.0–97.3)	92.3 (88.5–95.1)	NS
Total	84.0 (79.3–88.1)	21.4 (16.8–26.6)	0.0001

*, As determined by χ^2 calculation; NS, non-significant

group. The rate of Quechua women with severe MRS scores (total and subscales) significantly increased with age; this was not the case for Zenú women. It is important to mention that more than 90% of the women of both indigenous groups and in all age intervals displayed severe urogenital scores. When indigenous groups were compared within each age interval, significant differences were observed for all MRS components (total and subscale) except for the urogenital subscale.

DISCUSSION

Upon analyzing the epidemiological characteristics of the studied indigenous groups, the first issue that requires a comment is the fact that both groups were of similar age (mean 52 years) and were postmenopausal, 5–6 years on average. This implies that menopause onset should have occurred at approximately 46–47 years. This age is significantly lower than that reported in women from developed countries, who reach the natural menopause between 40 and 58 years of age, with an approximate mean of 51.4 years[20]. Menopause onset, even for indigenous women of other parts of the world, is observed at 50 years[21,22]. Contrary to this, menopause onset for Latin American indigenous women has been reported to be earlier; for instance, a cross-sectional study determined that, for Maya women from Chichimila (Mexico), it was 44.3 years[23] whereas, for Movima Bolivian indigenous women, it was 42.3 years[24]. Even after taking into account the high grade of ethnical blending found in the subcontinent, this earlier age at menopause onset for Latin American indigenous women is in accordance with the results of a multicenter study carried out among mid-aged

Table 4 Severe MRS scores for total and subscales (%) stratified by age and ethnic group. Data are given as percentages. All comparisons were performed with the χ^2 calculation

	Number of women		*Percentage of women with severe scores*							
			Somatic		*Psychological*		*Urogenital*		*Total score*	
Age (years)	*Quechua*	*Zenú*	*Quechua*	*Zenú*	*Quechua*	*Zenú*	*Quechua*	*Zenú*	*Quechua*	*Zenú*
45–49	81	77	29.6[a]	1.3*	39.5	6.5*	90.1	90.9	69.1	26.0*
50–54	148	137	58.8	2.9*	66.2	5.8*	95.9	91.2	85.8	22.6*
55–59	59	71	72.9	4.2*	94.2	5.6*	100.0	95.8	100.0	14.1*
p value for trend			0.0001	NS	0.0001	NS	0.02	NS	0.0001	NS

*, $p < 0.0001$ as compared to Quechua women; NS, non-significant

women of 47 cities in 15 Latin American countries which found that age at menopause onset ranged from 43.8 years (Asuncion, Paraguay) to 53.0 years (Cartagena de Indias, Colombia), with a median age for all centers set at 48.6 years[25], which is lower than that found for developed countries.

A second issue that arises after comparing both indigenous groups is the fact that, while practically all Quechua women speak their native language, only 0.7% of Zenú women do. This translates into an important difference among studied populations in terms of cultural influence. While difficulties in acclimatization to very high altitude kept Spanish conquerors away from Quechua communities, on the contrary the prairies of the north of Colombia allowed a higher rate of cultural dominance during the Spanish colonization. Although Zenú indigenous populations were allowed to maintain some of their lands, Spanish culture and local government practically made the Zenú language disappear[26].

Analysis of obtained mean scores for each item in the MRS revealed that Quechua women exhibited higher scores for all symptoms except hot flushes and sexual problems, which were similar in both groups. These differences are dramatically marked when MRS scores (total and subscales) are presented as percentages of severity; nearly 60% of Quechua women have severe quality-of-life impairment due to somatic or psychological symptoms, whereas this rate is only 5% in Zenú women. Contrarily, both groups present a similar and intense compromise in the urogenital domain, with more than 90% of them presenting severe scores. This higher grade of urogenital compromise correlates with the findings of a multi-ethnic study performed at seven different sites in the USA involving 16 065 women aged 40–55 years, which points out the fact that Hispanic women (generally with a high grade of indigenous blend) present higher rates of urinary incontinence and vaginal dryness than women of other ethnic origins such as Caucasian, Chinese, Japanese and Afro-American[27]. The Women's Health Initiative Study, analyzing more than 100 000 North American women, found an elevated prevalence of urogenital symptoms among Hispanic individuals; the study also confirmed the higher severity of menopausal symptoms among North American subjects with Hispanic ethnic origin[28]. Finally, one cannot rule out the fact that genital hygiene behaviors can explain the high prevalence of urogenital symptoms found among indigenous women. To highlight this, one can mention the fact that vulvovaginal cleaning practices increase two-fold the risk of urogenital complaints among Caribbean black women as compared to white ones[29].

