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Menopause Symptoms' Predictors: The Influence of Lifestyle, Health- and Menopause-Related, and Sociodemographic Characteristics

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This research explores a causal model of menopausal symptoms in peri- and postmenopausal women. A community sample of 710 women was assessed regarding menopausal symptoms, and sociodemographic, health- and menopause-related, and lifestyle characteristics. Structural equation modelling was used. Menopausal status predicted skin/facial hair changes ($\beta = .156$; $p < .001$), vasomotor ($\beta = .122$; $p < .001$) and sexual symptoms ($\beta = .158$; $p < .001$). Age was significantly associated with cognitive impairment ($\beta = .087$; $p = .003$), aches/pain ($\beta = .072$; $p = .006$), urinary ($\beta = .115$; $p = .004$) and also sexual symptoms ($\beta = .107$; $p = .021$). Several menopausal symptoms are predicted, not only by menopausal status, but also by age progression, among other variables; this should be considered in the context of a well-adapted menopausal transition.

KEYWORDS menopausal symptoms, predictors, structural equation modelling, health status, lifestyle

INTRODUCTION

The menopausal transition in women is one more change added to the effects of the aging process; hormonal changes can induce the appearance of symptoms that will have an impact on the quality of life (Genazzani,

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Gambacciani, & Simoncini, 2007). However, it is still uncertain which symptoms are directly related to menopausal status: there is an identified set of symptoms that are reported in this transitional phase, but there is also a culture-specific influence in the experience of menopause (Hardy & Kuh, 2002; Obermeyer & Sievert, 2007). Moreover, certain occurrences during the menopausal period may be considered part of the aging process (Sowers, 2000).

There is evidence that health-related characteristics like body mass index (BMI), smoking, and physical exercise, as well as sociodemographic and economic factors, may influence the prevalence of menopausal symptoms (Campagnoli, Morra, Belforte, Belforte, & Tousijn, 1981; Gold et al., 2000; Progetto Menopausa Italia Study Group, 2005; Whiteman et al., 2003).

Given that health behaviors may have an impact on the occurrence of menopausal symptoms (Dennerstein, 1996), interventions combining pharmacology and lifestyle changes can be the most effective in preventing the emergence of clinical occurrences (Franco et al., 2009). Adding to this, the exploration of menopause in nonclinical samples allows clinicians and researchers to have a better understanding of the specificities of the menopausal transition and to deconstruct misconceptions due to biased sampling (Mansfield & Voda, 1997).

Furthermore, since the studies exploring the correlates of menopausal symptoms are still scarce (Progetto Menopausa Italia Study Group, 2005), this study has the aim of exploring, in a community sample of peri- and postmenopausal women, if sociodemographic, health- and menopause-related, and lifestyle variables can predict the severity of menopausal symptoms.

METHODS

Procedure

This cross-sectional study on menopause with Portuguese women encompasses a community sample, which was mainly recruited through schools and universities in the city of Lisbon. The inclusion criteria in this research were gender (female) and age (between 42 and 60 years). The American Psychological Association's standards on the ethical treatment of participants were followed. A written informed consent form was delivered to all participants, explaining the aims of the study, and emphasizing that the participation in this research was voluntary and that participants could interrupt their collaboration at any time, without any consequences.

After receiving the informed consent form and agreeing to participate in the research, a sample of 1,003 Portuguese women between the ages of 42 and 60 filled in all the instruments adequately (45 were excluded due to insufficient information).

The present research includes 710 of those women, namely, participants in peri- and postmenopause.

Participants

The 710 participants in peri- and postmenopause gave answers to a validated inventory for menopausal symptoms, as well as to a questionnaire to identify the menopausal status and to explore sociodemographic, health- and menopause-related, and lifestyle characteristics. Table 1 describes the participants regarding the assessed variables.