It is very interesting that not all indigenous women of the American continent present with the same menopausal symptom severity. Webster found that Canadian aboriginal women appear to experience fewer vasomotor symptoms than other North American women[30]. Martin and colleagues[23], reporting on postmenopausal Mexican Maya women, determined that no women admitted hot flushes and

did not recall significant menopausal symptoms. In contrast, another study performed in the same ethnic population (Maya) from Guatemala revealed that the majority of indigenous women present menopausal symptoms[31]. These differences indicate that ethnicity may not be the only important influencing factor. It has been thought that, in these populations, the intake of herbs and other alternative medicine could modulate the severity of these symptoms; however, the utility of these treatments has not been conclusively demonstrated. The SWAN study analyzed the use of 21 types of alternative and complementary treatments in five different ethnic populations. It found that rates vary in different ethnic groups and are not related to symptoms or the menopause, but to sociodemographic factors[32]. Another factor to bear in mind when analyzing differences in climacteric symptoms among these two indigenous groups is their dietary habits. In postmenopausal women, an omnivorous diet decreased the prevalence of climacteric symptoms[33]. Within Quechua communities, the diet does not vary, but, as a result of their pastoral activities, meat and even milk and cheese are often eaten. Potatoes and the cereal-like goosefoot plants – *quinua (Cheno podium quinoa)* and *cañihua (Cheno podium callidicaule)* – are the most common crops and foods[34]. Contrary to this, Zenú women, due to their geographical location and easy communication with the environment, have a more varied diet such as corn, yucca and ñame (cultivated on their own small plantations), complemented with meat from animals bred on their own farms (poultry, pork, beef); additionally, fishing provides another important source of proteins. Moreover, these activities are combined with handcraft production, providing them with a greater financial power to improve their dietary habits[35]. All these observations point out to the fact that menopausal symptoms and their severity are the result of a complex interaction between genetic and sociocultural factors which can vary widely from one population to another.

Although the percentage of women presenting severe MRS scores (somatic and psychological) significantly increased with age in Quechua women, this trend was not observed among Zenú women. Contrary to this, the percentage of women presenting severe urogenital MRS scores was found to be quite high (>90%) and the rates were similar in both studied groups; this situation occurred from the earliest age interval. This rate is much higher than the reported rate world-wide, varying from 8.8% in Asian women, to 25% in Europe and the USA, to 31.4% in Latin America[4].

Regarding the total MRS score (global quality of life), Quechua (mean 22.7) and Zenú (mean 14.7) women presented higher scores (worse quality of life) than those previously reported for Latin America (mean 11.3)[1] and for Europe and North America (8.8 and 9.1, respectively)[2]. The finding that Quechua women have more impaired quality of life than Zenú women is an interesting fact and correlates with that previously reported in a study by Chedraui and colleagues[1], in which women living at high altitude, with a high grade of Quechua blend, displayed worse quality of life (higher total MRS scores). Contrary to this, mestizo Colombian women living in the nearby area of the Zenú region display better total MRS scores than the global score for Latin America (8.6 vs. 11.3)[18]. Another explanation for the more intense symptoms (higher MRS scores) among Quechua women can be related to the effects of living at high altitude. Indeed, as already cited, Chedraui and colleagues[1] found that women living in Latin American cities at ≥2000 m above sea level were at a 43% higher risk of presenting impaired quality of life due to more severe climacteric symptoms (higher total MRS scores). A possible explanation for the more intense climacteric symptoms found among Quechua women (high altitude) could be found in the study of Gonzales and colleagues[36] who observed lower oxygen saturation levels among Quechua women once they have reached the menopause. This has correlated with lower plasma estradiol levels and perhaps explains the presence of more intense symptoms. Determining whether living at high altitude or having a Quechua background is indeed a risk factor for more severe climacteric symptoms would require further research.

Finally, concerning the limitations of the present study, one can mention its cross-sectional design and the lack of a control group; we are aware of these facts. Determining body mass index can also be seen as a potential drawback since increased weight has been reported as a risk factor for increased menopausal symptoms[37–39]. Delineating the dietary habits among the studied groups would have provided useful insights for the study as well. Despite these drawbacks, strengths can also be recognized in this research such as the fact that the obtained data may serve as an important reference tool for other studies regarding indigenous women and it constitutes, to the best of our knowledge, the first study to compare two specific indigenous Latin American populations.

In the light of our results, we may propose the hypothesis that the increased menopausal symptoms seen in Latin American mid-aged women may be associated with their indigenous ethnic origin; the symptoms in the urogenital domain are the most affected, apparently a characteristic of the Quechua and Zenú indigenous populations. More data regarding other Latin American ethnicities is warranted.

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References

1. Chedraui P, Blümel JE, Baron G, *et al*. Impaired quality of life among middle aged women: A multicentre Latin American study. *Maturitas* 2008;61:323–9
2. http://www.menopause-rating-scale.info/documents/Int_MeanSD.pdf. Last accessed 14 October, 2008
3. Schnatz PF, Serra J, O'Sullivan DM, Sorosky JI. Menopausal symptoms in Hispanic women and the role of socioeconomic factors. *Obstet Gynecol Surv* 2006;61:187–93
4. http://www.menopause-rating-scale.info/documents/Ref_Values_CountrGr.pdf. Last accessed 20 June, 2008
5. Blümel JE, Chedraui P, Baron G, *et al*.; for the Collaborative Group for Research of the Climacteric in Latin America (REDLINC). Sexual dysfunction in middle-aged women: a multicenter Latin American study using the Female Sexual Function Index. *Menopause* 2009;16: 1139–48
6. Appling S, Paez K, Allen J. Ethnicity and vasomotor symptoms in postmenopausal women. *J Womens Health (Larchmt)* 2007;16: 1130–8
7. Sievert LL, Morrison L, Brown DE, Reza AM. Vasomotor symptoms among Japanese-American and European-American women living in Hilo, Hawaii. *Menopause* 2007;14:261–9
8. Freeman EW, Sherif K. Prevalence of hot flushes and night sweats around the world: a systematic review. *Climacteric* 2007;10:197–214
9. Dennerstein L, Lehert P, Koochaki PE, *et al*. A symptomatic approach to understanding women's health experiences: a cross-cultural comparison of women aged 20 to 70 years. *Menopause* 2007;14:688–96
10. Del Popolo F, Oyarce AM. Población indígena de América Latina: perfil sociodemográfico en el marco de la Conferencia Internacional sobre la Población y el Desarrollo y de las Metas del Milenio. *En Pueblos indígenas y afrodescendientes de América Latina y el Caribe*. Santiago de Chile: CEPAL, 2005
11. Soules MR, Sherman S, Parrott E, *et al*. Executive Summary: Stages of Reproductive Aging Workshop (STRAW). *Climacteric* 2001;4:267–72
12. Brett KM, Chong Y. *Hormone Replacement Therapy: Knowledge and Use in the United States*. Hyattsville, Maryland: National Center for Health Statistics, 2001
13. World Medical Association. Declaration of Helsinki. *JAMA* 1997;277:925–6
14. Heinemann K, Ruebig A, Potthoff P, *et al*. The Menopause Rating Scale (MRS) scale: a methodological review. *Health Qual Life Outcomes* 2004;2:45
15. Aedo S, Porcile A, Irribarra C. Calidad de vida relacionada con el climaterio en una población Chilena de mujeres saludables. *Rev Chil Obstet Ginecol* 2006;71:402–9
16. del Prado M, Fuenzalida A, Jara D, *et al*. Assessment of quality of life using the Menopause Rating Scale in women aged 40 to 59 years. *Rev Med Chil* 2008;136:1511–17