Measures

The instruments included the Menopause Symptoms' Severity Inventory, MSSI-38 (Pimenta, Leal, Maroco, & Ramos, 2011), which assesses menopausal symptoms in 38 items, organized in 12 sets (depressive mood; anxiety; cognitive impairment; aches and pain; skin and facial hair changes; numbness; body shape changes; perceived loss of control; mouth, nails and hair changes; vasomotor, urinary, and sexual symptoms). Both the frequency and intensity of the symptoms are measured in reference to the previous month, using a 5-point Likert-type scale, which ranges from "never" to "daily or almost every day" and from "not intense" to "extreme intensity" respectively. The severity of each symptom is calculated using the mean between the values of frequency and intensity for each of the symptoms.

The menopausal status was defined according to the Stages of Reproductive Aging Workshop's criteria (Soules et al., 2001). Perimenopausal participants would report a variable cycle length (a difference of more than 7 days than usual), or had skipped two or more cycles and had an amenorrhea interval superior to 60 days. Postmenopausal women had at least a 12-month period of amenorrhea. Besides menopausal status, the search for medical help to manage these symptoms was explored.

Sociodemographic characteristics (age, marital status, number of children [or parity], professional status, educational level, family annual income), as well as health- and menopause-related (presence of a recent disease or of a psychological problem, use of hormone therapy or herbal/soy products to manage menopausal symptoms), and lifestyle characteristics (alcohol, coffee and hot beverages intake; smoking; physical exercise; and body mass index [BMI]), were assessed. Lifestyle habits (namely, alcohol, coffee and hot beverages intake; smoking; and physical exercise) were assessed in terms of presence/absence, amount, and/or frequency. Hence, physical exercise, when present, was measured in terms of times per week and how many minutes the participant exercised; a mean between weekly frequency and duration was used in the multivariate model. Coffee and hot beverages

TABLE 1 Distribution of the Study's Participants According to Sociodemographic, Health- and Menopause-Related and Lifestyle Characteristics

	Perimenopause		Postmenopause	
Characteristics	*n*	%	*n*	%
n	298		412	
Age (*M*; *SD*)	47.6 (3.787)		53.9 (4.207)	
Education				
Primary school	28	9.5	62	15.4
Middle school	68	23.1	98	24.4
High school	91	31.0	109	27.1
University degree or higher	107	36.4	133	33.0
Marital Status				
Married or in a relationship	218	73.2	277	67.4
Not married or in a relationship	80	26.8	134	32.6
Parity				
0	22	7.5	42	10.4
1	97	33.1	104	25.9
2	136	46.4	186	46.3
3	32	10.9	49	12.2
>3	6	2.0	21	5.1
Professional Status				
Active	262	89.7	317	78.7
Inactive	30	10.3	86	21.3
Family Annual Income				
≤10,000 €	60	23.9	91	26.1
10,001–20,000 €	66	26.3	85	24.4
20,001–37,500 €	65	25.9	79	22.6
37,501–70,000 €	42	16.7	68	19.5
≥70,001 €	18	7.2	26	7.4
HT, Herbal/Soy Therapy or Nothing				
HT	13	4.5	49	13.5
Herbal/soy therapy	16	5.5	48	13.3
Nothing	262	90.0	265	73.2
Recent Disease				
Yes	51	18.0	95	23.8
No	233	82.0	304	76.2
Recent Psychological Problem				
Yes	43	14.8	76	18.9
No	247	85.2	327	81.1
Smoking Behavior				
Current smoker	87	29.7	82	20.5
Current nonsmoker	206	70.3	318	79.5
Alcohol Consumption				
Yes	157	53.0	192	47.2
No	139	47.0	215	52.8
Coffee Consumption				
Yes	266	89.6	344	84.3
No	31	10.4	64	15.7
Hot Beverages Intake				
Daily	260	92.3	333	87.7
Occasionally or never	22	7.8	47	12.3
Physical Activity				
Yes	127	43.1	197	48.8
No	168	56.9	207	51.2
Body Mass Index (kg/m^2)				
≤24.9	157	53.0	205	50.6
>24.9	139	47.0	200	49.4

intake, when present, was assessed in a four-option scale, ranging from "occasionally" to "more than five per day." Alcohol intake, when observed, was measured both in terms of frequency (daily, every weekend, or rarely) and quantity (until I feel drunk, moderately or less than a glass per occasion); a mean value of both translates the alcohol consumption variable in the causal model. Finally, for current smokers, smoking was quantified in a 6-point Likert-type scale that ranged from "less than 10 cigarettes per month" to "more than 40 cigarettes per day"; this quantification integrated the structural equation model to assert the influence of smoking on the menopausal symptoms' severity.

Statistical Analysis

Missing values were interpolated for variables, where their frequency was lower than 10% of the sample. This was done using the mean interpolation method. Multicollinearity between the independent variables was evaluated with the variance inflation factor (VIF) given by SPSS Statistics (v. 19, IBM SPSS Inc, Chicago, IL). All variables presented a value below 5, indicating the absence of collinearity (Weisberg, 1985).

The distributions of the studied variables were explored with SPSS Statistics (v. 19, IBM SPSS Inc, Chicago, IL).

To test the causal model for menopausal symptoms, a structural equation model was built relating the dependent variables (the 12 menopausal symptoms) with the 18 independent variables (age; parity; marital and professional status; income; education; presence of a recent psychological problem or a disease; transition from peri- to postmenopause; use of hormone therapy or herbal/soy products to manage menopause symptomatology; search for medical help to deal with menopause; alcohol, coffee and hot beverages intake; smoking; physical exercise; and body mass index), through AMOS software (v. 18, IBM SPSS Inc, Chicago, IL). The quality of the fit of the structural model was given by chi-square statistics (χ^2/df), comparative fit index (CFI), goodness of fit index (GFI) and root mean square error of approximation (RMSEA), and the reference values currently practiced in structural equation modelling (Byrne, 2001) were used. A two-step approach was used to evaluate the causal structural model. First, the factor's measurement model was evaluated to demonstrate an acceptable fit. Thereafter, the structural causal model, encompassing the 12 dependent and the 18 independent variables, was adjusted, and the significances of the causal trajectories were evaluated.

RESULTS

There is no multicollinearity between the independent variables. The fit of the measurement model was very good ($X^2/df = 2.855$; CFI = .915;

GFI = .885; RMSEA = .051].049; .054[; CI 90%; $p = .212$) as it was the one of the causal model ($X^2/df = 2.149$; CFI = .908; GFI = .884; RMSEA = .040].038; .043[CI 90%; $p = 1.000$).

Table 2 evidences the significant structural weights (standardized estimates, standard error, and significance level).

Table 3 presents the results of the squared multiple correlations—that is, the percentage of the variability accounted for by the sociodemographic, menopause, health-related, and lifestyle variables in the proposed causal model for each set of symptoms.

DISCUSSION

Body-shape changes, perceived loss of control, depressive mood, and sexual and urinary symptoms are the menopausal symptoms for which variability was explained to a greater extent by the sociodemographic, health- and menopause-related, and lifestyle characteristics included in this research. The most frequent predictors of menopausal symptoms were educational level and the presence of a psychological problem.

The menopausal status predicted significant skin and facial hair changes and vasomotor and sexual symptoms.

Although facial hair and skin modifications are usually indentified as hormone therapy's secondary effects (Munarriz et al., 2002), in this group of peri- and postmenopausal women, these symptoms were not related to the use of that therapy but, instead, were associated with the menopausal status. Hypoestrogenia as a consequence of menopause is known for having an impact on skin; however, so does the aging process (Raine-Fenning, Brincat, & Muscat-Baron, 2003). In the present research the changes in skin were significantly associated with the menopausal status, but not with age, supporting the fact that estrogen's decline has a stronger impact on the skin's conservation than age progression does.

The menopause status has been identified as a robust predictor of vasomotor symptoms' occurrence in prior research (Binfa et al., 2004; Olofsson & Collins, 2000). Moreover, and because hormone therapy is efficient in the decrease of these symptoms, a biological aetiology has been suggested for hot flashes and night sweats (Blümel et al., 2004). In this sample, the menopausal status predicted vasomotor symptoms, supporting a strong association between endogenous estrogens decrease and vasomotor symptoms. However, other nonhormonal variables, specifically marital status, educational level, and parity, were also significantly associated with these symptoms.