17. Aedo S, Schiattino I, Cavada G, Porcile A. Quality of life in climacteric Chilean women treated with low-dose estrogen. *Maturitas* 2008;61:248–51
18. Monterrosa A, Blumel JE, Chedraui P. Increased menopausal symptoms among Afro-Colombian women as assessed with the Menopause Rating Scale. *Maturitas* 2008;59:182–90
19. Chedraui P, Aguirre W, Hidalgo L, Fayad L. Assessing menopausal symptoms among healthy middle aged women with the Menopause Rating Scale. *Maturitas* 2007;57:271–8
20. North American Menopause Society. *Menopause Core Curriculum Study Guide*. Cleveland, OH: North American Menopause Society, 2002
21. Syed Alwi SA, Lee PY, Awi I, Mallik PS, Md Haizal MN. The menopausal experience among indigenous women of Sarawak, Malaysia. *Climacteric* 2010;13:548–56
22. Johnston SL. Associations with age at natural menopause in Blackfeet women. *Am J Hum Biol* 2001;13:512–20
23. Martin MC, Block JE, Sanchez SD, Arnaud CD, Beyene Y. Menopause without symptoms: the endocrinology of menopause among rural Mayan Indians. *Am J Obstet Gynecol* 1993;168:1839–43
24. Castelo-Branco C, Palacios S, Mostajo D, Tobar C, von Helde S. Menopausal transition in Movima women, a Bolivian Native-American. *Maturitas* 2005;51:380–5
25. Castelo-Branco C, Blumel JE, Chedraui P, *et al*. Age at menopause in Latin America. *Menopause* 2006;13:706–12
26. Deas M. Tipos y costumbres de la nueva granada. Revista Credencial Historia. Biblioteca Luis Ángel Arango del Banco de la República http://www.lablaa.org/blaavirtual/antropologia/zenues/azenu1.htm. Last accessed 21 September, 2009
27. Gold EB, Sternfeld B, Kelsey JL, *et al*. Relation of demographic and lifestyle factors to symptoms in a multi-racial/ethnic population of women 40–55 years of age. *Am J Epidemiol* 2000;152:463–73
28. Pastore LM, Carter RA, Hulka BS, Wells E. Self-reported urogenital symptoms in postmenopausal women: Women's Health Initiative. *Maturitas* 2004;49:292–303
29. Rajamanoharan S, Low N, Jones SB, Pozniak AL. Bacterial vaginosis, ethnicity, and the use of genital cleaning agents: a case control study. *Sex Transm Dis* 1999;2:404–9
30. Webster RW. Aboriginal women and menopause. *J Obstet Gynaecol Can* 2002;24:938–40
31. Stewart DE. Menopause in highland Guatemala Mayan women. *Maturitas* 2003;44:293–7
32. Gold EB, Bair Y, Zhang G, *et al*. Cross-sectional analysis of specific complementary and alternative medicine (CAM) use by racial/ethnic group and menopausal status: the Study of Women's Health Across the Nation (SWAN). *Menopause* 2007;14:612–23
33. Zhang Q, Li F, Yu Y, *et al*. Differential factors associated with hot flashes in Chinese perimenopausal and postmenopausal women. *Maturitas* 2009;63:94–8
34. Mazess RB, Baker PT. Diet of quechua indians living at high altitude: Nuñoa, Peru. *Am J Clin Nutr* 1964;15:341–51
35. http://www.lablaa.org/blaavirtual/geografia/geoco4v3/zenues1.htm. Last accessed 18 December 2009
36. Gonzales GF, Villena A. Low pulse oxygen saturation in postmenopausal women at high altitude is related to a high serum testosterone/estradiol ratio. *Int J Gynaecol Obstet* 2000;71:147–54
37. Chedraui P, Hidalgo L, Chavez D, *et al*. Menopausal symptoms and associated risk factors among postmenopausal women screened for the metabolic syndrome. *Arch Gynecol Obstet* 2007;275:161–8
38. Li C, Samsioe G, Borgfeldt C, *et al*. Menopause-related symptoms: what are the background factors? A prospective population-based cohort study of Swedish women (The Women's Health in Lund Area study). *Am J Obstet Gynecol* 2003;189:1646–53
39. Greendale GA, Gold EB. Lifestyle factors: are they related to vasomotor symptoms and do they modify the effectiveness or side effects of hormone therapy? *Am J Med* 2005;118:148–54