Sexual response has been associated with the menopause status (Dennerstein & Lehert, 2004; Genazzani et al., 2007), and some authors support the idea that only vasomotor symptoms and a decrease in sexual

TABLE 2 Significant Structural Weights of the Independent Variables (Sociodemographic, Health- and Menopause-Related, and Lifestyle Characteristics) Regarding the Dependent Variables (Menopausal Symptoms)

Trajectories	*β(SE)p*
Cognitive impairment ← Age	.087(.005)**
Aches and Pain ← Age	.072(.004)**
Urinary Symptoms ← Age	.115(.006)**
Sexual Symptoms ← Age	.107(.008)*
Depressive Mood ← Marital Status	−.060(.040)**
Sexual Symptoms ← Marital Status	.165(.070)***
Vasomotor Symptoms ← Marital Status	.079(.051)*
Numbness ← Professional Status	−.073(.072)*
Depressive Mood ← Educational Level	−.163(.014)***
Aches and Pain ← Educational Level	−.161(.016)***
Vasomotor Symptoms ← Educational Level	−.112(.014)**
Perceived Loss of Control ← Educational Level	−.189(.011)***
Numbness ← Educational Level	−.187(.018)***
Mouth, Nails, and Hair Changes ← Educational Level	−.153(.016)***
Anxiety ← Educational Level	−.093(.015)***
Urinary Symptoms ← Educational Level	−.091(.020)*
Sexual Symptoms ← Educational Level	−.149(.020)***
Skin and Facial Hair Changes ← Household Annual Income	.111(.023)**
Vasomotor Symptoms ← Parity	−.116(.024)***
Mouth, Nails, and Hair Changes ← Parity	.084(.027)*
Vasomotor Symptoms ← Menopausal Status	.122(.048)***
Skin and Facial Hair Changes ← Menopausal Status	.156(.054)***
Sexual Symptoms ← Menopausal Status	.158(.081)***
Vasomotor Symptoms ← Herbal/Soy Products	.143(.082)***
Numbness ← Herbal/Soy Products	.071(.089)*
Sexual Symptoms ← Herbal/Soy Products	.111(.111)**
Body Shape Changes ← Herbal/Soy Products	.100(.095)**
Vasomotor Symptoms ← Recent Disease	.071(.057)*
Mouth, Nails, and Hair Changes ← Recent Disease	.141(.066)***
Depressive Mood ← Recent Psychological Problem	.357(.087)***
Cognitive Impairment ← Recent Psychological Problem	.346(.092)***
Aches and Pain ← Recent Psychological Problem	.228(.094)***
Vasomotor Symptoms ← Recent Psychological Problem	.124(.071)**
Perceived Loss of Control ← Recent Psychological Problem	.336(.062)***
Numbness ← Recent Psychological Problem	.145(.091)***
Mouth, Nails, and Hair Changes ← Recent Psychological Problem	.238(.087)***
Anxiety ← Recent Psychological Problem	.331(.093)***
Skin and Facial Hair Changes ← Recent Psychological Problem	.234(.087)***
Urinary Symptoms ← Recent Psychological Problem	.261(.098)***
Sexual Symptoms ← Recent Psychological Problem	.243(.104)***
Body Shape Changes ← Recent Psychological Problem	.203(.092)***
Aches and Pain ← BMI	.074(.006)**
Numbness ← BMI	.103(.007)**
Urinary Symptoms ← BMI	.222(.008)***
Body Shape Changes ← BMI	.337(.007)***
Perceived Loss of Control ← Smoking	−.091(.011)*
Numbness ← Coffee Intake	.067(.029)*
Vasomotor Symptoms ← Hot Beverages Intake	−.075(.030)*

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$

TABLE 3 Variability of Menopausal Symptoms Accounted for by the Independent Variables

Menopausal Symptoms	% of the Symptoms' Variability Accounted for by the Independent Variables
Depressive Mood	16.6
Cognitive Impairment	12.9
Aches and Pain	10.7
Vasomotor Symptoms	10.1
Perceived Loss of Control	16.5
Numbness	9.8
Mouth, Nails, and Hair Changes	12.6
Anxiety	12.2
Skin and Facial Hair Changes	9.1
Urinary Symptoms	17.2
Sexual Symptoms	19.3
Body Shape Changes	16.8

interest are related to menopausal status (Vanwesenbeeck, Vennix, & van de Wiel, 2001). As expected, the menopausal status significantly predicted sexual symptoms in this sample. However, so did age progressing, marital status, educational level, and the presence of a psychological problem. These outcomes emphasize that it is not only hormonal variations that have a significant influence on the severity of vasomotor and of sexual symptoms in peri- and postmenopause.

Besides sexual symptoms, there were other symptoms significantly predicted by age, namely, cognitive impairment, aches and pain, and urinary symptoms.

The occurrence of cognitive difficulties during perimenopause was described previously; however, the authors suggest that these problems are transitory since there are no differences when comparing women in pre- and postmenopause (Greendale et al., 2009). Contrary to this, a decline in cognitive function (namely, working memory and perceptual speed) was not observed across the different menopausal stages in another study (Meyer et al., 2003). Moreover, it has also been concluded that women attribute their memory changes during the menopausal transition to physical health status, levels of stress, and the aging process rather than to the menstrual cycle and hormone use (Mitchell & Woods, 2001).

Our causal model supports the two latter studies: cognitive impairment was not predicted by the menopausal status; instead, age progression and the presence of a psychological problem were strongly associated with more severe levels of cognitive difficulties.

Joint pain has been referred to as related to menopause (Olofsson & Collins, 2000); however, this was not the case in this sample, which evidences aches and pain (including joint pain) as a consequence of aging.

Age also positively predicted urinary symptoms. Lower urinary tract symptoms have been associated with marital status, presence of a disease,

menopausal status, and parity (Manonai et al., 2004). In this sample, besides age, only the presence of a psychological problem and lower educational level predicted more severe urinary symptoms.

Surprisingly, hot beverages intake was a negative predictor of vasomotor symptoms. Given that it was expected that hot beverages would have a positive relation with vasomotor symptoms (Shaw, 1997), it was hypothesized that women who drank hot beverages more frequently would be the ones who had less severe (or absent) vasomotor symptoms; this would allow the maintenance of a high frequency intake of hot beverages, given that this would not promote a vasomotor exacerbation. Another concomitant conjecture was the possibility that, prior to the present investigation, women with severe vasomotor symptoms had learned by experience, or had been informed that a frequent ingestion of hot liquids triggers hot flashes and for that reason they had decreased hot beverages to a less frequent intake or had stopped consuming hot beverages altogether.

The use of herbal/soy products to manage menopausal symptoms was significantly associated with more severe vasomotor and sexual symptoms, as well as with numbness and body-shape modifications. Therefore, the use of these natural products was not significant in the attenuation of any of the menopausal symptoms, and it is related to the exacerbation of the mentioned symptoms. This might translate an insufficient clinical supervision and a mismatching between personal needs of the symptomatic women and products use. Given that clinical prescription is not mandatory and pharmaceutical recommendations are only given if women ask for them directly, there can be an erroneous use of these products, based on an absence of adequate counseling. As evidenced in a recent study on the decision-making process regarding the use of natural products for menopausal symptoms, women present several difficulties, namely, deciding on the adequate product, the adequate dosage, and the use of this kind of therapy specifically for menopausal symptoms. Unrealistic expectations about the efficacy of the natural products, inaccurate information about them, and the interference of menopausal symptoms are strongly related to these difficulties (Légarè, 2007).

The absence of an effect between hormone therapy and menopausal symptoms might be due to the fact that this is a community sample and, thus, participants might evidence less severe symptomatology than clinic patients, making the effect of hormone therapy undetectable when comparing with counterparts not using it.

CONCLUSIONS

The causal model proposed in this study evidences that there are several symptoms, recognized as menopausal, that are predicted by the menopausal

status (like skin and facial hair changes, and vasomotor and sexual symptoms), but also by sociodemographic characteristics. Others are strongly associated with the age progression, leading to the question of whether these symptoms are the result of actual hormonal changes.

This research also highlights the fact that several sociodemographic, health-related, and lifestyle characteristics play an important role in menopausal symptoms' prediction; this conclusion allows the promotion of strategies, specifically related to certain lifestyle changes, that might lead to the reduction of the menopausal symptoms' severity.

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